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REINVENTING BOSTON: 1640-2003

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ABSTRACT

The three largest cities in colonial America remain at the core of three of America's largest metropolitan areas today. This paper asks how Boston has been able to survive despite repeated periods of crisis and decline. Boston has reinvented itself three times: in the early 19th century as the provider of seafaring human capital for a far flung maritime trading and fishing empire, in the late 19th century as a factory town built on immigrant labor and Brahmin capital, and finally in the late 20th century as a center of the information economy. In all three instances, human capital – admittedly of radically different forms – provided the secret to Boston's rebirth. The history of Boston suggests that a strong base of skilled workers is a more reliable source of long-run urban health.

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I. Introduction

In 1980, Boston was a declining city in a middle-income metropolitan area in a cold state. Over the 60 year period between 1920 and 1980, Boston's population had fallen from 758,000 to 563,000, and Boston's real estate values in 1980 were so low that three quarters of its homes were worth less than the bricks and mortar cost of construction (Glaeser and Gyourko, 2001). There was little reason at that date to suspect that Boston would be any more successful than Rochester or Pittsburgh or St. Louis over the next few decades.

Twenty years later, Boston looks like the future not the past. The city and the metropolitan area have grown. More strikingly, the Boston primary metropolitan statistical area (the core city and its close suburbs) is the eighth richest metropolitan area in the country ranked by per capita income; it is the richest metropolitan area that is neither a suburb of New York nor in the Bay Area. Housing prices—always the surest sign that people want to live in a city—have soared. According to the 2000 census, Boston's median housing value of \$233,000 makes it the fourth most expensive metropolitan area (after Boulder, Honolulu and Orange County) that is neither in the New York nor San Francisco metropolitan statistical areas. In one sample of 541 cities, four of the five cities with the fastest housing price growth between 1980 and 2000 were Somerville, Newton, Boston and Cambridge.

The source of Boston's recent success is not unknown. Most skilled cities have done well over the past two decades, and Boston in 1980 had a strong skill base relative to its rustbelt peers like Syracuse and Detroit. Today, Boston is one of the most educated metropolitan areas of the country. This skill base, which is most strongly related to the educational history of the region, enabled Boston to become a successful city in the information age. The Boston region's dominant industries are now high technology, higher education and financial services. These industries have done extremely well over

the past 20 years and have strengthened Boston's economy, but Boston's ability to be a center for these sectors was itself a result of its historic commitment to skills.

But Boston's transformation from a dying factory town to a thriving information city is only the latest of the region's remarkable rebirths. Boston's history is not a seamless story of steady success, but rather a series of crises and restructuring. For the first century of colonial America, Boston had been the largest city in the colonies and had thrived as a conduit of goods between the old world and the new. But during the second half of the 18th century, the city stagnated. New York and Philadelphia were superior ports because of better river access to the rich hinterland and because they were more southern and less isolated in New England. Boston looked as if it was likely to become a nostalgic backwater just as the United States were being formed.

However, during the first fifty years of the 19th century, Boston was able to capitalize on its remarkable base of seafaring human capital to become a center for global shipping and sailing. Boston's comparative advantage was not in its port, but in its people who crewed, captained and owned ships that sailed in and out of ports from New York to China. One way to understand this change is that peace and technological improvements created an increasingly global maritime economy during the early 19th century. Boston's comparative advantage in seafaring became increasingly valuable during this era, and the city changed from being an important port for goods coming and going to America, into the capital of a vast seafaring empire.

The source of Boston's early 19th century success—sailing skills—ensured that Boston's maritime empire would not survive the switch from clipper ships to steam. Steamships required far less human capital than sailing ships, and all of a sudden Boston seemed like it was in danger of becoming obsolete. Indeed, its New England competitors such as Salem and New Bedford never really recovered from the switch from sail to steam. But unlike those cities, Boston had acquired, as a last product of its sailing supremacy, a vast population of Irish immigrants. Boston became Irish because the potato famine happened to have coincided with the last decade when it was cheaper to get from Liverpool to

Boston than from Liverpool to New York. If the famine had occurred ten years later, it seems likely that there would have been no substantial Irish population in Boston because steerage fares on steamships to New York had become sufficiently cheap.

The initial Irish population which served as the nucleus for a growing city of immigrants during the nineteenth century helped to turn Boston from a maritime city in 1840 to an industrial city in 1890. Other factors also mattered. Fortunes, made off the China trade, were reinvested in Boston area manufacturing plants. Railroads, sometimes also built from trading wealth, turned Boston into the railroad hub of New England. Finally, the switch from water power to steam enabled factories to move from rivers like the Merrimack to a more central location to save on labor and transportation costs. Like most large American cities during the late 19th century, Boston did well as a center for the industrializing country.

But Boston's heady period of growth was over by 1920. Between 1920 and 1950, the city population stayed flat, while the country's population grew by 50 percent. Between 1950 and 1980, the city lost population. In 1910, Boston was the fifth largest city in the country. By 1980, 19 cities were bigger than Boston. Boston declined for at least four separate reasons. First, Boston was a cold city and over the 20th century, warm cities grew much more quickly than cold cities. Air conditioning and improvements in public health greatly increased the quality of public life in the sunbelt. Declining transport costs freed workers from having to live close to rivers or natural resources. Instead, people could move to warm places that were pleasant to live in. Second, Boston had been a manufacturing town and all manufacturing towns were declining. Third, the automobile was supplanting older forms of personal transportation and central city Boston was particularly tied to these older forms of transportation and particularly bad as a driving city. Finally, Boston was a city with high taxes and heavy regulation. All of these factors suggest that Boston's mid-twentieth century decline was pretty inevitable.

Yet, again Boston has reinvented itself and the past twenty years have been a period of enormous success for the region both in terms of incomes and in terms of property

values. In the labor market, education is the dominant factor in today's economy, and Boston has been specializing in skills for almost 400 years. Among the 200 or so metropolitan areas with more than 160,000 residents, the Boston primary metropolitan statistical area ranks fifth in share of the population over the age of 25 with college degrees (after Boulder, Stamford, Madison, and San Jose) and third in the share of the population between 25 and 34 with college degrees (after Boulder and Stamford). It ranks seventh among all metropolitan areas in its share of employees in managerial, professional or related professions after Boulder, Corvallis, San Francisco, San Jose, Stamford and Washington. The region's success has meant that the most pressing problem for the area is that its regulation of new construction has meant that not enough people have been able to take advantage of the area's high levels of productivity.

The story of Boston's history yields the following implications about urban dynamics. First, long run urban success does not mean perpetual growth. Long run urban success means successfully responding to challenges. The basic pattern of Boston's history is that the city specializes in one area and inevitably either this area declines or their dominance in the area is challenged. The survival of the city hinges on re-orientation. Boston is a large city while Salem is not, because Boston responded to the decline of sail by becoming a manufacturing city while Salem did not. Boston is a thriving city while Detroit is not because when manufacturing declined, Boston was able to redefine itself as a high technology city, while Detroit was not.

Second, Boston's ability to re-orient itself hinged on industrial diversity. Boston had never been just a port and from the beginning, artisans in the town had manufactured goods which were then taken on Bostonian ships abroad. As such, the switch from seaport to factory town required a large re-emphasis, but not inventing industry from scratch. Likewise, Boston's seafaring commerce had always needed financial services, and as a result, the city had always had banks, brokers and insurers. As Boston's manufacturing declined, finance was able to take up its slack.

Third, Boston's ability to regenerate itself hinged upon its ability to attract residents, not just firms. The American cities that grew because of proximity to productive natural resources, such as coal, have suffered tremendously over the past 50 years. When the demand for the key natural resource declined, no one saw any reason to remain in the city and they left. By contrast, from its earliest days, Boston existed not only as a productive center but as a place that people wanted to live: a consumer city. Because people wanted to live there, as well as work there, during times of economic trouble, residents innovated and stayed. In the coal towns of central Pennsylvania exodus, not innovation, was a more common response.

Fourth, in all of its period of reinvention, Boston's human capital has been critical. Skills with sailing ships enabled the city to reinvent itself as a global maritime center in the early 19th century. Yankee technology and Irish labor together fueled industrialization. And today more than ever, Boston's skills provide the impetus for economic success in technology, professional services and higher education. Boston's experience certainly suggests that human capital is most valuable to a city during transition periods when skills create flexibility and the ability to reorient towards a new urban focus.

II. Colonial Dominance and Decline: 1620-1790

Boston became the capital of Massachusetts and the first city of New England because of a spring. In 1629, John Endecott had built a house in Charlestown for Massachusetts' new governor, John Winthrop, to live (Bremer, 2003, p. 192). Salem, where Endecott had been living, was passed over as a capital surely in part because its rocky soil couldn't save its small group of pre-Winthrop settlers from starvation. By contrast, Charlestown offered better farmland, as well as a protected harbor and the Charles river. Winthrop was living in the house that Endecott built by July, 1630, but Winthrop's fellow settlers were soon dying from disease in Charlestown. Even the limited medical knowledge of 1630 included the understanding that fresh water was a key to health. Charlestown's one spring was accessible only during low tide. Winthrop and his sick companions moved

across the Charles to Boston “drawn there by a spring with abundant fresh water” (Bremer, 2003, p. 193).

In 1630, Winthrop had brought 150 settlers to Boston. By 1640, Boston’s population had grown to 1,200 and by 1690, the city had a population of 7,000. Boston’s colonial population appears to have peaked around 1740, with 17,000 residents, and when it finally lost its status as the colonies premier status to Philadelphia. While the exact location of Winthrop’s capital owes much to springs, rivers and soil, the longer term success of this city was primarily a result of the success of the Massachusetts colony and its unusual nature. Indeed, the special character of the Massachusetts Bay colony can help us to understand not only the success of Boston between 1630 and 1740, but also the city’s success three centuries later.

Every successful colony prior to Massachusetts had been oriented around extracting wealth from the new world and bringing that resource back to Europe. Spanish settlement in the South was driven by silver and gold which enriched the conquistadors, who returned to Spain and which funded the vast Hapsburg military machine. The Dutch colony in New Amsterdam and the Swedish colony in what became Delaware were essentially trading posts oriented towards acquiring furs from Native Americans. The Virginia settlements soon became plantations from growing tobacco and shipping that valuable product back to the old world. These were extractive settlements built around an obvious source of wealth which could be readily exploited, and where many settlers sought return to the old country once their fortunes were made.

The Massachusetts’ Bay Colony was fundamentally different. The settlers brought by John Winthrop sought material prosperity certainly, but they had every intention of living permanently in Massachusetts. After all, the Boston settlers saw Stuart London as a sinful city to be fled, not as an ideal spot to retire. Moreover, New England had no obvious source of wealth. As John Smith wrote in 1616, New England’s “main staple, from hence to bee extracted for the present to produce the rest, is fish” (Smith, 1616), and there was no reason to live in Massachusetts to fish there. After all, fleets from Europe

had been exploiting New England's fish population for decades before 1630. While Virginia extended the simple extractive model of Latin America and the previous trading posts, Massachusetts created a new model with settlers with the goal of building a new society. New England offered cheap land to be sure, but no natural export.

The data illustrate the differences between New England and the Southern Colonies. In 1700, Virginia and Maryland together exported 317,302 pounds worth of goods (mainly tobacco) to England. These colonies imported only 173,481 pounds worth of goods from the mother country. This trade surplus is not a fluke of that year. Between 1700 and 1750, Virginia and Maryland ran trade surpluses in all but three years, and in most years the surpluses were enormous. Virginia's trade surplus is the hard evidence for the extraction of tobacco wealth being brought from the new world to the old. By contrast, between 1697 and 1774, New England ran a trade deficit every year. In most years, imports from England were more than double exports. New England wasn't extracting wealth from the hinterland and shipping it back to the mother country. But Massachusetts' residents were still managing to make enough money to pay for the goods that they were importing from England.

During the 1630s, the Massachusetts economy operated as something of a colonial Ponzi scheme. Early settlers provided food and other necessities to newer settlers who had brought their life's savings over from England. As such, the capital needed for old settlers to purchase commodities from England was provided by newer settlers who bought simple agricultural products at high prices. But this model requires a high ratio of new settlers to old residents. By 1640, there were already too few people coming from England for the model to work and Bostonians needed to find an alternative source of funds to buy the products they needed from England.

