The Dueling Models: NEG vs Amenity Migration in Explaining U.S. Engines of Growth

By

Mark D. Partridge
Swank Professor of Rural-Urban Policy
AED Economics
2120 Fyffe Rd
Ohio State University
Columbus, OH 43220 USA
Email: partridge.27@osu.edu

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Abstract: The New Economic Geography (NEG) has become a mainstay of regional science in the last two decades, as signified by the awarding of Paul Krugman the Nobel Prize. Yet, most American regional scientists and urban/regional economists do not use the NEG in determining regional growth patterns. Instead, they rely on factors such as natural amenity migration, whose roots lie back to the work of Philip Graves in the mid 1970s. Conversely, two of the world's leading economic geographers—Allen Scott and Michael Storper—have strongly argued that job availability not household amenities have determined U.S. regional dynamics. Given the disparity of views over the largest developed economy in the world, we hold a competition to determine which of these leading contenders accurately predict U.S. interregional growth dynamics over the last 40 - 60 years. The runaway winner of the duel is natural amenity led growth with the crown going to Graves. Implications are drawn for both empirical research and EU economic integration.

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1. Introduction

This paper follows from the 2nd Annual *Spatial Economic Analysis Lecture* the author delivered at the 2009 North American Regional Science Association Meetings in San Francisco. Those meetings marked a decade of remarkable growth in regional science. One key factor underlying a resurgence in interest in regional science is Paul Krugman winning the 2008 Nobel Prize in part due to his work on the New Economic Geography (NEG) (e.g., Behrens and Robert-Nicoud, 2009). Refining and tweaking the base Krugman NEG model has created a virtual cottage industry of scholars with one of the world's leading Geographical Economics texts devoted to the topic (Brakman et al., 2009a). NEG appears to have its strongest appeal in Europe and Asia (especially Japan), but there is less interest among U.S. regional and urban researchers (Irwin et al., 2010).

The lack of interest in NEG models among U.S. scholars is particularly curious because the key benefits of the NEG is to endogenize backward and forward linkages of agglomeration economies while allowing for interregional migration. The NEG should appeal to U.S. researchers because of its particularly high rates of interregional migration (many times greater than Europe) and greater labor market flexibility (Obstfeld and Peri, 1998, Puga, 1999; Partridge and Rickman, 2005). American researchers instead give a special emphasis to the role of amenity migration in which people move to areas with high levels of natural amenities such as warm winters, proximity to oceans and lakes, and pleasant landscape (Ullman, 1954; Graves 1976, 1979; 1980; Deller et al., 2001; Glaeser et al., 2001; Partridge and Rickman, 2003; Rappaport, 2007). Though Philip Graves was not the first scholar to emphasize amenities, he was the first to formally research its effects in the mid 1970s. The U.S. amenity emphasis is ironic in that it is American *economists* arguing that quality of life is a primary driver of interregional growth—not just strong regional economies. Yet, this does not minimize the appeal of urban agglomeration economies to American researchers, especially in describing a "special role" for the preeminence of global cities such as Boston, Chicago, and New York (Glaeser and Maré, 2001; Glaeser 2007; Glaeser and Ponzetto, 2007; Glaeser and Ressenger, 2010).[1]

[1]One key difference between NEG and the view held by Glaeser and most U.S. urban economists is the latter attributes a special role to human capital, knowledge spillovers, labor market pooling; and innovation (also see Duranton, 2007; Duranton and Puga, 2001).

However, a third view is held by the Michael Storper and Allen Scott (S&S)—who are arguably the two leading contemporary economic geographers (Storper and Scott, 2009). S&S agree with NEG proponents about the critical role of agglomeration economies as a force for generating cumulative causation, though they resist applying formal models. Moreover, like Glaeser and his colleagues (and core NEG models), they see a special role for world cities such as Chicago, Los Angeles, and New York in successfully garnering agglomeration economies (Scott, 2007; Storper and Manville, 2006). Yet, what really stands out about S&S (2009) is how they differ from Graves and his subsequent followers (including Glaeser) in their contention that natural amenity migration is not a key factor behind American regional growth patterns. In a nutshell, S&S contend that people only move to "nice places" with suitable employment (S&S, 2009). They argue that only after agglomeration economies and cumulative causation forces take hold are workers attracted to a particular location.[2] Indeed, skepticism about amenity growth from two of world's top economic geographers calls for a reappraisal of its role.

We thus have three differing views of how growth takes place as proposed by four giants of Regional/Urban Economics (regional science) and Economic Geography: Paul Krugman (NEG), Philip Graves (amenity-led growth), and Michael Storper and Allen Scott ("jobs" not "people" or amenities) (with the latter group being more of a "spoiler" by raining on the amenity-led growth parade). With regional science at a new pinnacle, it is a suitable time to have a duel between these three important streams of thought in describing U.S. growth processes over the last 50 to 60 years—i.e., a race to describe the economics of space with the prize given to the most accurate theory.[3] Such a duel is

[2]S&S do not give any reason for agglomeration economies to take hold in a given location except to note that "…each case needs to be treated with all due respect to its historical, geographical and sectoral specificity." (S&S, 2009, p. 164)—calling for case studies. S&S (2009) are also skeptical of human capital explanations of growth (Faggian and McCann, 2006), as well as related creative-class arguments (e.g., those by Florida, 2003). S&S conclude that policies aimed at improving the livability of cities from good public services to creating 'cool' vibrant downtowns will unlikely generate growth.