However, it turns out that their basic model—providing food and other basic goods which would never have found a market in England to other colonists—could be slightly perturbed and made the basis for the commercial economy of New England. The soil of the extractive economies of the Caribbean and the South was far too valuable to waste on

livestock and wheat, but the farmers of these colonies still needed to eat. Producing food in Massachusetts and shipping it to these richer, southern areas provided the income needed to pay for commodities which in turn were bought from England. In 1770, 73 percent of Massachusetts shipping left for America, Bermuda and the Caribbean and only 19 percent left for England. Shephard and Walton (1972) tell us that in the 1768-1772 period, 35 percent of the New England exports to the West Indies were fish, 32 percent were livestock and 21 percent were wood products.

Why does all this matter for the history of Boston? In the modern world, urbanization and income go closely together. But in colonial America, the extraction-based colonies were richer than Massachusetts. In 1774, private wealth per free capita was about four times higher in the south than in New England (Historical Statistics of the United States, p. 1175). By all accounts, New England seems to have been prospering relative to Europe, but Boston's size was not a result of Massachusetts' wealth.

Instead, Boston's size was a result of the way that Massachusetts made its wealth. Virginia's tobacco trade was simple and hinged on dispersion across vast plantations. Boats would come down the river to pay cash for bales of tobacco. No Southern rival grew larger than Boston, in part because one relatively simple commodity dominated southern life and this didn't require a commercial or manufacturing center. But since Massachusetts' produce was worth too little to export to England, the colonial merchants had to develop a complex trading system that handled a rich number of commodities which were shipped to four separate countries. Indeed, one third of Boston's population (according to Henretta, 1965) was directly involved in the shipping trades.

Boston's elite were merchants who grouped together to share risks and learn of the latest information about prices and shipments. Growing tobacco doesn't hinge on up-to-date information. A mercantile operation that tries to match supply with demand across continents inevitably requires face-to-face contact between merchants. Morison (1961) describes how Boston merchants even in the 19th century "still continued their eighteenth-century custom of meeting on 'change, at one o'clock every week day, to

discuss business and politics before going home to their two or three o'clock dinner." Their information-intensive business required first-hand knowledge which couldn't be gotten by living far from the port.

Surrounding this mercantile elite was a larger population supporting the ocean-going trades. Many of Massachusetts' exports required some workmanship, especially ships and other wood products. Boston became a certain for this form of manufacturing where New England lumber was transformed into finished goods. Of course, Boston also provided support services, such as taverns and boarding houses, for the sailors. As tobacco was so much more valuable per pound than Massachusetts' exports, the number of ships leaving Charleston or other southern ports was also lower than the number of ships leaving Boston, even if the value of the cargo was higher. Since the size of the port is more likely to reflect the tonnage of ships than the value of goods, this helps us to understand Boston's size.

Despite Boston's success, it is worth stressing that while the absence of a cash crop in Massachusetts seems to have made Massachusetts more urban than its southern competitors, it was still much poorer. This was not a case of hardship being perversely beneficial, at least not in the short run. Rather it is a case of smart colonists surviving in a difficult environment.

Boston grew as a center for commerce and immigration settled in the America's first colony with a balanced economy. The fact that settlers saw themselves as permanent residents combined with the religious nature of the colony (which partially led the settlers to want to be permanent in the first place) to create a number of important Boston institutions. From the start, Boston had a much stronger set of community organizations than the southern colonies because of its church structure. Membership in the church was a necessity for anyone wanting full membership in the community, and the churches organized and disciplined the population. As a result, Massachusetts had dense social networks and something like rule of law, when the southern colonies were far more dangerous areas (see Kim, 2003). The differences in homicide rates, which persist to this

day between New England and the South, date from this period, and it is hard not to think that the well functioning church-based organization of Boston played a major role in keeping the peace.

A second important feature of Boston's religion-based permanence was its tradition of democratic egalitarianism. The Puritan's Calvinist ethos tended to imply political equality between the righteous. As a result, all church-goers, regardless of wealth, had equal political rights in the community. Moreover, as the reformation directly challenged the hierarchical nature of the Catholic Church and tried to replace it with a bottom-up "congregational" system, Boston's traditions of direct democracy, home rule and town meetings come from this era.

The final, remarkable feature of Boston, which again comes from the fact that it was a balanced, permanent and religious colony, was its focus on education. The Boston Latin School was founded in 1635 and Harvard College was founded, with government money, the next year. These institutions were meant originally to train ministers, but they flourished in a community that valued learning. Again, the Calvinist attention to literacy surely mattered, but the more complex Massachusetts economy also demanded more widespread knowledge than the tobacco culture of the south. Harvard's earliest graduates were men of the cloth, but increasingly a Harvard education provided valuable background for merchants and lawyers in a world where literacy and knowledge increased earnings.

This is not to say that the Southern land-holders of the 18th century weren't sometimes enormously well educated, but in the South learning appears to have been more of a consumption good than an aid in production. After all, both Adams and Jefferson were extraordinarily well educated and knowledgeable men. Adams earned his living with his learning excelling in Boston's complex legal world. Jefferson's learning helped him found universities and write the Declaration of Independence, but by all accounts, he was a pretty unsuccessful plantation manager, and there is no evidence to suggest that his learning ever helped him increase his earnings.

The economy of Massachusetts Bay both drove Boston's early success and helps us to understand some of its social, political and educational traditions. Of course, natural conditions also mattered. Boston's sheltered harbor facilitated trade. Boston's colder climate also helped the urbanization process. While in the 20th century, warm areas have done well, in the 17th century, warmth was better for microbes than for humans. As a result, the Southern colonies were generally far more disease prone than New England and when people concentrated into cities the risks of disease increased even further.

Still, despite these advantages, in the mid-18th century Boston was being surpassed by first Philadelphia and then New York. To a large extent, the growth of these cities and their surrounding countryside followed the Massachusetts, not the Virginia, model. Like Massachusetts, the Penn Family's colony was based on available land and widespread permanent settlement, not on a single cash crop. Like Massachusetts, Pennsylvania ran large trade deficits with England and made them up with trade with southern colonies and the Indies. Philadelphia would surpass Boston because land in Pennsylvania was much better than land in New England, because Philadelphia was closer to the markets in the Indies and in the South, and because the Schuylkill is a much more navigable river than the Charles. By the 1760s, Philadelphia's port became busier than the port of Boston because of these natural advantages.

During much of the later half of the 18th century, Boston slumped. Its population barely grew from 17,000 in 1740 to 18,300 in 1790. This slow population growth is certainly associated with Massachusetts losing ground relative to New York and Pennsylvania. Between 1740 and 1790, the population of Massachusetts more than doubled, but the population of those other two states increased five-fold. But Boston's dominance over Massachusetts was much weaker than New York and Philadelphia's dominance over their own states during this era. For example, in 1790, all New York State shipping went through New York City and more than 95 percent of Pennsylvania shipping went through Philadelphia.

By contrast, Boston's share (by ton) of ships leaving Massachusetts was only 52 percent. Somewhat remarkably (from the modern perspective), Boston was only one of three Massachusetts cities that were among the ten largest cities in America's first census (the other two being Marblehead and Salem). In the late colonial period, about 5,000 tons of salted cod alone was shipped out of Salem, most of it to parts of the Spanish empire. While Boston offered better access to the American hinterland, Salem was a better fishing port. This helps us understand how Massachusetts remained the most important seafaring colony, although Boston was no longer the most important seafaring city in the thirteen colonies.

III. 1790-1920: Immigrants and Manufacturing

While Boston's population stagnated between 1740 and 1790, Boston's population surged after that year and grew steadily for the next 130 years. The town of 1790 with 18,000 residents became a city of 748,000 in 1920. Figure 1 shows the time path of Boston's population. Over the 1790-1890 period, Boston's population grew steadily by 3.2 percent per year, or 37 percent per decade. The 1790s were a typical decade. Boston's population increased from 18,320 to 24,937 for a 36 percent increase. The best decade for Boston's population growth between 1790 and 1900 was the 1830s when population grew by 51 percent and the worst decade was the 1880s when population only grew by 24 percent.

Of course, America as a whole was growing remarkably over this period. The new republic had 3.9 million Americans in 1790 and 106 million in 1920. Was Boston growing faster than the U.S. as a whole? Figure 2 shows change over time in the ratio of the population of Boston to the population of the U.S. as a whole. During the 1790-1830 period, Boston grew at about the same rate as the country as a whole. 4.6 percent of Americans lived in Boston in 1790 and 4.7 percent of Americans lived in Boston forty years later. Starting in 1830, for fifty years, Boston started growing at a much faster rate than the country as a whole, and by 1880 7.2 percent of Americans were living in Boston.

After that point, Boston's share of the U.S. population stayed constant for forty years, and then began its eighty year decline.

Two other benchmarks are useful to put Boston's growth in perspective. Figure 3 shows Boston's population relative to the population of Massachusetts as a whole and relative to the city of New York. Boston's population relative to Massachusetts rises during every decade from 1790 and 1880 and declines during every subsequent decade. The growth period represents the increasing urbanization of New England. The decline period is somewhat misleading because the bulk of Massachusetts growth during this later period has been in areas which can fairly be called satellites of Boston.

The relationship between Boston population and New York population is more straightforward. Boston loses population relative to New York in every decade outside of the 1860-1880 period. After all, during 1790-1890 when Boston grew at a 3.2 annual rate, New York grew at an even more impressive 3.9 percent annual rate. When a town grows from 18,000 to 450,000 in a century, it seems like the big story is that increase, not the fact that some other cities grew even more quickly. There were some cities that grew far more slowly. While Salem's population eventually reached 40,000, its growth rate over the 1790-1890 period was an anemic 1.36 percent per year. While Boston was the third largest city in the country in 1790, somewhat remarkably it remained the fifth largest city in the country as late as 1910.

How can we understand the growth of Boston during the 19th century? The available evidence suggests that Boston's growth during the 1790-1840 period followed the maritime pattern set during the colonial era. Unlike New York, Philadelphia or even Baltimore, Boston appears to have been overwhelmingly oriented towards trade and fishing. As late as 1840, the Census reports that Boston had 10,813 people in the ocean-going professions and only 5,333 people in manufacturing. By contrast, New York had 43,390 people working in manufacturing and only 2,786 residents in the ocean-going trades. In fact, Lowell, not Boston, was Massachusetts' first city of manufacturing with 8,936 people working in the textile mills. Boston had more sea-going occupants than all

of America's other big cities put together. While they had become manufacturing centers by 1840, Boston remained centered on the sea just as it had been 100 years earlier.

How did an ocean-going orientation lead to growth between 1790 and 1840 when it had led to stagnation between 1740 and 1790? During the 1740-1790 period, international wars cut Boston off from trading partners (notably Spain), British mercantilism constrained colonial shipping development and, under the Articles of Confederation, state policies blocked Boston merchants from intra-U.S. trade. As a result, U.S. shipping as a whole grew only modestly during this era, and Boston's share of that shipping clearly declined as it was passed by more southerly ports.

After 1790, the constitution broke down the barriers to national trade. The U.S. was no longer constrained from trading with Britain's enemies (and indeed the U.S. fought a war in part over our right to trade with whomever it pleased). No imperial tariffs constrained Boston merchants. And so while total U.S. exports and imports were worth \$20 million in 1790 (\$391 million in today's dollars), by 1840, total exports and imports were worth \$239 million (or \$4.9 billion today). The increase in trade certainly gave a boost to all of America's ports.

But if the pre-1790 trends had continued, we might have expected New England to have a smaller and smaller share of an increasingly large amount of American water-borne trade. However, somewhat surprisingly between 1816 (the first available year for comparison) and 1840 New England's share of trade appears to have risen. In 1791, 38 percent of U.S. merchant vessel tonnage was in New England ships. In 1841, New England's share of merchant vessel tonnage was up to 58 percent (Albion, 1932). Morison (1961) reports that between 1798 and 1855, the Boston Customs' District ownership of shipping rose from 81,000 to 546,000 tons.

This fact doesn't mean that Boston's share of American exports and imports was rising. It wasn't. In 1821, 21 percent of America's imports and exports were handled by Boston and 29 percent were handled by New York. Twenty years later, New York's share was

up to 43 percent and Boston's was down to 10 percent. Boston Harbor was clearly outclassed by New York's harbor along many dimensions, and the opening of the Erie Canal just made things worse. As a port for products coming from or going to the American hinterland, New York was vastly superior to Boston and we can't be surprised at New York's rise relative to Boston.

But the boats that landed in New York were to a large extent owned and operated by New Englanders, often Bostonians. As Albion (1932) writes "Yankees captured New York Port around 1820 and dominated its activity at least until the Civil War." Indeed, during the same era when Boston was losing its importance as a port of entry, Boston and New England were increasing their control over the shipping fleets. Between 1811 and 1851, New England's share of foreign commerce fell from 28 percent to 11 percent while New York's share of foreign commerce rose from 21 percent to 52 percent. Over the same four decades, the share of registered tonnage owned by New Englanders increased from 45 percent to 58 percent (all figures in Albion, 1931). Boston shipyards were providing the boats, Boston's merchants owned these ships and its sailors operated them, even though they were sailing into New York.

If New York was America's best port, what was Boston doing with all the sailors and ship-owners? The best explanation for this puzzle is Adam Smith's classic doctrine of comparative advantage. The essence of maritime trade is mobility. A community that has skills in mining coal will still not lead to a coal mining community if there is no coal in the area. You can't move a mine. But a community with seafaring skills can easily supply ships and sailors throughout the world, because ships can move. Boston exploited its early edge as a maritime community, which stretched back into the 16th century, to become the capital of a vast maritime empire. Boston was generally just the spot where the ships began their voyages and where many of the sailors returned home, but this was enough to give the city in the early 19th century its maritime wealth.

What was Boston's comparative advantage in the maritime industries? In one aspect of the trade, New England was well suited—its access to lumber. New England's large

forests supplied the Boston shipbuilding industry which supplied most of America's ships (and many English ships as well) for decades. Unsurprisingly though, this industry gradually shifted to Maine which has even more forests. Boston's northerly location is a plus for some forms of fishing, especially access to plentiful fish off the Canadian coast. Likewise, proximity to Canada and England was worth something in trade.

But the real advantage of Boston in seafaring was not geography but human capital. Operating and managing sailing ships requires skill. As Morison (1961) writes "even an ordinary seaman was expected 'to hand, reef and steer, ... to be able to reeve all the studdingsail gear, and set a topgallant or royal studdingsail out of the top; to loose and furl a royal, and a small topgallant-sail or flying jib; and perhaps, also to send or cross a royal yard.'" Certainly, these skills could be learned by Pennsylvania farmboys (and Massachusetts' farmboys for that matter), but children who were sons of seamen who grew up in New England's fishing and seafaring towns certainly began with a big advantage. The importance of maritime human capital didn't stop at the forecastle. Large maritime fortunes were often founded by sea captains who had themselves all of the skills of mates and more besides. The skills required in leading a multi-year, multi-continent trading voyage that involved dealing with cultures as disparate as the Northwest Indians (who sold the Boston traders otter furs) and the Chinese Court of Canton (who traded high end China goods for those same otter furs) were also enormous.

As ships got faster and as peace and independence made it possible to establish trading routes that traveled thousands of miles, Boston's advantage in human capital made it a natural capital for a trading empire. Furthermore, Boston had institutions like maritime insurance, begun in 1724 by Joseph Marion, that were complements to international trade. When trading high-value products that had traveled thousands of miles, the disadvantage of starting and ending the journey at Boston relative to New York became minimal. Far more important was the skill and entrepreneurship that Boston merchants brought to the exploitation of international trade routes.

While the majority of Boston ship tonnage was in trade not fishing, the fishing trades also supported Boston's growth. Perhaps the most dynamic fishing industry in the 1800-1850 period was whaling. Whaling was a small 18th century industry, but in the 19th century, Massachusetts whaling became big business. At one point, manufacturing whale products was the third largest industry in Massachusetts. The big innovation of the 19th century seems to have been whaling in the Pacific Ocean, both in the tropical south seas and in arctic waters. Nantucket and especially New Bedford were the centers of the whaling trade, but certainly the success of these centers boosted demand for services and goods provided in Boston. Whaling shows again the pattern of New Englanders with sea-specific skills exploiting new opportunities created by the increasing globalization of the early 19th century.

Perhaps the best single piece of evidence that it was sail-specific human capital that drove Boston's maritime dominance in the first half of the 19th century is that this dominance disappeared quickly with the move to steam. Steamships were not only generally superior for most trips, but like many engine-driven technologies, steamships radically reduced the skill requirements of operation. Moreover, the skills involved were not the same as the skills involved in rigging a clipper ship. New England even lost its edge in ship-building which increasingly involved iron and steel, rather than wood. This change in technology was perhaps the single most important factor driving the decline of Boston as a port and the decline of the Boston shipping industry. If Boston's growth in the first half of the 19th century depended on the maritime industries, Boston's growth in the latter half of that century occurred despite maritime decline.

The Boston Irish

While Boston's shipping empire would not continue throughout the 19th century, one by-product of its maritime dominance in the 1840s would profoundly shape the entire future of the city. The 1840s and the 1850s, which were the last great period of Boston shipping, happen to have coincided with one of the great agricultural disasters of European history: the Irish Potato Famine. In the modern era, when a flood of

immigrants comes to America, they primarily come to Miami, or California or New York. These areas offer proximity or strong labor markets to people leaving Latin America or Asia.

In the 1840s, Boston was the closest American port to Liverpool and the abundance of Boston sailing ships meant that fares to Boston were lower than fares to anywhere else in the U.S. The Liverpool-Boston fares were often less than 20 dollars. As a result, we shouldn't be surprised that many Irish emigrants, often on the verge of starvation, minimized transport costs and came to the nearest harbor. If the potato famine had happened even 30 years later, Boston's transport edge would have been gone, and steamships would have bypassed Boston entirely heading straight for New York. Indeed, Boston's share of immigrants coming to America was far higher in the 1840s than Boston's share of the immigrants during the 1880s and 1890s.

Between 1845 and 1855, 208,000 immigrants came to America through Boston. This represented 6.6 percent of total immigration into the U.S. during that time period, during an era when Boston's base population was less than .6 percent of the total population of the U.S. This share substantially underestimates Boston's share of Irish immigration, since the Irish came disproportionately to Boston and the Germans arrived disproportionately in New York. Boston's population rose by about 43,000 during both the 1850s and the 1860s and almost doubled its population over that 20 year period. At the same time, Boston was changing from a Yankee town into an Irish city. In 1840, less than 30 percent of Bostonians were foreigners or first generation Americans. By 1880, 64 percent of the city was foreign born or first generation. The overwhelming share of the foreign born and their children were Irish. Success with the sailing ship made Boston Irish.

Of course, Boston's attraction for the Irish continued after the Civil War. To a certain extent, this reflected some continuing maritime vitality, but to a much greater extent, Irish immigrants came to a city with a thriving Irish network. In many cases, Irish Bostonians funded their relatives coming to Boston. In other cases, as in almost all immigrant

enclaves, an initial concentration ensured that new immigrants would have neighbors who shared their culture and preferences. Indeed, the gain from ethnic concentration was even greater in an age when native Protestant gangs were known to terrorize the Irish. Indeed, this violence was so common that one nativist mob even stormed an Ursuline Convent in Watertown.

Manufacturing in New England

Cheap sailing ship fares brought the Irish to Boston, but these migrants wouldn't have stayed without economic opportunities. The economic success of late 19th century Boston combined low-wage Irish labor with Yankee capital and factory technologies. While the Boston of 1840 was a seafaring town, the Irish Bostonians of 1880 were overwhelmingly involved in manufacturing (and for women, the service trades). Boston's success before 1920 depended on its ability to employ Irish and native workers in factory jobs.

New England manufacturing actually began during the 1800-1840 period, but Lowell, not Boston, was Massachusetts' largest manufacturing town. Lowell was established in the 1820s as a textile center and was named after Francis Cabot Lowell. Lowell himself came from a Boston mercantile family, and the capital used to fund the Lowell mills came from sea trading profits. Boston's seafaring past also supported its industrial development because Lowell had studied English factories and made them the basis for his Massachusetts operation.

But while the capital for the Lowell mills came from Boston and technology came from England, the Lowell mills were put in a rural area northwest of Boston. While Lowell's original factory was on the Charles at Waltham, textile mills depended on a water-borne power and the Charles was too small of a river to support the mill. As such, it was natural to move the operation to the closest big river to Boston: the Merrimack. As such, Lowell was founded at the site of an existing dam on the Merrimack (see Temin, 2000).

The Merrimack location also enabled water-born transportation through Newburyport. By 1840, Lowell had more than 20,000 residents and more than 8,000 workers. The Lowell labor force was predominantly female. Sklar (1993) documents the strong New England educational system that ensured that women were unusually well-educated for the time period, and as such they provided a first-rate and inexpensive labor force.

Many of the earliest New England factories were spread throughout the hinterland, and not located in New England's largest city. Chauncey Jerome established his pioneering clock factory in Litchfield county, Connecticut. Samuel Colt's hand gun factory was in Hartford, Connecticut. Southern New England was the birthplace of American industrialization, and this industrialization was led by entrepreneurs like Lowell, Jerome and Colt. Sokoloff (1988) documents that during much of the ante-bellum period, Southern New England was the most inventive area of the country, leading the U.S. in patents per capita across all fields and in manufacturing in particular. As Temin (2000) argues, the central forces behind New England's growth appear to be the region's "commitment to education" and "clear laws and a judicial process that allowed laws to adapt to new problems undreamed of by the original legislators" (Temin, 2000, p. 110).

But while manufacturing began in smaller towns throughout the Massachusetts area, the city of Boston gradually became a more and more important center for industry. While the Boston of 1840 was oriented towards the wharf, the Boston of 1890 was a manufacturing town whose workforce labored in factories. One side of this transformation is the decline of Boston's port which, as discussed above, was the natural result of New York's vast geographic advantage and the irrelevance of New England sailing acumen in the age of steam. The other side of this transformation is the increasing location of factories within the city of Boston and in its near suburbs. The story of late 19th century Boston is the increasing centralization of New England manufacturing in the city of Boston.

Boston's rise as a center for manufacturing is neither unique nor surprising. As Kim (1995) has documented, all of manufacturing became more concentrated in the late 19th

century. While factories in the middle 19th century were strewn across the American northeast, by the start of the 20th century, industry and manufacturing was centralized in a few large metropolitan areas. In 1870, the ten largest cities in the U.S. had a total of 3.7 million inhabitants or 9.5 percent of the total U.S. population. By 1920, the ten largest cities had 15.4 million residents or 14.4 percent of the overall U.S. population. Boston's growth during this period was certainly spectacular, but it was hardly unique. New York, Chicago, and even Philadelphia had growth rates that were similarly impressive.

Table 1 shows the population in 1860 and 1920 of the ten largest cities in the U.S. as of 1860. The table makes it clear that Boston's 320% growth rate, while high, was hardly unusual. In this table, four cities grew more slowly than Boston and five grew more quickly. The average growth rate in this table is 563%, which is much higher than Boston's growth rate.

Indeed, one can reasonably take the view that Boston underperformed during this period, if it is compared to other Northern cities. Expanding our analysis to the 20 largest cities in the U.S. in 1860, Boston's growth rate ranks fourteenth. Excluding the three cities below the Mason-Dixon (Baltimore, Louisville and New Orleans), Boston again ranks thirteenth out of seventeen cities. The only Northern cities with more than 45,000 residents in 1860 that grew more slowly than Boston were Albany, Cincinnati, and Philadelphia. Indeed, an even more spectacular fact is that America's urban population as a whole grew by 772 percent over this sixty year period. Understanding Boston's growth between 1860 and 1920 does not require understanding Boston-specific factors, but rather the general forces which were causing a population explosion in all of America's cities.

Four factors drove the rise of cities in the late 19th century: increasing agricultural productivity, changing manufacturing technologies, improvements in transportation and the related rise in immigration. As urbanists have emphasized for decades, if not centuries, increasing urbanization critically requires improvements in the productivity of farms. In 1860, 58 percent of gainful workers were in agriculture. In 1920, 26 percent of

gainful workers were in agriculture (Historical Statistics, Series D 152-166). As America has been a net exporter of food products throughout its history, this change means that in 1860, the average farmer was feeding four non-farmers. In 1920, the average farmer was feeding 8.5 non-farmers.¹ If caloric consumption stayed relatively constant, this tells us that farm output per farmer needs to have more than doubled over this sixty-year period for the U.S. to be fed by its agriculturalists.