[3]Of course, another giant is Edward Glaeser who has supported amenity-led growth in certain cases and is also a strong advocate of agglomeration economies and human capital arguments of growth (e.g., Faggian and McCann, 2006, 2009; Glaeser and Resseger, 2010). This means that it is harder to simply include his views in this duel as they overlap much of the other three positions. Nonetheless, I will refer to Glaeser's ideas at appropriate times. Apologies to Professor Glaeser. Maybe he will demand a follow up race where he takes on the winner of this duel. Likewise, another key model is the endogenous growth model. The endogenous growth model is useful for describing persistent growth differentials such as across U.S. regions, but it is hard to point to just a handful of endogenous growth variables that lead to growth differentials. The model encompasses so many factors from governance, innovation, to entrepreneurship that a full test cannot be done in one paper, let alone several papers.

important because these competing viewpoints help define regional science as a discipline and a better understanding of their applicability to actual migration patterns will produce better modeling and policy.

We assess these theories with reference to the United States because it represents the largest economy in the world and it has migration flows that are nearly a magnitude greater than what is found in the EU (Obstfeld and Peri, 1998, Puga, 1999). The utter scale of U.S. internal migration flows is phenomenal. During the 1960s, about 20% of Americans changed residence each year and even since 2000 with lower mobility rates, about 13% of Americans change residences every year (U.S. Census, 2009). If a model or a theory of economic growth is to be considered important, it arguably must play a key role in explaining this large-scale movement of people and resources. Moreover, the U.S. is not just an interesting case study because I will argue that Europe will increasingly mimic the U.S. experience of the last 60 years.

In what follows, the next section describes the underlying principles of the key contestants including some shortcomings. The next two sections then assess how much broad U.S. regional growth processes can be explained by the NEG and amenity migration as characterized by Graves and then S&S. Section 5 awards the medal to the winner and Section 6 discusses why these findings matter not just for the U.S., but also for other developed economies—especially the EU. Section 7 provides concluding thoughts.

2. The Dueling Models

This section describes the NEG model, followed by the amenity approach and S&S's approach. Particular attention will be given to the spatial equilibrium model that underlies the work of Philip Graves and his subsequent followers because it is less popular outside the U.S.

2.1 The New Economic Geography Model

The NEG dates back to the base model of Paul Krugman (1991). The model's assumptions include interregional labor mobility, monopolistic competition in one sector (manufacturing) with increasing returns to scale for firms that are interregionally mobile, along with backward and forward linkages with their suppliers and customers. From this model, Krugman derives an endogenous process that can produce complete agglomeration of the monopolistically competitive sector in one region when there are low

transportation costs, or complete equalization across regions of the monopolistically competitive sector when transportation costs are high.

There are two forces in the base NEG model that promote agglomeration: (1) the home market effect and (2) the price-index effect (Brakman et al., 2009a; Chapter 3). The home market effect occurs because, as more firms and workers locate in one region, additional firms move there to take advantage of serving a larger market with lower transportation costs—i.e., there is a more than proportionate increase in production as home income rises (Head and Mayer, 2004). The price index effect occurs as a region increases in size, resulting in a greater number of varieties of the monopolistically competitive product. Workers are then willing to accept a lower wage in the region—i.e., the love of variety. An offsetting third effect, the extent of competition effect, implies that increasing competition in the larger region will depress output prices—which pressures firms to relocate to the smaller region. The base NEG model is elegant in its formal ability to endogenize core-periphery patterns of regional location. Thus, its beauty is that its predictions are driven from a structural model rather than more loose representations such as "*ad hoc"* knowledge spillovers and labor market pooling.[4]

Empirically testing NEG models is in its early stages (Head and Mayer, 2004). Redding (2010) proposes one possible fruitful avenue in combining traditional agglomeration economies with NEG approaches, though he acknowledges that identifying causality from observational equivalence is a vexing problem (Redding, 2010, p. 308). Head and Mayer propose five different testable empirical predictions for NEG theory, for which I will focus on "does market potential induce factor inflows", because it is most associated with the regional growth differentials and migration flows of interest.[5]

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[4]Beenstock and Felsenstein (2010) present a theoretical model where technological externalities of the type stressed by Marshall are modelled in conjunction with heterogeneous preferences based on amenities (using a utility function). They provide a solution that stands in contrast to NEG pecuniary externalities, one that emphasizes differences in total factor productivity rather than market variety as in NEG models.

[5]The other four testable implications are: (1) market potential raises local factor prices; (2) home magnification effect; (3) Trade induces magnification; and (4) shock sensitivity or shocks have permanent effects (Head and Mayer, 2004). The association between how market potential affects both migration and local factor prices are very closely related (Head and Mayer, 2006)—i.e., a key factor associated with migration is higher wages. Nonetheless, U.S. evidence for the association between "NEG market potential" and local wages is mixed. Using one approach, Hanson (2005) finds a strong positive association between the two, while using an approach like Head and Mayer (2006), Knaap finds very little supporting evidence. Using a method akin to Hanson (2005), Partridge et al. (2009a) find that NEG market access has a relatively small impact on factor prices after accounting for urban access effects related to traditional Central Place Theory. Yet, Fallah et al. (2010) find that market access is positively related to local U.S. income inequality in a manner consistent with NEG theory. Generally, Head and Mayer (2004) conclude

Critiques and Refinements of NEG Models. From this vantage point, the eloquence of NEG models has warranted considerable praise and it added to legitimacy to regional science. Yet, creating analytically solvable NEG models come at the expense of realism (Nijkamp, 2001; Neary, 2001). One key criticism is that they do not incorporate institutional factors that underlie major differences in economic activity. For example, the vast differences in economic development between San Diego and neighbouring Tijuana Mexico are not due to the market potential differences (especially with NAFTA), but rather large institutional differences. Likewise, compared to neighboring France, the fact that Italy began rapidly expanding in the 1950s and Spain and Portugal in the 1980s were not primarily due to large increases in market potential compared to France—but rather institutional changes. Furthermore, as noted above, core NEG models omit key factors such as knowledge spillovers or human capital, while even small changes in transportation costs can dramatically alter the final outcome.