The available evidence suggests that productivity did increase by at least this amount. In 1840, it took 233 man hours to produce 100 bushels of wheat. By 1880, it took 152 man hours to produce the same 100 bushels and by 1920, only 90 man hours were needed to produce those bushels. A similar improvement occurred in corn production which required 276 man hours to produce 100 bushels in 1840 and 122 man hours to produce 100 bushels in 1920 (Historical Statistics Series K 445-485).

Typically, increases in farm productivity are divided into technological improvements, which generally increase the amount of land that a farmer can sow and reap, and biological improvements, which increase the productivity per acre. Certainly, Cyrus McCormick's mechanical reaper is one of the great technological innovations in the history of agriculture. This nineteenth century innovation meant that the time it took to harvest one acre of wheat dropped from 20 hours in 1830 to less than one hour in 1895. But despite this innovation, land per farm fell during the 1860-1920 period. Land per farmer and farm land per U.S. citizen also fell. Farmland per agricultural worker increased from 66 acres per worker in 1860 to 86 acres per worker in 1920, or a 30 percent increase. Thus, while some of the increase in productivity came from more land per worker, the bulk of the increase in agricultural productivity came from more efficient use of land, not bigger farms.

¹ These statistics are somewhat misleading because a large number of farmers were producing non-food crops such as cotton and tobacco. However, if the share of farmers producing these products stayed relatively constant over this period, then the same doubling of productivity is needed to feed the increasingly non-agricultural share of the population.

Two factors appear to have been particularly important. First, the 19th century saw an explosion in the use of commercial fertilizer. In 1860, 164,000 short tons of fertilizer were consumed in the U.S. By 1920, 7.2 million short tons of fertilizer were consumed (Historical Statistics Series K 192-194). This forty-fold increase in the use of fertilizer helped increase crop yields per acre substantially. Second, the location of farms within the United States changed substantially over this period. In 1860, 71 percent of U.S. farmland was in Northeastern and Southern states of the U.S. By 1920, only 42 percent of farmland was in these areas. The spread of U.S. population across the continent meant that farmers moved from the lower productivity land of New England to the enormously productive farms of states like Iowa.

This spread of population would have been impossible without the rise of railroads which shipped farm products across the vast American hinterland. In 1860, there were 30,626 miles of rail in the United States. By 1920, 406,580 miles of railroad track were in operation. This vast increase sped the flow of farm products, but it also led to the development of cities which generally became vast hubs of railroad lines. Eight independent railroad lines going into Boston were opened in the 20 years between 1835 and 1855 alone. This massive improvement in transportation technology would also play a critical role in the development of large urban areas.

The development of cities is almost always driven by a desire to save on transportation costs. In the 17th century, Boston's growth hinged on its importance as the major port for New England. In the 19th century, Boston, like all of the big cities discussed above, became a major rail center for the northeast. If a factory's products were to be shipped throughout the New England area, then Boston offered an optimal location. Just as Chicago became the hub of the Midwest because of its railroads, Boston's dominance over New England occurred in part because of its central position as a railroad hub.

But Boston had been a transport hub in 1820, and the Boston Associates still decided to set up their factories along the Merrimac. What had changed? There were two related changes within manufacturing technology that supported the urbanization of factories.

First, water power was no longer as important to the functioning of a factory. In the first part of the 19th century, factories spread across New England in large part to take advantage of the power created by water mills. By the late 19th century, the cost advantages of this form of technology had been eroded by the rapid proliferation of stationary steam engine, which were powering an increasingly large share of New England manufacturing. In 1838, there were 31 stationary steam engines in New England. By 1900, there were 14,245 such engines. Steam engines freed factories from the rivers and enabled them to locate in large urban areas.

Of all cities, perhaps Boston was the most changed by steam technology. In the 19th century, the Back Bay was filled in and this massive public works project permanently changed the physical structure of the city. This would not have been possible without steam shovels.

The second technological change that supported the urbanization of industry was the reduction in the space requirements of factories. The early textile mills had been vast edifices which required large amounts of physical areas for big machines. Increasingly “such technical innovations as the lathe and sewing machine permitted the use of small machines which were neither expensive of space nor specialized in their structural requirements so that the upper stories of vacant warehouses and even the attics of adjacent tenements were rapidly converted into workshop premises” (Ward, 1966). As a result of these changes, industrial entrepreneurs didn’t need to locate in empty space where land was cheap. Instead, they could locate in the heart of the city and reap the advantages of proximity to suppliers, customers and workers.

This last urban advantage—proximity to workers—is particularly important in explaining the development of urban manufacturing. As discussed above, Boston served as the entryway for the vast Irish immigration. But the primary importance of the Irish immigration wave is not that the Irish came through Boston, but that they decided to stay there. In earlier times, immigrants came through Boston but didn’t settle there. By the late 19th century, both immigrants to the U.S. and rural-urban migrants were deciding to

stay in Boston. In part, the urbanization of population is the natural result of the urbanization of manufacturing, but there were reasons beyond labor demand that cities increasingly attracted residents.

For example, public transportation made it possible to travel around Boston more cheaply than traveling around low density communities. Big cities offered a much richer array of social activities than low density farming communities. For recent Catholic immigrants, who were often subject to violent nativist antipathy, dense urban areas facilitated the formation of segregated communities which could be defended. Furthermore, the tremendous health disadvantages that cities once had were being eroded by tremendous advances in public health (especially the rise of clean water) in the late 19th century. For these reasons, big cities were becoming more attractive places to live, not just places to work.

IV. 1920-1980: The Declining City

Boston's population did not start declining in absolute terms until after 1950, but relative to the U.S. as a whole, the city's collapse began in 1920. Between 1920 and 1980, Boston fell from containing .7 percent of the U.S. population to .25 percent of the U.S. population. Boston's population as a whole fell from 750,000 in 1920 to 560,000 sixty years later. Figure 4 shows the ratio of Boston's population to the combined populations of Suffolk, Middlesex and Norfolk counties. As Figure 5 shows, the counties surrounding Boston fared considerably better. Both Middlesex and Norfolk counties gained population over this period, but as Figure 6 shows, both of the larger counties (Suffolk and Middlesex) lost population substantially relative to the U.S. as a whole.

Why did Boston decline so much during the middle decades of the 20th century? There are four important factors that explain the absolute loss of population in Boston as a city and the relative loss of population in the outlying counties: (1) weather, (2) transportation technology, (3) the decline of manufacturing, and (4) government policies. I will document the relative importance of each of these factors in turn.

No variable can explain state and city growth over the past 80 years as reliably as temperature. Warm places grew significantly in the 20th century. Cold places also grew, but much more slowly. Figure 7 shows the relationship between average January temperature in a state and the population growth of that state between 1920 and 1980. Average January temperature is the average January temperature between 1961 and 1990 taken from the 2000 Statistical Abstract of the U.S., Table 408.² The growth rate of population is the change in the logarithm of state population, which can be interpreted loosely as the percentage growth in state population.³ The correlation coefficient between average January temperature and state population growth over this period is 48 percent. The line in the graph tells us that as January temperature rises by 1 percent, the expected growth rate of the state increases by 2.3 percent.

Another way to think about the impact of temperature is that the average growth rate of the 25 states with mean January temperatures less than 29.7 degrees was 95 percent. The average growth rate of the 25 states with mean January temperature above 29.7 degrees was 309 percent. The connection between temperature and population growth is quite strong over this period, and this is certainly one reason why Massachusetts' population grew only modestly over this period.

Why did warm places grow so much more quickly than poor places? There are two important sets of explanations for this fact. First, a series of technological improvements disproportionately improved life in hot states. Most obviously, the air conditioner made it possible to live comfortably, and perhaps even more importantly to have factories in hot climates. Improvements in public health meant that diseases, such as malaria and cholera that used to regularly kill the residents of Southern states, were brought under control.

² The table generally lists the average January average for one major city in the state. In the few cases where multiple cities were included, I averaged the temperatures across these cities.

³ I use the change in the logarithm of state population instead of the actual percentage growth in population, because the logarithmic measure tends to be less sensitive to extreme values, especially among states that begin with a particularly low level of population.

Second, changes in transportation technology eliminated the advantages of northern states, which had once thrived because of proximity to natural resources and rivers. The average city of 1900 had been located in places which had an advantage in producing manufactured goods and shipping them by water. As the cost of moving goods plummeted by over 90 percent in real terms during the 20th century (see Glaeser and Kohlhase, 2003), these production advantages disappeared and people moved to places that were distinguished mainly by their advantages as consumer cities (see Glaeser, Kolko and Saiz, for an analysis of the consumer city phenomenon). Cold cities were unpleasant to live in and as a result, people moved west and south in search of more pleasant climates. Firms were no longer tied to the northeast and eventually followed the workers.

But the decline of cold cities can only partially explain the decline of Boston. After all, cold weather is shared by all of Massachusetts, but the state grew much more quickly than the city of Boston did. As a whole, the state of Massachusetts grew by 49 percent between 1920 and 1980, which is much slower than the national population growth rate of 98 percent, and this gap is perhaps primarily explained by Massachusetts' cold weather. Still, the city of Boston fell by 25 percent over this time period. Something more than cold weather must be to blame.

Beyond the weather, the second great force moving urban populations over the mid-20th century was sprawl. Old, dense cities declined and lower density cities, particularly those on the edge of traditional downtowns, boomed. The primary reason for this rise of sprawling cities is the rise of the automobile. The traditional American cities were built first around walking and then around public transportation. Boston's oldest areas, such as Beacon Hill and the waterfront, are built at sufficiently high densities to accommodate foot-borne travelers. 19th century areas, such as Back Bay, Roxbury or nearby suburbs such as Brookline, were built around the early forms of public transportation such as omnibuses and then streetcars. These forms of transportation require bigger roads and allow people to travel larger distances, but they still require people to walk to and from bus stops. As such, the densities need to be moderate.

The automobile requires a completely different level of construction. Roads must be an order of magnitude when they are meant to accommodate cars rather than buses, because the area used by a car traveler is at least ten times greater than the area used by someone using public transportation. Furthermore, cars need parking lots which are themselves enormously space intensive. It is possible to drive in a city built at pedestrian densities, but it isn't pleasant, as anyone who drives around central Paris or Wall Street can attest. The rise of the automobile inevitably meant that people would increasingly move to lower density communities that could be designed around the new technology. Indeed, much of 20th century urban history can be seen as the rise of decentralized communities which is itself the result of the technological dominance of the automobile.

The rise of the car meant that cities that were built at high densities inevitably suffered because high densities tend to be incompatible with the automobile. Indeed, the correlation between a city's density in 1920 and its use of public transportation 60 years later is more than 50 percent. Since high density cities, like Boston, were badly suited to the dominant new transportation technology, those cities tended to lose population.

This fact can be seen in Figure 7 which shows the relationship between urban density in 1920 and growth over the next 60 years. The correlation coefficient between initial density and urban growth is -44.8 percent. The line in the graph tells us that as a city's density in 1920 increases by 1000 people per square mile, the expected growth rate of the city declines by 5.6 percent. Put another way, the median growth rate of the 68 cities among the 100 largest in 1920 with less than 10,000 people per square mile was 43 percent. The median growth rate of the cities with more than 10,000 people per square mile was -20 percent. Boston's density level in 1920 was 17,200 people per square mile, making it the eighth densest of America's large cities. As such, its low growth isn't much of a surprise. Boston was a highly dense city in a cold state. Throughout the middle years of the 20th century, those two factors almost always led to declining population levels.

Density and cold are themselves enough to explain Boston's decline, but indeed, Boston had other features which also generally led to urban decline. As I discussed in the previous section, Boston in 1920 was a manufacturing city and its success had come in large part from its ability to employ large numbers of immigrant workers in factories. In general, manufacturing cities did extremely poorly during the middle 20th century. The factors which made it natural for industry to urbanize in the late 19th centuries, such as access to ports and rail depots, disappeared in the 20th century. Manufacturing left cities for suburbs, which could easily be accessed by trucks. Manufacturing left the northeast for the sunbelt, which had a much less pro-union environment (see Holmes, 1994, for the classic analysis showing the positive effect of right-to-work laws on employment). Finally, low transportation costs even made it possible for manufacturing to locate outside of the U.S. entirely to take advantage of cheap labor costs.

The net result of these factors was a dramatic decline of those cities which had specialized in manufacturing. Figure 9 shows the relationship between the share of workers in manufacturing industries and city growth between 1920 and 1980. Unfortunately, due to data availability, I have been forced to use the share of manufacturing in 1980, rather than 1920, which is less than ideal. The graph illustrates the strong negative relationship between manufacturing and urban decline. Cities that were manufacturing centers generally did poorly during the 20th century urban success, and Boston may have suffered for this reason as well.

A final reason for Boston's difficulties during the middle years of the 20th century is city government. The 1920-1950 period in Boston was the era of James Michael Curley, and Curley set a pattern of large spending and inflammatory rhetoric. Curley's success can itself be traced to the longstanding hostility between the city's poorer Irish population and its wealthier Protestant residents. This ethnic division, accompanied by sharp income disparities between the two groups, set the stage for Curleyism, which included large-scale public projects and a general program of redistribution from the Yankee rich to the Irish poor. Unsurprisingly, this program pushed the rich out of the city.

There is little compelling evidence on the connection between government policies and city growth, but Figure 10 shows the relationship between city growth between 1920 and 1980 and per capita taxes in 1980. Again, somewhat problematically, I am forced to use taxes and income in 1980 due to data availability. I have divided per capita city taxes by per capita income in 1980. These taxes are meant to include city-level taxes from all sources. The graph shows a significant negative relationship, and also shows that Boston is among the highest tax cities in the sample. The line in the graph tells us that as taxes (relative to income) rise by one percent, the expected growth rate during the 1920-1980 period declines by six percent.

Boston had a number of features which drove its decline during the middle decades of the 20th century. It built at density levels too high for the automobile to function effectively and it was located in a cold state. The city had concentrated in manufacturing (although this was over by 1980) and had extremely high local tax levels. Together these factors drove Boston's decline. By 1980, Boston was just another of America's formerly great declining cities. Its real estate values were low and it had lost population steadily since 1950. The city was beginning to suffer from the social problems, such as high poverty and unemployment, that generally accompany urban decline. Indeed, an urban observer looking at Boston in 1980 would have every reason to believe that it would go the way of Detroit and Syracuse and continue along its sad path towards urban irrelevance.

V. 1980-2000: America's Athens Turns Commercial

But that didn't happen. During the past 20 years, the Boston metropolitan area has gained population steadily. The city of Boston hasn't grown significantly more populous, but at least the population drain has stopped. Most dramatically, there has been an explosion of housing values. These values create urban problems of their own, but they are a strong indication of demand for that particular city. While Detroit and Syracuse are still places marked by extremely low housing demand, the Boston market has generally been extremely hot. Moreover, Boston has been linked to a number of the most

important developments in the U.S. economy over the past 20 years. In this section, I explore the reasons for Boston's success in the 1980-2000 period.

One of the most persistent predictors of urban growth over the last century is the skill level of a city (Simon and Nardinelli, 2002, Glaeser et al., 1995). Figure 11 shows the relationship between percent college educated in 1980 and the population growth over the next 20 years among the 147 metropolitan areas with more than 100,000 residents in 1980 with mean January temperatures below 40 degrees. Among these colder cities, skills are the best predictor of growth. The correlation coefficient between share of college graduates in 1980 and growth between 1980 and 2000 is 54 percent in this sample. The correlation coefficient in the full sample of metropolitan areas with more than 100,000 people is 29 percent. The line in the figure tells us that as the share of the population (over 25 years old) with college degrees rises by one percent, the growth rate between 1980 and 2000 rose by 1.9 percent.

At this point, it is not clear why high human capital areas do well and low human capital areas do more poorly. One set of theories focuses on the role of skilled workers are innovators and entrepreneurs. An alternative set of theories focuses on the importance of a skilled labor force and argues that firms are moving to places with skilled labor forces. Alternatively, skilled workers may be particularly important in providing locational amenities. Poverty and social problems go together and it may well be that the poor growth record of low skill cities actually reflects the social problems that accompany low levels of skill. A final theory is that skilled workers have specialized in industries that have done well over the last 50 years.

Boston is, of course, hardly the most educated metropolitan area in the country or even the most educated of the larger metropolitan areas. In 2000, Boulder, Colorado was the metropolitan area with the highest share of college graduates amongst its adult population. Indeed not only Boulder but also the metropolitan areas of Madison, Wisconsin, San Francisco, San Jose, Stamford, Connecticut and Washington, D.C. all have a higher share of college graduates than Boston. Still, out of the set of 209

metropolitan areas with more than 200,000 people, the Boston primary metropolitan statistical area had the sixth highest level of college graduates in 2000.⁴ 39.5 percent of Boston's population over the age of 25 had a college degree and 51.2 percent of Bostonians between the ages of 25 and 34 had that much education. This extremely high level of education predicts that Boston should have done well over the past 20 years, and indeed it did.

How was education the engine of Boston's success? Table 1 displays the top industries in Suffolk, Middlesex and Norfolk counties. This data comes from the 2001 edition of County Business Patterns, is based on establishment level questionnaires, and omits workers in sufficiently small businesses and government employment.⁵ I have used the North American Industry Classification System codes and reported employment by 3-digit "NAICS" code. Together the top ten industries account for 63, 57 and 46 percent of employment in Suffolk, Middlesex and Norfolk counties respectively. The first fact to take away from these tables is that while Middlesex county has 110 percent more people than Suffolk county, it only has 50 percent more employees. Thus, while it is certainly true that employment within the Boston metropolitan area has decentralized, it also remains true that there is more employment at the center than at the periphery.

The tables make it clear that Boston is dominated by four export industries: professional services, education, finance and healthcare. Professional services is a big category that means different things in Middlesex and Suffolk counties. In Middlesex county, professional services are primarily computer-related services (with 38,679 employees) and scientific research and development services (with 20,016 employees). These two four digit SIC code industries account for 53 percent of professional services in Middlesex and six percent of total employment in the county. In Middlesex county, therefore, professional services means high technology. In Suffolk, however, the professional services are dominated by law firms who employ 17,908 people in that county. Suffolk county also has 9,217 people working at computer-related consulting

⁴ In this case, I have included all primary metropolitan statistical areas.

⁵ Some industries with small numbers of employers are suppressed, so there is some potential for error.

firms and 8,277 people working for management consulting firms. Suffolk is a more traditional downtown county with a focus on law and management consulting, while Middlesex county is dominated by the technology sector. This dominance can also be seen by the fact that Middlesex county is the only one of the three counties with a significant manufacturing industry: computer and electronic machinery manufacturing.

It is also obviously true that if Boston is not the Athens of America, it is still remarkably oriented towards education. Educational services is the second largest industry in Middlesex county and the fourth largest industry in Suffolk county. These numbers are dominated by higher education, since public school employees are excluded from County Business Patterns. In a sense, Boston's specialization in education is actually more remarkable than its specialization in professional services. After all, professional services are a large sector of the U.S. economy as a whole. Across the nation, 6.2 percent of employees in County Business patterns are in the professional services industry, which tells us that Boston workers are about twice as likely to be in those industries as workers elsewhere. But only 2.3 percent of County Business Pattern workers are employed by educational service firms in the country as a whole. As a result, workers in Middlesex county are more than three times more likely to be in education than workers elsewhere in the U.S. Boston's dominance in higher education has existed for centuries and in an era when college and post-graduate education became increasingly valuable, it is not surprising that Boston's schools did well.

Health care is another large Boston industry, especially in Suffolk County where hospitals and ambulatory health care together account for 14 percent of the total employees in County Business Patterns. These two three digit industries account for six percent of employment in Middlesex County and eight percent of employment in Norfolk County. These numbers are not that unusual. Nationwide, 8.5 percent of County Business Patterns employees are in these two industries. Suffolk County is unusually dependent on this industry, but they are a big component of employment in the other counties because they are a large component of employment in most places.

Finally, Suffolk County (and to a lesser degree Norfolk County) has a remaining presence in financial services. Nine percent of Suffolk County employment is in securities and commodity contracts and four percent is in financial intermediation. Like New York, Boston developed expertise in finance because of the early connection between finance and shipping. This connection occurred both because shipping required risk-sharing and complicated commodity trading, and because shipping generated profits that were then reinvested. Like New York, finance remains important long after the maritime trades have lost their relevance.

The remaining top industries are usually big and generally cater to local residents. They are not themselves either a source of external revenues or economic growth. Indeed, health care is itself correlated with urban decline (at least over the past decade) not urban growth, so the keys to Boston's growth have been (and will continue to be) technology, finance and education. These industries are the flip side of Boston's high education level. Boston's high level of education is important because it is connected to specialization in these three industries. Skilled workers are needed in these industries and the presence of skilled workers led to entrepreneurship in both technology and professional services.

With this I can return to the comparison between Boston and the rust belt cities. Like Syracuse and Detroit, Boston was a cold, manufacturing city that had done poorly over the 1950-1980 period. But unlike those cities, Boston had universities, a well educated workforce and a residual finance industry. In the 1980s, the return to schooling skyrocketed. The computer revolution sped up and demand for education soared. As a result, Boston did extremely well. The other manufacturing cities of the northeast had much lower levels of education and, as a result, little presence in technology. In 1950, Boston's universities may have seemed like a quaint anachronism of the city's Brahmin past. However, those universities meant that when America became an information economy, Boston would be able to capitalize on that transformation.

The Forms of Boston's Success

To any reasonable observer, the past twenty years of Boston's history looks like a success, but at this point it is worth asking what form that success has taken and why Boston has changed in the way that it has changed. First, the Boston area has become more populous. The Boston consolidated metropolitan statistical area has grown by 13.5 percent over the past two decades. This is certainly impressive, but the median metropolitan area with more than 200,000 people grew by 22 percent and the total U.S. population grew by 24 percent. Inner Boston population growth was even more modest. The city of Boston grew by 4.3 percent over those two decades and the city of Cambridge grew by 6.3 percent. Admittedly this growth was better than the decline of the 1950-1980 period, but Boston's success—if it exists—must show up elsewhere.

Conventionally, there are three ways of measuring urban success: population growth, income growth and housing price growth. All three measures have advantages and problems. Increasing productivity in a city will show up in increasing wages, prices and population. In principle, increasing “demand” for a city, by which I mean an increasing desire of people to live in a particular area, will show up in increasing population and increasing housing prices. As such, it is worthwhile asking what has happened to wages and housing in the Boston area to examine these other measures of urban success.

Wages in the Boston area have certainly increased. In 1980, Boston's income ranked it in the second quartile of metropolitan statistical areas with more than 200,000 people. In other words, about one-quarter of larger metropolitan areas had higher income levels than Boston. Bostonians earned somewhat less than the residents of Atlanta and somewhat more than the residents of Pittsburgh. Today, the Boston consolidated metropolitan area's median household income ranks fourth among consolidated metropolitan areas behind Minneapolis, San Francisco and Washington, D.C. Boston's per capita income ranks fifth behind those three areas and West Palm Beach. While Boston's population growth has not been extraordinary, its income growth has been extremely impressive and now Boston is among the richest places in the country.

Boston's income growth has been matched by truly spectacular housing price growth. Because of the considerable variables across cities within the Boston area, it makes sense to focus on housing prices at the city, not metropolitan area, level. Across 541 cities in the U.S. in 1980 with more than 25,000 residents, by median housing value growth, Boston ranks fourth. Newton ranks third. Somerville ranks fifth and Cambridge ranks first. The average housing price growth in this sample is 147 percent over these two decades. The median housing price in Somerville increased by 393 percent. The median housing price in Boston increased by 429 percent and the median housing price in Newton increased by 439 percent. Most incredibly, the median housing price in Cambridge increased by 549 percent. These numbers are incredible, but they capture reality: Boston has boomed over the past 20 years but this boom has been reflected mostly in higher housing prices, not in larger population levels.