There are other features that limit the broad-scale applicability of NEG models to policymaking (Isserman, 1996). For example, iceberg transport costs are invoked to analytically solve the model. The iceberg assumption has been criticized for not being a realistic depiction of actual transport costs and for being rather naïve in a world with multidimensional transportation and communication modes (McCann, 2005; McCann and Fingleton, 2007; Nijkamp, 2001; Neary, 2001; Redding, 2010).[6] Also the NEG emphasis on transportation costs seems odd in an era when commentators have noted the death of distance and the world is flat, although this issue is much more complex (McCann 2009). Another criticism of NEG models is that actual economic geography is characterized by more discontinuous shifts in transportation costs because the identity of the nearest higher-tiered urban center can change with small movements across space, which is better depicted in a traditional Central Place Theory approach (Eaton and Eckstein, 1997; Brülhart and Koenig, 2006; Partridge et al., 2008b). The core NEG model has also been criticized for being a static model in which the predictions in the case of a large number of non-equidistant regions are basically unknown (e.g., Brakman et al., 2009a). However, there have been some

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that the evidence regarding the implications 2-4 above are also mixed—e.g., see Davis and Weinstein regarding the long-term "shock" effects of Allied bombing in Japan.

[6]There have been efforts such as Lang (2010) to make NEG models more realistic such as assuming heterogeneous transportations costs across firms. Likewise, Gruber and Marattin (2010) introduce government financing of public infrastructure to an NEG model and show that construction of infrastructure reinforces agglomeration to the core, though the periphery benefits from being able to access lower cost manufactured products from the core.

advances in implementing NEG features in dynamic models (Baldwin and Martin, 2004).

The core NEG has been extended in some ways to address criticisms. First, Helpman (1998) adds a nontradeable housing sector to the model to introduce congestion costs, which dampens agglomeration—i.e., population growth raises housing costs which disperses economic activity (Helpman, 1998).[7] Tabuchi and Thisse (2002) introduce taste heterogeneity into a Helpman NEG model to account for regional amenity differentials (Nocco, 2009; Zeng and Picard, forthcoming). They show that greater heterogeneity across workers is another dispersal factor, though we do not need an NEG model to show that individual preferences can affect migration choices. In addition, they did not directly address questions such as how migration is affected by rising income when amenities are a normal or superior good and they do not address whether technological changes such as air conditioning affect amenity migration.

Tabuchi and Thisse (2006) introduce commuting costs to the model, along with another nontraded sector (see Accetturo, 2010 for how commuting costs can reduce aggregate growth in a NEG model). While their model is hard to simulate, their general conclusion is that falling commuting costs act to increase full agglomeration, even with a nontraded sector that increases congestion costs. In sum, these changes illustrate that the core NEG model can be expanded, but at some costs. Yet, one senses that while they are more realistic, these extensions of the NEG model make it less elegant—i.e., they introduce *ad hoc* changes to the model that could be more easily considered in other approaches (e.g., preferences of workers for climate), which was what the core NEG model was trying to avoid. These extensions also show that the NEG model quickly becomes unsolvable as one adds extensions, which greatly limits its flexibility.[8] Indeed, a key advantage of the spatial equilibrium model discussed below is its flexibility.

2.2 Amenity Migration and the Spatial Equilibrium Model

Before describing amenity migration, two initial steps are necessary. First we need to define amenities and then we need to define the spatial equilibrium model that underlies North American modeling of migration behavior.

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[7]Of course, sprawling American cities imply a more elastic housing supply that limits the congestion effects that housing would have in locations with more stringent land controls (Glaeser, 2007).

[8]Brakman et al. (2009b) show that NEG models work better in explaining growth between countries than within them. Also, see Pfüger (2004) for an extension of the NEG model that leads to partial agglomeration as a more interesting stable equilibrium.

*Defining Amenities. A*menities are simply anything that shifts the household willingness to locate in a particular location. By definition, they are broadly defined and include weather, landscape, public services, public infrastructure, crime, ambience, and so on (e.g., Roback, 1982; Gyourko and Tracy, 1991; Dalenberg and Partridge, 1997; Glaeser, 2007). When only considering job and population growth, there is observational equivalence between places that are growing due to strong firm productivity versus those that grow due to favorable amenities—i.e., the so-called 'chicken and egg' of whether places grow due to jobs or people (Partridge and Rickman, 1999, 2003). The spatial equilibrium approach examines both wages and rents, or other factors that help aid with identification (Roback, 1982; Glaeser, 2007).

A shortcoming of the spatial equilibrium approach is that it is not dynamic, nor can it easily be interpreted out of equilibrium. A spatial equilibrium by definition assumes net migration equals zero and is not useful in itself in describing why one place grows faster than another. To make it more dynamic, Partridge and Rickman (1999; 2003) consider changes in wage and job growth, which can easily be depicted with labor supply and demand curves. Namely, a favorable industry shift in prices or productivity will increase labor demand (see Figure 1a), while a favorable change in amenities will increase labor supply (see Figure 1b). Both raise employment but productivity is identified as the dominant causal factor if wages rise and amenities are identified as dominant if wages fall—breaking the observational equivalence in the jobs versus people debate when using only population and job growth.

Revising the spatial equilibrium approach to describe how regions adjust when out of equilibrium is then consistent with the Tiebout approach where people 'vote with their feet' to reside in the locations that maximize utility.[9] Firms maximize profits, which are a function of regional prices for outputs, wages, land prices, and location-specific attributes including access to agglomeration economies, public services, and natural resources. If region *i* has greater profits than the national average, then new firms locate in region *i* and existing firms will expand, increasing labor demand relative to the national average.

Following Ferguson et al. (2007), households maximize utility, which are a function of wages, housing costs, *in situ* amenities, and the tax price of public services. Net migration into region *i* can be written as:

[9]Rappaport (2004) is the most formal effort to include migration in the spatial equilibrium model. Likewise, Benzhaf and Walsh (2008) focus on household self-sorting based on environmental attributes (also Partridge et al., 2009b).

(1) $NM_i = f(V_i - V_{NAT} - M_{avg})$, $f' > 0$,

where V is the indirect utility function for region *i* and the national average and M reflects average moving costs between regions. Thus, places with higher average utility will attract new residents. High psychic and pecuniary moving costs limit migration, which means that household responses are relatively more critical in North America where moving costs are lower than Europe. Note that equation (1) shows that net migration responds in some combination to *both* economic conditions and quality of life including natural amenities. Thus, an important question is how strong are economic factors compared to quality of life factors in determining individual migration preferences and whether this ratio changes over time.

Amenity Migration. Observations that people were moving to nice places with mountain sceneries, warm climates, lakes, and oceans appears to have began shortly after World War II (Ullman, 1954). Much of the Sunbelt experienced a significant increase in population beginning around 1960, reversing a century of outmigration. Likewise, rural areas with high endowments of natural amenities began to experience a significant rebound in the early 1970s, reversing decades of decline related to problems associated with the mechanization of farming (Graves and Clawson, 1981).

More formal empirical and theoretical modeling of how amenities—especially climate—affects migration began with the work by Philip Graves in the mid 1970s (e.g, Graves, 1976, 1980, Graves and Linneman, 1979). The theoretical approach is consistent with the spatial equilibrium/Tiebout sorting approach described above. A key feature is that amenities are considered a normal or superior good—i.e., at low income levels, households focus on necessities such as housing or food, but as incomes rise, natural amenities become more important (Graves, 1979). When income was lower in the 19th Century, natural amenities were considerably less important in driving migration flows. A second feature noted by American migration specialists is the widespread adoption of air conditioning after World War II and public health measures that made Sunbelt weather more appealing (e.g., Rappaport, 2007; Polese, 2009).

Consistent with spatial equilibrium and Tiebout sorting, Graves and his followers do not discount the importance of economic conditions in determining migration patterns or life cycle effects (e.g., Graves, 1979), but under conditions that increasingly took hold in the U.S. during the 20th Century (low moving

costs, rising incomes and affluence, and new technologies), amenity migration became a *relatively* more important phenomenon. Thus, a key advantage of the spatial equilibrium/Tiebout sorting approach is its flexibility in allowing both economic conditions and quality of life to influence migration.

U.S. economists in 1970 would have placed very little weight on quality of life in determining *interregional* migration, but with the work of Graves and others, there was a transformation in the ensuing two decades. This is no small feat given the importance that economists place on economic conditions. Yet, there is one feature of the spatial equilibrium model that may cut off amenity migration regardless of its value to households. Specifically, if natural amenities become fully capitalized into land prices and wages (Graves and Waldman, 1991; McGranahan, 2007; Irwin et al., 2010).

2.3 Storper-Scott Challenge to Amenity Migration

Contemporary economic geographers have long debated regional scientists and economists over many issues including the supposed over reliance of economists on mathematical models and geographers' interest in explaining heterogeneity across locations rather than discovering general patterns of growth as economists are prone to do (e.g., Martin, 1999). Michael Storper and Allen Scott's (2009) paper is particularly noteworthy in that they reject the notion of household sorting on the basis of quality of life in terms of inter-metropolitan migration. Indeed, S&S's views are "back-to-the future" because they are akin to North American regional scientists of the 1960s because they focused too generally on the economic causes for regional growth.[10] Moreover, S&S (2009, p. 157) note that it is hard to empirically verify 'consumer city' or man-made amenity arguments—*a la* Glaeser et al. (2001) and/or Florida (2003)—because causation runs both ways between urban growth (agglomeration) and amenities.

Most important to our competition is that S&S (2009) reject the notion of amenity led growth, thus drawing themselves in opposition to Graves and his followers. They offer no statistical support for their position (though it is much easier to statistically identify the impact of natural amenities because causation clearly runs from proximity to oceans, lakes, mountains, or warm weather to economic growth).

[10]S&S are just another generation of scholars that have been skeptical of amenity migration. For example, the decade of the 1980s and early 1990s was devoted to arguments about "equilibrium" (amenity/people) migration versus "disequilibrium" (jobs) migration. The primary proponent of disequilibrium migration was Michael Greenwood, Graves' colleague at University of Colorado. In the end, both sides were essentially correct in arguing that there could be persistent migration trends (amenities) while there could be migration to adjust for short-term economic shocks. For related classics, see Evans (1990), Greenwood et al. (1991), and Mueser and Graves (1995).

Their evidence is more anecdotal. For instance, they note that if natural amenities such as climate are an important factor behind migration, then we need to understand why amenity migration seemed to only become important as the 20th Century unfolded (S&S, 2009, p. 153). S&S (2009, p. 155) argue that southern cities such as Charleston, SC, Norfolk, VA, Richmond, VA, and New Orleans all peaked in relative population rank by 1840, prior to advances in air conditioning. Their point is that because climate had little to do with past migration patterns, it should have very little to do with contemporary American migration patterns.