Why does a booming Texas economy lead to more bodies and little change in housing prices, but a booming Massachusetts economy lead only to massive increases in the price of housing? Standard economic reasoning tells us that the key determinant of whether prices or population rises is the elasticity of housing supply. When housing is elastically supplied, we should expect there to be little change in price and a large increase in bodies. When housing is inelastically supplied, then a local boom causes prices to rise and little change in total population. The most natural explanation of the form of Boston's success is that housing supply has been extremely inelastic, especially in the cities close to downtown Boston.

There are several reasons for this inelasticity. Boston's traditionally high densities are also partially to blame. Furthermore, housing supply is completely inelastic when housing prices are below construction costs and indeed for much of the 1980-2000 period (but not today) housing prices were still too low for builders to actually want to build (see Glaeser and Gyourko, 2002, for details). Finally, zoning and other constraints on new construction can lead to major constraints on new development. These constraints mean that if a city becomes more attractive, prices rise, but there are only very tiny amounts of new construction.

To make this point clearly, I now compare Massachusetts and Texas over the 1980-2000 period. I chose Texas because it has some of the fewest constraints on development anywhere in the U.S. In 2002 alone, Texas handed out 160,530 construction permits. In that year, Massachusetts gave out 16,875 permits. The sunbelt has other states that are similar to Texas (Nevada, Arizona, etc.), but Texas seems like a good example of a state with few barriers to new construction.

Figures 12 and 13 shows the impact of initial years of education on urban success in Texas over the 1980-2000 period. I use city-level observations and in Figure 12 I show the relationship between city population growth and the initial share of the adult education with college degrees. As I argued earlier, college education is associated with urban success and this is as true in Texas as anywhere else. Figure 12 shows a 39 percent correlation between city growth and the share of the population with college degrees. The line in the graph tells us that if the share of the city's population with college degrees rises by one percent, the expected growth rate over the period rises by 1.2 percent. Figure 13 shows the relationship between education and housing price growth in Texas—there is none. The relationship between the two variables is weakly negative and not statistically significant from zero. Skills predict population growth but not housing price growth in Texas. New homes are built and people are able to move into cities that are growing.

Figures 14 and 15 show the same relationships for Massachusetts. Figure 14 shows the connection between initial years of schooling and later population growth across Massachusetts cities. In this case, initial schooling has no impact on later population growth. Figure 15 shows that this lack of impact does not mean that schooling fails to predict urban success in Massachusetts. Initial schooling has an extraordinary positive effect on housing price growth in Massachusetts over the 1980-2000 period. The correlation coefficient between these two variables is 78 percent. As share of the initial population with college degrees rises by one percent, expected housing price growth rises

by 1.5 percent. Urban success in Massachusetts means higher housing prices. In Texas, success means more bodies.

Together these set of graphs suggest that the regulatory environment strongly influences the path of urban growth. In Texas, which is one extreme, successful cities grow in population. In Boston, which has a much more restrictive regulatory environment, urban success has led to higher prices, but not more people.

At this point, it is hard to say how costly the regulation of new construction in Massachusetts may be. Indeed, it may be that the benefits of preserving low density living outweigh the costs of artificially forcing people to stay away from Boston, and the costs of forcing employers to pay more for workers. Further work must address this issue. In 1980, dealing with urban success did not seem to be Boston's most pressing problem, but in 2000, we are lucky enough to be challenged with figuring out the right way to grow.

VI. Conclusion

Boston has had an extraordinary history and it has had four different eras of success, each driven by a slightly different force. For the first 100 years of its existence, it was America's premier city. Boston was the capital of America's most commercially diverse region and it served as the central port for that region. In the 1750-1800 period, Boston had its first era of decline as its port was eclipsed by New York and Philadelphia. Those cities' more southern locations and superior rivers made them vastly superior places for shipping goods into and out of America.

But in the first 40 years of the 19th century, Boston had its first recovery. Peace and the increasing globalization of the 19th century maritime economy enabled Boston seafarers to exploit their expertise. New York and Philadelphia were still the dominant points of entry in the U.S., but Boston based seafarers manned ships owned by Boston merchants,

which traveled into and out of those ports. Boston mariners also thrived from the China trade and the whaling industry.

Just as the steamship eliminated Boston's supremacy in sailing ships, Boston reinvented itself once again as a manufacturing city. Because of the unusual temporal coincidence of the Irish potato famine and the last period of Bostonian maritime dominance, a vast number of Irish immigrants came to Massachusetts because Boston was the cheapest and closest port of entry. These immigrants would provide the muscle for industrial growth of what had been a maritime time. Boston's nineteenth century industrial growth was abetted by railroads and by the fact that factories used steam, not water, for power. Indeed, almost every large northern city in the U.S. as of 1860 became an industrial powerhouse over the next 60 years as factories started in central locations where they could save transport costs and make use of large urban labor forces.

But this period of growth came to an end in 1920. During the middle years of the 20th century, urban growth was driven by the move to sun and sprawl. As Boston was a high density city in a cold state, it was bound to decline. Bostonian streets were built around the pedestrian and the streetcar and, unsurprisingly, people left for the edges of the metropolitan area. Moreover, technological improvements meant that warmer climates became increasingly attractive and people moved south and west. As of 1980, Boston resembled many of the industrial hulks dotting the northeast and Midwest. A reasonable guess was that Boston's path between 1980 and 2000 would resemble the path that was actually taken by Detroit.

In the 1980-2000 period, Boston turned out to look more like San Jose than like Detroit. The booming information economy relied on skilled workers and Boston's long history had left the city with a surfeit of universities. As a result, Boston was ideally poised to take advantage of the rise in returns to skill that so marked the last quarter of the twentieth century. Boston left manufacturing and specialized in high technology, finance and education—industries that required skilled workers and that did extremely well over

the 1980-2000 period. Indeed, as long as the skills boom continues, it seems likely that Boston will continue to thrive.

Still, Boston's success leaves us with a major policy quandary. In the less regulated areas of the sunbelt, local economic success leads to massive new construction, accompanying large increases in population and small changes in housing prices. In the regulated Massachusetts economy, new construction is extremely difficult and as a result, economic success leads to higher prices, not large numbers of new homes. As a result, Boston faces extraordinarily high housing prices. Boston's limits on new construction were relatively costless in an era of urban decline, but as the area thrives, these barriers to construction pose the largest barrier to new growth and may well create large social costs for Bostonians and would-be Bostonians. The regulation on new construction is surely the most important policy area facing Boston today.

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Table 1: Population Growth of the Ten Largest American Cities in 1860

City	Population in 1860	Population in 1920	Growth Rate
New York	813,669	5,620,048	590%
Philadelphia	565,529	1,823,779	222%
Brooklyn*	266,661	2,300,664	763%
Baltimore	212,418	733,826	245%
Boston	177,840	748,060	320%
New Orleans	168,675	387,219	129%
Cincinnati	161,044	401,247	149%
St. Louis	160,773	772,897	380%
Chicago	112,172	2,701,705	2,308%
Buffalo	81,129	506,775	525%

*The population for Brooklyn in 1920 is the population of Kings County.

Table 2: Employment in Suffolk, Middlesex and Norfolk Counties

Suffolk County	Total Employment	Share of Total (579,254)
Professional, Scientific and Technical Services (541)	61,863	.11
Hospitals (622)	55,637	.10
Security, Commodity Contracts, etc. (523)	52,834	.09
Educational Services (611)	42,987	.07
Administrative and Support Services (561)	42,494	.07
Food Services and Drinking Places (722)	35,316	.06
Credit Intermediation and Related Services (522)	21,502	.04
Ambulatory Health Care (621)	21,065	.04
Management of Companies and Enterprises (551)	15,429	.03
Social Assistance (623)	13,767	.02
Total	362,894	.63

Middlesex County	Total Employment	Share of Total (871,013)
Professional, Scientific and Technical Services (541)	110,239	.13
Educational Services (611)	64,226	.07
Administrative and Support Services (561)	63,914	.07
Computer and Electronic Product Manuf. (334)	57,609	.07
Wholesale Trade, Durable Goods (421)	43,562	.05
Food Services and Drinking Places (722)	42,121	.05
Management of Companies and Enterprises (551)	31,068	.04
Ambulatory Health Care (621)	28,682	.03

Hospitals (622)	26,858	.03
Publishing (511)	24,480	.03
Total	492,759	.57

Norfolk County	Total Employment	Share of Total (344,196)
Professional, Scientific and Technical Services (541)	28,209	.08
Administrative and Support Services (561)	20,391	.06
Food Services and Drinking Places (722)	20,027	.06
Ambulatory Health Care (621)	14,954	.04
Wholesale Trade, Durable Goods (421)	14,094	.04
Hospitals (622)	13,356	.04
Educational Services (611)	12,855	.04
Special Trade Contractors (235)	12,314	.04
Insurance Carriers and Related Activities	11,869	.03
Management of Companies and Enterprises (551)	11,405	.03
Total	159,474	.46