The problem is that S&S's (2009) examples do not prove anything related to contemporary migration. Economists and regional scientists note that this pattern can be explained by natural amenities being a normal or superior good, which becomes important once certain income thresholds are crossed. Technological change such as air conditioning reinforces these trends. Consistent with spatial equilibrium/revealed preference approaches, Graves and his followers would readily acknowledge that cities such as Charleston, which developed as port cities for agricultural staples, would have had a major economic advantage that attracted residents. Likewise, they agree that contemporary economic advantages would continue to attract residents—e.g., the oil sands of Northern Alberta being a prime example of economic conditions driving massive growth rather than amenities. Graves *et al* would simply contend that contemporary migration is increasingly affected by *in situ* natural amenities. Whether southern cities had prior periods of growth led by favorable economic conditions has little relevance to whether contemporary migrants are attracted by natural amenities.

Scott (2010) further weighs in on the jobs versus people debate. In a novel consideration of 13 categories of engineers, he examines their in-migration behavior across U.S. metropolitan areas. He concludes that job opportunities play a dominant role, while amenities play little if any role. Unfortunately, this conclusion does not follow from the analysis. Foremost, the empirical model controls for *both* wages and housing costs. From the spatial equilibrium model, wages and housing costs would capitalize the effects of amenities. Thus, all that could be concluded is that after amenities are capitalized into wages and housing costs, amenities have no further effect on the in-migration of engineers (Greenwood et al. 1991; Clark et al. 2003). Because wages and rents are statistically insignificant in his

results, Scott would have been on better footing by concluding that engineers were near a spatial equilibrium, but he needs a different model to assess their relative preference for jobs or amenities.[11]

S&S (2009) are also conceptually opposed to the revealed preference notion that people vote with their feet to places that offer higher satisfaction—at least when considering growth between metropolitan areas (also see Scott, 2007; Storper, 2008). That is, they ask how do we know that people who move to location *y* actually prefer the attributes of location *y* over other alternative locations? Economists contend that if they voluntarily choose location *y,* then the move represents an expected welfare improvement, suggesting that migrants must have preferred the attributes associated with location *y*. There is a long economic literature supporting Tiebout revealed preference behavior over economic and non-economic opportunities.[12] Most people prefer warm winters over suffering through cold and snow that hampers recreation and the associated challenges of getting children to school or going to work. The empirical question is the strength of those preferences compared to other preferences including economic ones. Are people willing to tradeoff weaker economic conditions (i.e., lower expected wages) for amenities? Hence, I go forward assuming people are rational and choose to live in places with higher expected utility.

The winner of the competition will then be decided upon statistical evidence regarding the role of amenities and economic conditions. The winner will not be determined by a notion in which revealed preferences are used to support arguments one may prefer (say job opportunities in the case of S&S) but disregarding them in other cases where one does not agree (say amenities in the case of S&S). Indeed, one could turn the tables and argue that people choosing to live in cities are not doing so on the basis of employment opportunities due to agglomeration economies (a position S&S support), but rather reflects a

[11]There are other concerns with Scott's approach that limit the applicability of his conclusions. (1) Scott's empirical model only considered *in*-migration rates, not *net*-migration rates—i.e., the jobs versus people debate is not about the size of migration churning, but what causes employment growth and population growth, which are both determined by *net*-migration. (2), Scott's study may be the only paper commenting on the jobs versus people debate without an actual job growth variable (in which exogenous measures of demand *shifts* for engineers could have been calculated). (3), only one measure of natural amenities was considered, which is insufficient. His list of "amenity" variables included metropolitan population and population density, which are normally considered agglomeration variables. (4), the only consistent statistically significant effect was that in-migration rates of engineers were positively linked to high metropolitan area *out*-commuting rates, which is usually associated with the *lack* of local employment opportunities. Thus, while Scott's (2010) study contains novel classifications, follow-up research is needed to answer the questions he put forth.

[12]For a discussion of revealed preference and migration, see Tabuchi and Kentaro (forthcoming) and Benzhaf and Walsh (2008).

spurious application of revealed preferences. Nonetheless, even if most people *strongly* prefer nice amenities, this would not imply that Graves and his followers will be the winners because these amenities (and their expected effects over time) may be fully capitalized into housing prices and wages, which implies there will be no ensuing migration. Then, S&S would beat Graves in the duel.

One feature that S&S have in common with the proponents of NEG (and others such as Glaeser) is the view that large global cities have particularly fared well in recent decades—e.g., New York, Los Angeles, Chicago, Boston (S&S, 2009; Scott, 2007, 2008; Storper and Manville, 2006; Storper, 2008). S&S (2009) also argue that institutional considerations are another important feature because they affect how agglomeration economies take hold (Storper, 2008). Conversely, NEG proponents are generally silent on the role of institutions, though supporters of the spatial equilibrium approach (including Graves and his followers) also acknowledge the importance of institutions because they can affect both relative employment opportunities and quality of life. Institutions will likely play an important role in deciding the winner of the duel. Namely, did rapidly growing regions have the necessary institutions in the beginning to facilitate endogenous growth, or were natural amenities the impetus for sustaining growth?

3. The Criterion of the Race: What are the Predictions of Each Model?

The period under consideration begins in the middle of the 20th Century during the prosperous post World War II era and it ends today. Mid 20th Century America had a clear core-periphery depiction. The core region was the manufacturing belt that extended from Wisconsin and Illinois (Milwaukee/Chicago) across the Great Lakes states taking in the core Northeast Atlantic cities running from Pennsylvania up to Massachusetts. The core contained New York, home of the world's dominant financial market for most of the period. In terms of NEG market potential, the core would have been centered in Ohio and Michigan with good access to the entire manufacturing belt and Northeast, core regions of Canada, as well as the upper South and Plains states. Thus, it is not surprising that U.S. manufacturing was particularly concentrated in Michigan and Ohio, and their close access to a large share of the North American market is something that is still trumpeted by their respective state economic development officials.

The Southern U.S., Southwest U.S. (with the exception of California), and the Rocky Mountain West were the periphery in the mid 20th Century. The interior Western U.S. was very sparsely populated and

lacked agglomeration economies that are usually identified with growth. For example, the Mid Atlantic states of New York, New Jersey and Pennsylvania had just over 300 people per square mile in 1950, but population densities in the Rocky Mountain West were less than 6 people per square mile (U.S. Census Bureau, 1952). While also lacking the agglomeration economies, though not to the extent as the arid West, the South (composed of former Confederate states in the American Civil War) faced what would appear to be even stronger drawbacks at mid 20th Century. These states had Jim Crow laws that created a near-apartheid system and they possessed an entrenched political system that long benefited privileged landowners and business classes.[13] Educational attainment was particularly low and per-capita incomes were typically about one-half of the wealthiest state New York.[14] It is not apparent that this environment would be conducive to wide-scale endogenous growth taking hold. For these reasons, one would not have expected significant *economic* migration from the wealthy manufacturing belt to the Sunbelt in 1950.

Given the initial conditions, another key factor that would determine the predictions of core NEG models is the evolution of transportation costs. Conventional wisdom is that new technologies and the expansion of the Interstate Highway system greatly lowered costs for the movement of people for commuting and for transporting goods (Glaeser and Kohlhase, 2004; Polese, 2009). To confirm this view, Figure 2 shows overall U.S. transportation and warehousing costs relative to both the U.S. GDP deflator and the U.S. Consumer Price Index for 1947 to 2005. Relative transportation costs clearly fell by at least one-half over the period. Likewise, the geographical expansion of U.S. metropolitan areas illustrates how commuting costs fell with the construction of the Interstate system.

Under the conditions of circa 1950-1970, the standard NEG model (e.g., Krugman, 1991) would predict further agglomeration into the core. Namely falling transportation costs facilitated a concentration into the core from the mid 19th Century to the mid 20th Century. With continued declines in transport costs, the base NEG model would predict further concentration—i.e., nothing changed to alter this

[13]For a state-by-state breakdown of Southern political and economic conditions in mid Century, see Key (1984).
[14]For perspective in 1950, relative to the wealthiest state New York, Georgia (home of Atlanta) per-capita income was 52%, Florida was 65%, Alabama and South Carolina were both 45%, Mississippi was 37%, North Carolina was 51%, Texas 69%, etc (U.S. Census Bureau, 1952). Relative per-capita figures were significantly lower prior to World War II—e.g., Mississippi's per-capita income was only 24% of New York's in 1939. Note that the South had a "pro-business" climate well before 1950, suggesting that a pro-business climate in itself did not turn the tables.

dynamic.[15] For example, one manufacturing plant in Michigan or Ohio could take advantage of increasing returns to scale and then supply a much larger market with lower transportation costs. The Tabuchi and Thisse (2006) model that accounts for congestion costs through commuting would likewise predict greater regional agglomeration into the core because falling commuting costs would reduce congestion costs, reinforcing the effects of falling transport costs. Both the core U.S. regions and the largest cities in general would benefit from the fall in transport and commuting costs, increasing their growth prospects.

Given conditions of the mid-20th Century, Graves and his followers would have predicted that rising incomes and technological improvements would lead to increasing migration to the Sunbelt, the Coasts, Mountainous locales, and other places endowed with greater natural amenities (all else constant). In contrast to NEG models, the core would generally lag due to the lack of natural amenities.

S&S's (2009) predictions would tend to support NEG models in terms of agglomeration of being a key force—though among their clearer predictions is that large global U.S. cities should fare well. To be sure, they would generally suggest that any area in which the seeds of agglomeration economies take hold are good candidates for growth, though they do not clearly outline which places would have been favored (especially regarding the Sunbelt).[16] More importantly for the duel, S&S argue that natural amenities are at most an insignificant factor behind regional growth. In this case, given that the South and Rocky Mountain regions—two areas blessed with natural amenities—faced significant economic barriers in the mid 20th Century, it would be very hard to expect that given their initial economic and institutional conditions (and their pre-1960 track record), they would be strong candidates for endogenous growth.

4. The Duel Begins.

4.1 The Duel Part 1, Growth of Cities.

Figures 3a and 3b show 1969-2007 and 1990-2008 population growth rates for nonmetropolitan and metropolitan areas (MSAs) broken down into four size classes. The size classes are based on 1969 metro

[15]There are iterations of NEG models that predict dispersal from the core with falling transport costs. Yet, given that the pre-1950 world was that falling transportation costs were associated with concentration, continued declines in transport costs should facilitate further concentration, as no key "initial" condition associated with standard NEG models changed circa 1950.

[16]For example, S&S claim that access to knowledge and creative workers was not the spark that caused Silicon Valley to take off (S&S , 2009; p. 162). Rather knowledge workers were attracted there only after the software and computer industries took off, even though Silicon Valley is near two of the world's best universities.

population to assess whether growth was associated with initial agglomeration economies. The four classes are (1) the 8 Big MSAs with a 1969 population greater than 3 million (New York, Los Angeles, Chicago, Philadelphia, Detroit, Boston, San Francisco and Washington, DC.), (2) the 27 Large-Medium MSAs with a 1969 population between 1 to 3 million, (3) The 85 Small-Medium MSAs with a 1969 population of 250,000 to 1 million, and (4) the 230 Small MSAs with a 1969 population under 250,000.[17]

Figure 3a shows that the largest 8 MSAs only grew just one-third of the rate of the other three smaller MSA categories between 1969-2007. Indeed, they even trailed the average growth rate of nonmetropolitan areas. However, some have claimed that the relative performance of cold American cities greatly improved after 1990 (a "resurgence") due to a variety of reasons such as reductions in crime (e.g., Glaeser and Pancetto, 2007; Storper and Manville, 2006; Scott, 2007; Scott, 2008; S&S, 2009). Figure 3b shows that the performance of the large MSAs was only slightly better during this period—i.e., their growth rates were still only about one-half of the average rates for the three smaller MSA size categories and the Big MSA growth rate barely exceeded that of nonmetropolitan areas. The relatively dismal performance of the Big 8 MSAs would have been even worse over the entire period if not for the relatively strong performance of the Washington, DC MSA.[18] For example, both the New York and Boston MSAs trailed the weak average of the Big 8 over the entire period and since 1990.