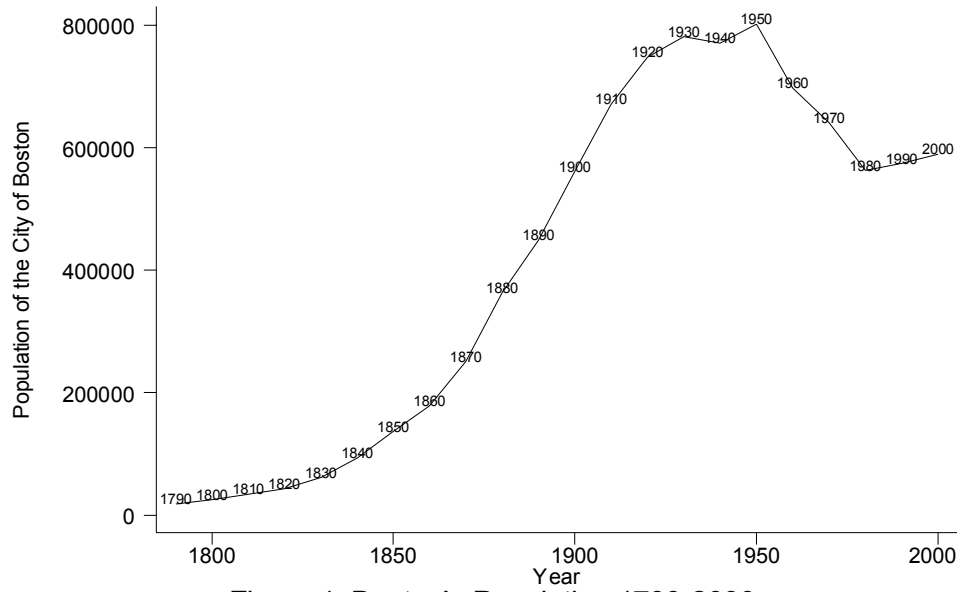


Figure 1: Boston's Population 1790-2000

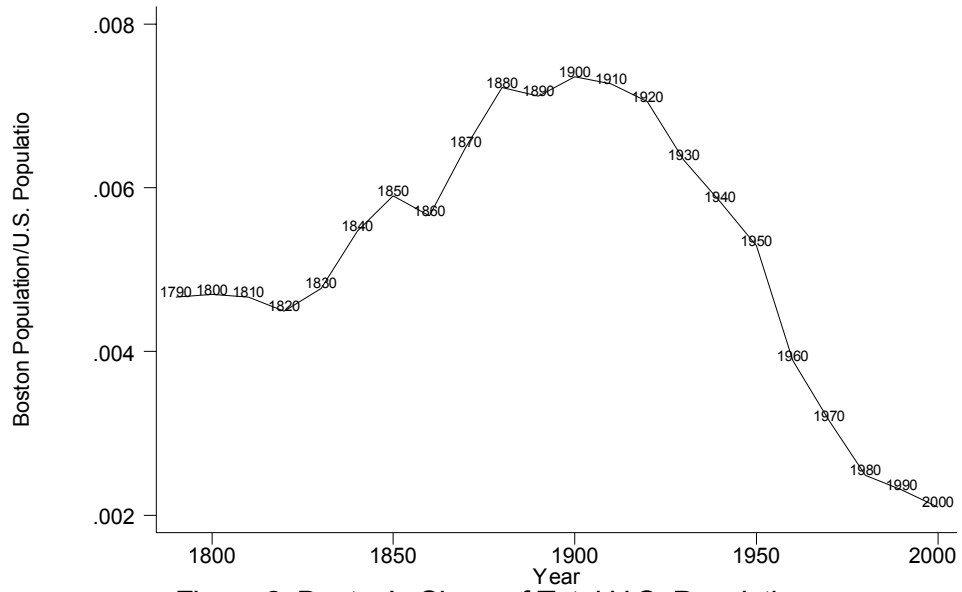


Figure 2: Boston's Share of Total U.S. Population

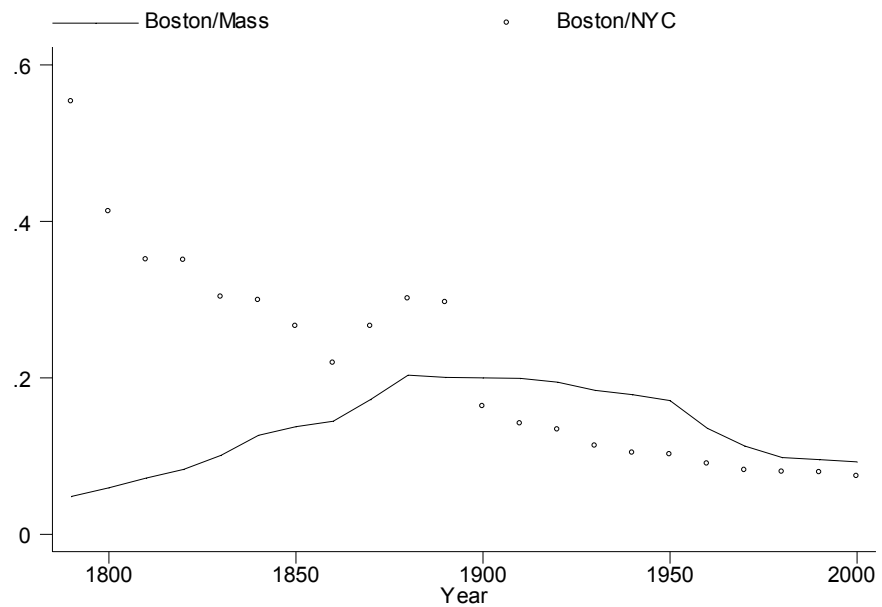


Figure 3: Boston Relative to Mass. and NYC

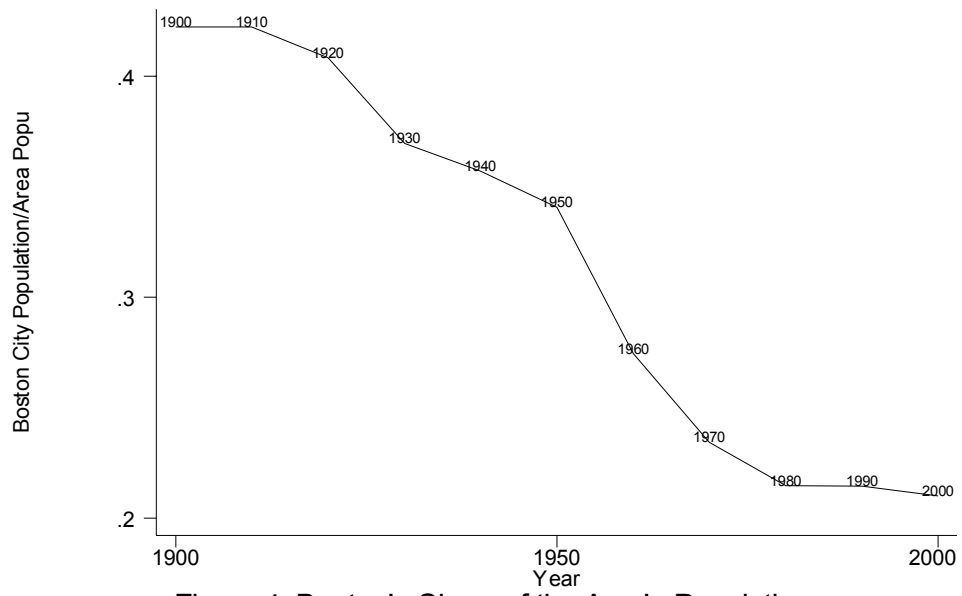


Figure 4: Boston's Share of the Area's Population

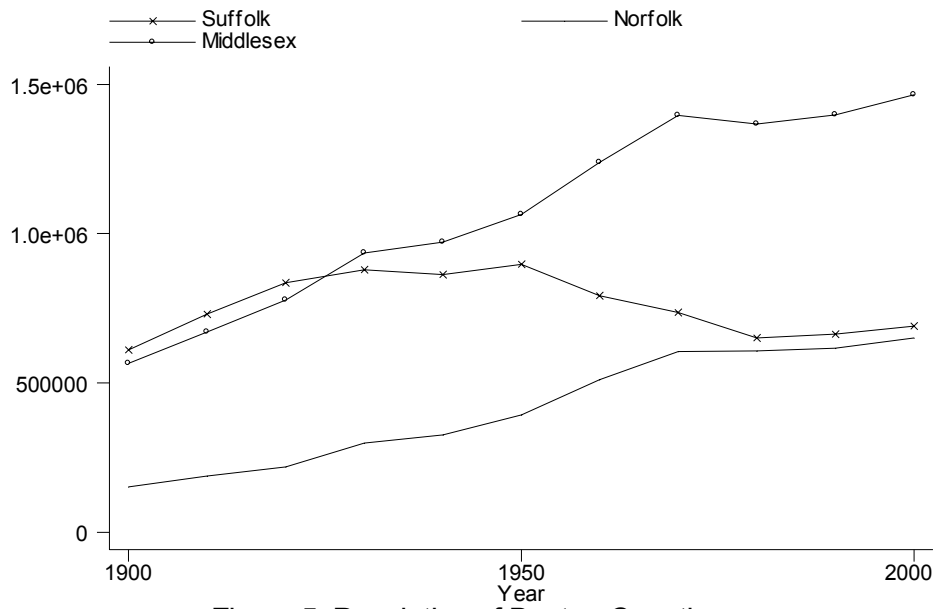


Figure 5: Population of Boston Counties

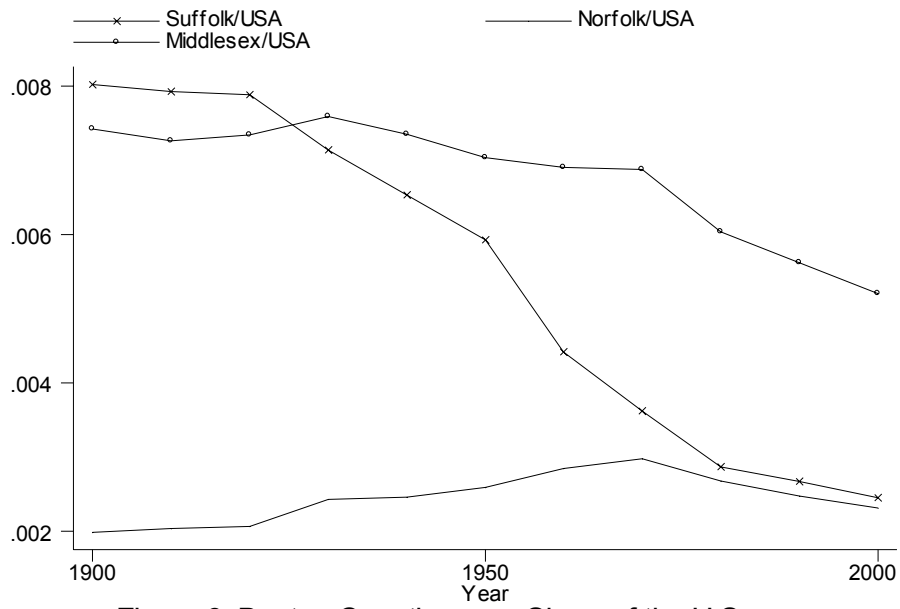


Figure 6: Boston Counties as a Share of the U.S.

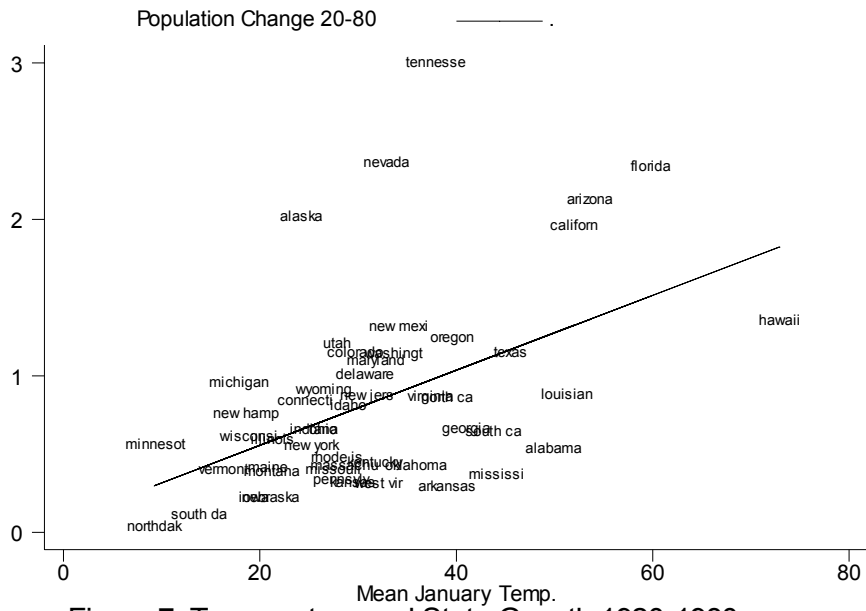
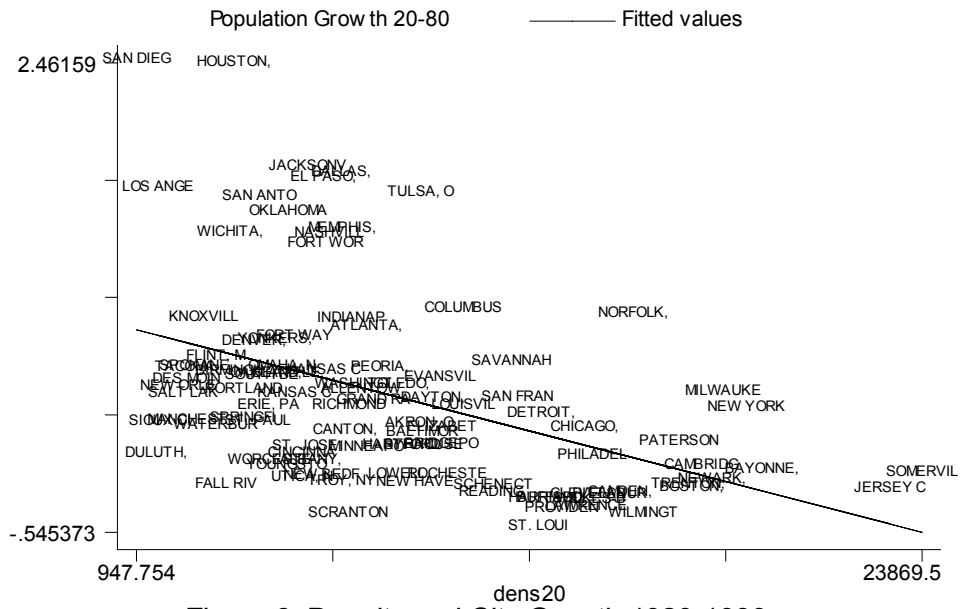