Indeed, these results suggest that rural areas (nonmetropolitan) and the biggest cities are the weakest performers in terms of people voting with their feet, while there is not much difference in growth across the small and medium-sized MSA groupings. Thus, these findings do not support core NEG predictions. They are also inconsistent with S&S's expectation that wealthy global U.S. cities should have subsequently fared well—though S&S's predictions focus on a "resurgence" after 1990. Yet, the results are consistent with authors, who in the 1960s and 1970s, argued that poor quality of life in the largest MSAs (riots, crime, environmental problems, etc) would lead to weak performance to the benefit of

[17]The MSAs use 2008 definitions. Seventeen MSAs with less than 50,000 population in 1969 were omitted due to a small base. These were generally in UT, NV, and FL and grew very rapidly. Including them in the results below would produce even stronger results than already presented. Note that using 2008 MSA definitions makes nonmetropolitan growth appear especially small because faster growing nonmetropolitan areas were most predisposed to either be reclassified as a MSA or as part of an existing MSA. Taking this factor into account will make the results appear even stronger than presented.

[18]Per-capita income relative to the national average gained 2.75% in the Big-8 MSAs over the period, or even with slightly higher income growth, those regions had weak population growth, suggesting lagging quality of life.

intermediate sized MSAs (Berry, 1970; Graves and Clawson, 1981; Hansen, 1970; also Rappaport, 2003).

Though the relatively weak performance of the U.S. core big cities of the mid 20th Century is not supportive of NEG, there are other ways that population could have concentrated in the core. For example, it could have been redistributed *within* the core from the largest cities to intermediate-sized cities—or population would continue to concentrate in the core. For example, congestion effects or rising housing prices may have made the largest core-cities less appealing, but firms may have simply relocated to nearby intermediate-sized core-region cities to maintain access to significant market potential. In fact, Puga (1999) indicates that the relatively high concentrations of population across U.S. *states* compared to European nations imply that NEG models could better explain U.S. population dynamics.

Figure 4 assesses this issue by examining the standard deviation of relative total nonfarm employment per square mile across U.S. states as well as the corresponding standard deviation for manufacturing (U.S. average = 1). For example, a state with twice the employment per square mile compared to the national average gets a value of 2. Even in the face of declining transportation and commuting costs, Figure 4 shows that the U.S. has been deconcentrating away from the core for decades whether considering total nonfarm employment or manufacturing employment.[19] The manufacturing results are most telling for NEG models because that sector would be most likely to be characterized by increasing returns to scale and affected by falling transport costs. In sum, U.S. regional patterns are inconsistent with the predictions of core NEG models.[20]

To explore how agglomeration economies interact with regional location, we examine metropolitan growth within particular regions. Thus, we can examine whether there are differences by region as predicted by amenity models. Figures 5a and 5b respectively show the growth for four categories of representative cites over the 1969-2007 and 1990-2007 period. The specific categories are the (1)

[19]The same deconcentration results would apply if instead we considered relative employment levels versus relative employment density per square mile. Likewise, in a Helpman (1998) NEG model, increases in housing costs would be a spreading force away from the core. While long-term housing prices have gone up more in the historic-core regions of the East coast (e.g., Boston), it has been rather flat in much of the Rustbelt (e.g., Cleveland, Detroit), which should be the strongest area for concentration in NEG models. Thus, falling relative housing prices would have been a positive-concentration factor in much of the manufacturing belt. Another factor that may have limited growth in the core is the rise of the service sector. Yet, such an argument is offset by the phenomenal rise of traded financial services which are concentrated in the core.

[20]For empirical evidence of the limited applicability of NEG models to explain U.S. migration patterns and wage and rental gradients, see Partridge et al. (2008b, 2009a, 2009b).

Traditional Core MSAs that were at the top of the core's urban hierarchy (New York, Boston, Philadelphia, and Chicago); Rustbelt MSAs that led the manufacturing economies of the mid 20th Century (Detroit, Cleveland, Pittsburgh, and St. Louis); Sunbelt MSAs that are in warm places, without natural resource advantages such as energy (Miami, Atlanta, Phoenix, Tampa, Orlando and Las Vegas); and Mountain/Landscape MSAs (Seattle, Denver, Portland, and Salt Lake).

Figure 5a shows that the Rustbelt and Traditional Core cities barely grew on average over the 1969-2007 period, while the Sunbelt MSA populations tripled on average and the Mountain/Landscape MSAs more than doubled. Figure 5b shows a similar pattern for 1990-2007, though the relative gap appears to have slightly narrowed. The evidence is most consistent with amenity migration being the initial factor behind growth, though agglomeration economies and cumulative causation may have facilitated the growth process once it took hold in high-amenity areas.

4.2. The Duel Part 2: Amenity Led Growth?

There have been scores of empirical studies on the role of amenities dating back to the seminal work of Philip Graves in the 1970s. Virtually all these studies found that amenities are associated with growth, but I will focus on two sets of studies that are most useful for our purposes.