Figure 7: Temperature and State Growth 1920-1980



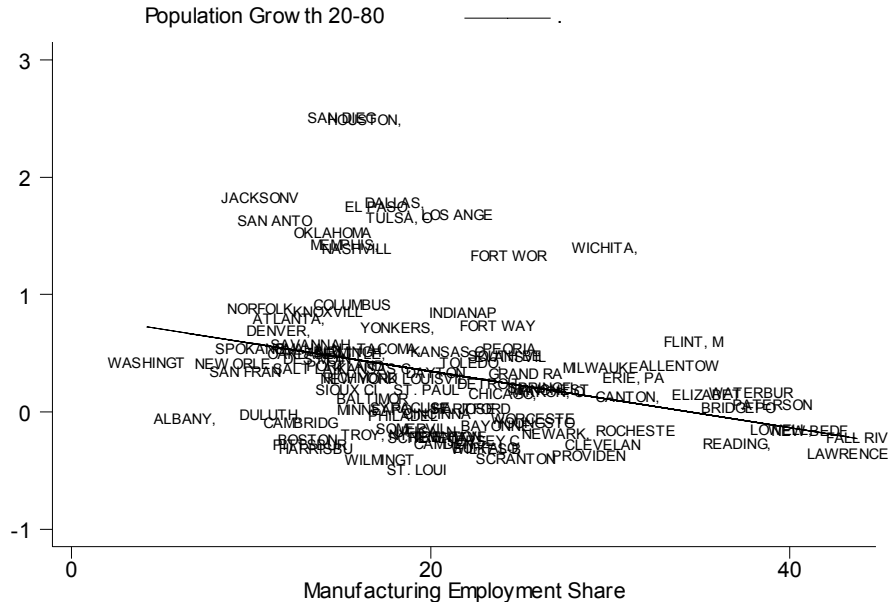
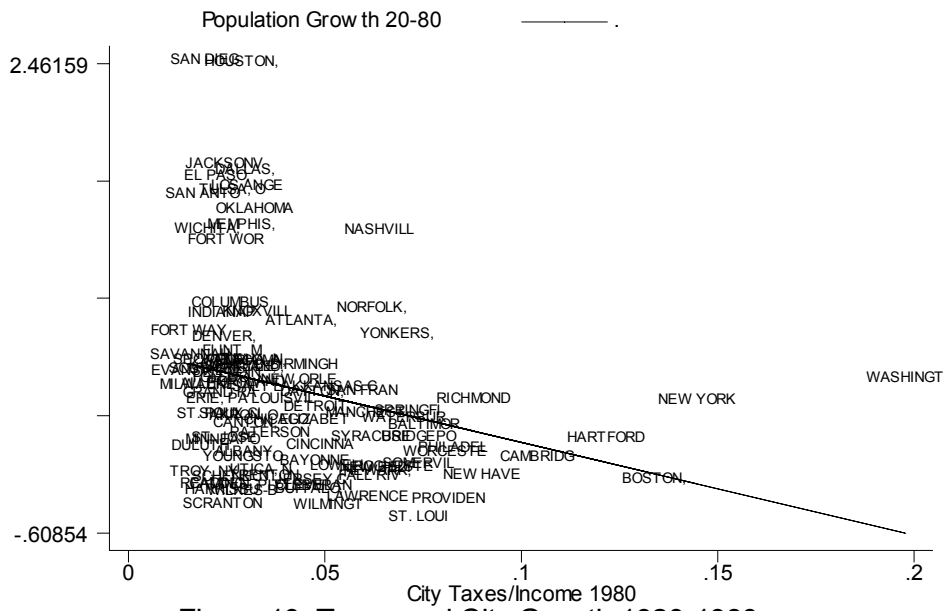


Figure 9: Manufacturing and Urban Decline



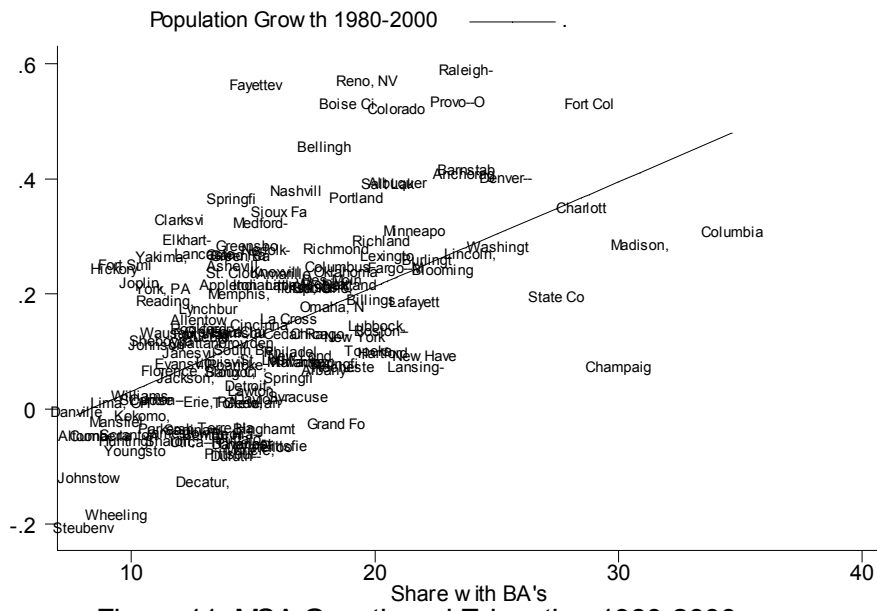


Figure 11: MSA Growth and Education 1980-2000

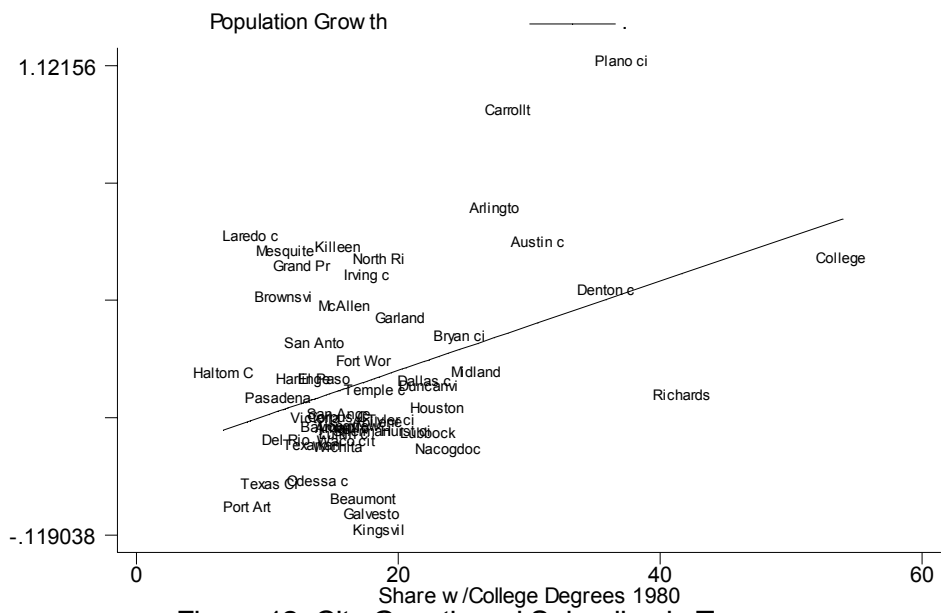


Figure 12: City Growth and Schooling in Texas

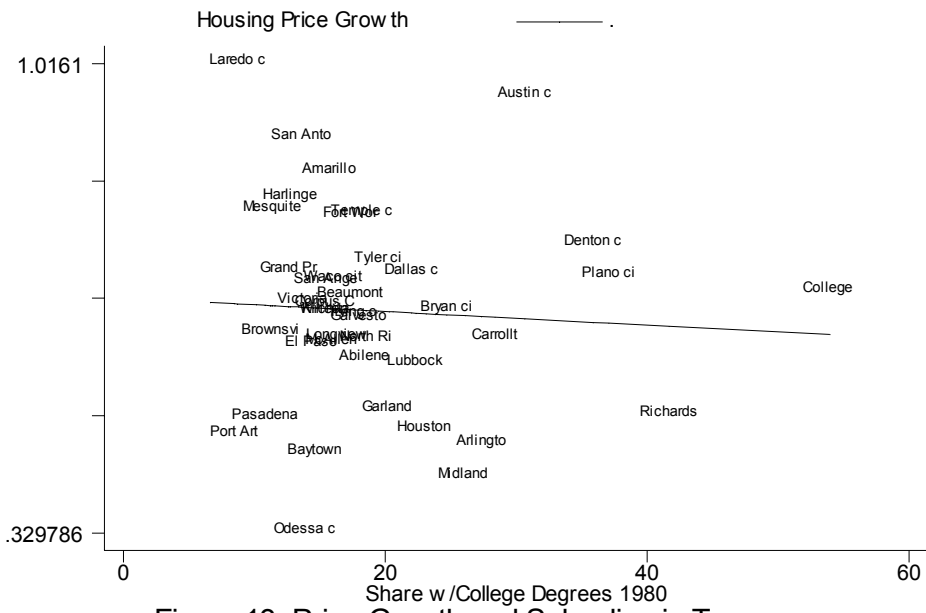


Figure 13: Price Growth and Schooling in Texas

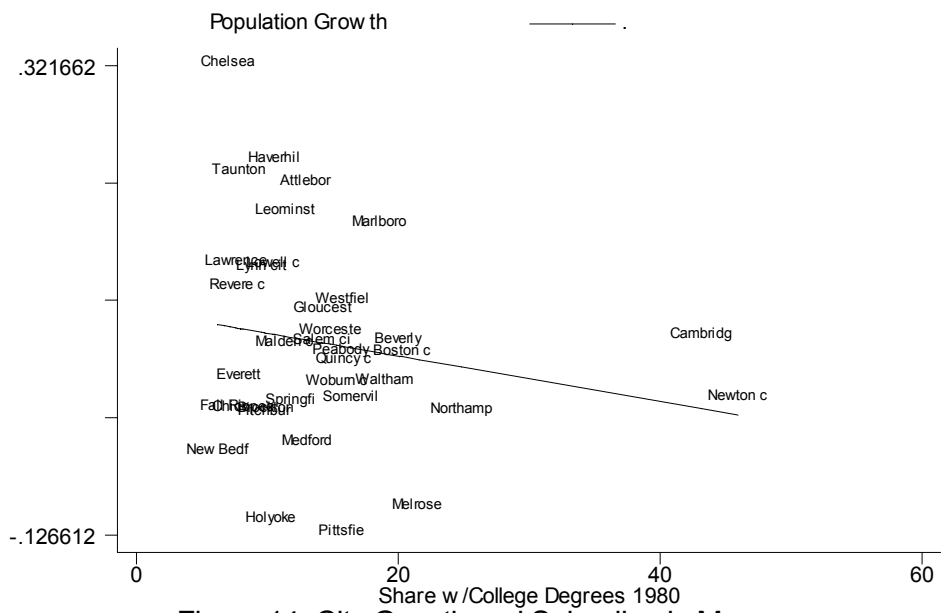


Figure 14: City Growth and Schooling in Mass.

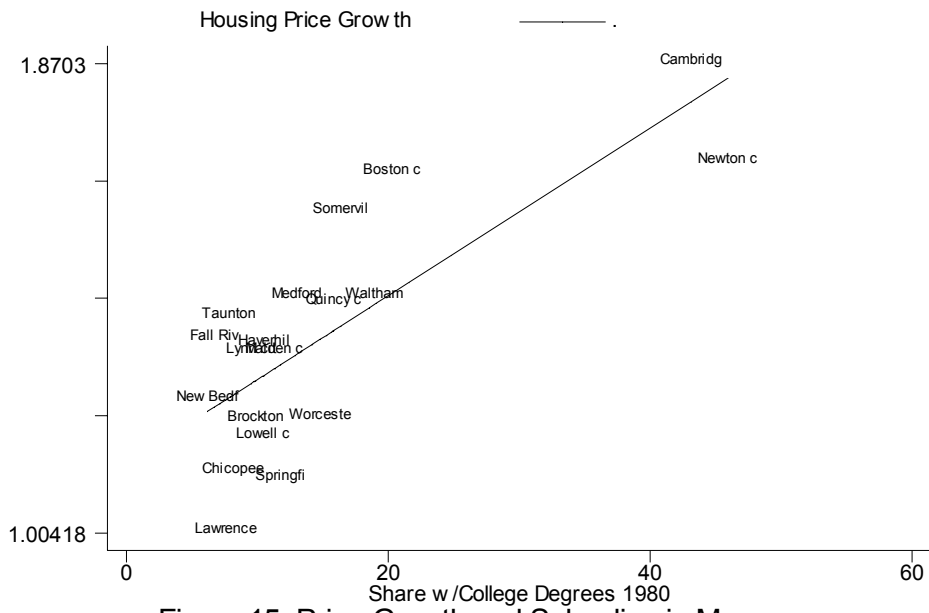


Figure 15: Price Growth and Schooling in Mass.