The first noteworthy study is Rappaport (2007). He examined U.S. county population growth rates over every decade of the 20th Century while controlling for NEG factors such as market potential as well as other growth factors. He finds that climate did not become an important feature driving growth until the 1920s, but it has remained so ever since. Rappaport concludes that the key factor behind the shift in the 1920s was the rise of income levels beyond a certain threshold so that people began to consider amenities in their location decisions. The case of rural areas is particularly compelling because they faced significant depopulation due to labor saving technological change in agriculture and natural resource industries. Around 1970, there was a major rebound in high-amenity rural areas even though they are, by definition, not urban agglomerations (Irwin et al., 2010; Deller et al., 2001; McGranahan, 2007).

Second, Partridge & Rickman (2003) is noteworthy because of its attempts to identify firm demand and household labor supply shifts using wages and employment growth in a *structural* vector

autoregression model. Thus, the modeling is among the most careful in identifying firm effects from household effects while allowing for migration. Their results suggest that household supply factors such as amenities explain just over one-half of the variation in annual state-to-state migration flows while labor demand (firm productivity/profitability) shocks explain just under one-half of the variation. Their identification process is particularly compelling because the regional patterns are consistent with known patterns. Over time, they find that firm-shocks play a paramount role during severe recessions and during the energy shocks of the 1970s and early 1980s. Across regions, they estimated that firm-side effects dominate for regions such as oil-patch states and the manufacturing-intensive Rustbelt, which are more exposed to demand shocks. Sunbelt states are most affected by household shifts, which is also expected.[21]

The hedonic literature is full of examples of people "paying" to live in nice places either through accepting lower wages or through paying higher housing costs. For one, Schmidt and Courant (2006, p. 939, 942) find that workers would take a 4% pay cut to live 100 miles nearer to a 'nice place' such as a national park, seashore, landmark—e.g., residents of Omaha, Nebraska have 20% higher wages to compensate for the disadvantage of being the farthest place in the U.S. from a "nice place" *(cet. par*.).

Figure 6 shows a map of U.S. state population growth over the 1960-2008 period. The map clearly shows that population growth lagged in amenity-poor areas in the interior Great Plains region, and in the manufacturing belt around the Great Lakes states and the Northeast. Two exceptions are lightly-populated New Hampshire and Vermont that are bucolic high-amenity states that pull growth from nearby urban areas (Polese, 2009).[22] Conversely, the highest growth states are in Sunbelt states in the Southeast, Southwest, Pacific Coast region, and the Rocky Mountain West. Again, there are few exceptions such as Alabama and Mississippi, illustrating that warm weather alone is not enough to overcome historical legacy effects that pull growth down.

Figure 7 shows 1990-2008 population growth at the county level. County level growth is particularly

[21]Partridge and Rickman's models account for state business-climate policy effects such as "right-to-work" laws that played a key role in manufacturing relocating to Southern states (Holmes, 1998). Of course, note that manufacturing's diminishing role in the U.S. economy means that it would not be a dominant factor behind the Partridge and Rickman's (2003, 2006) aggregate results across the entire economy.

[22]The positive performance of Minnesota is a good example that economic geographers could point as illustrating the value of case studies. Growth in the northern Upper Midwest has been linked to not everyone preferring warm winters (Partridge et al., 2008a). See Polese (2010) for further discussion of Minnesota's "over performance."

compelling because we can further examine within-state trends—i.e., counties within a given state have similar business climates and settlement histories, though their endowment of natural amenities can greatly differ. For example, while all of Montana is sparsely settled, the beautiful western mountainous part has experienced robust growth since about 1990, while the barren eastern plains region has long stagnated (even though energy rich). Colorado has a similar pattern to Montana. Likewise, the Ozark regions of Missouri and Arkansas also show up as over performing in their respective states, where again the region is sparsely settled but possesses favorable natural amenities. The general pattern is high amenity areas are typically the best performing regions within their given states.

Partridge et al.'s (2008b) study of 1950-2000 county growth patterns helps quantify the economic significance of amenity migration. They control for amenities, distance to various-sized urban centers and state fixed effects, among other variables. Their data indicates that the typical nonmetropolitan county gained about 32% population between 1950-2000, while small-MSA counties (MSAs with < 250,000 people in 1990) and large-MSA counties averaged 122% to 138% population growth (Table 1, Row 1).[23]

To ease the interpretation of the results, let us compare the results for the amenities variables using the values for Detroit, MI (in the Rustbelt) and Orlando, FL (in the Sunbelt).[24] Rows 2 to 4 report the results of the key climate variables holding the other control variables constant. Over the 50 year period, a nonmetropolitan county with Detroit's average January temperature would have expected 136% lower population growth than a nonmetropolitan county with Orlando's average temperature (*ceteris paribus),* while the corresponding differences for small and large MSAs are respectively -769% and -732%. Of course, Rows 3 and 4 show that this advantage is partially offset by hot humid summers in Orlando. Yet, this overall pattern is consistent with the predictions of Graves and his followers and inconsistent with S&S's (2009) predictions that natural amenities would be a small factor. Likewise, NEG models would not have predicted that periphery locations like Orlando would experience such growth.

The second to the last row of Table 1 shows the results when all of the amenity variables are

[23]Including state dummies is important because they account for state business climate factors. Ironically, Partridge et al.'s (2008b) stress the role of urban agglomeration in affecting growth, not amenities.

[24]For perspective, Orange County, the central county of the Orlando, FL MSA grew by 680% over the 50 year span, and it even grew an additional 20% between 2000 and 2008 (which pales compares to the growth of Clark County NV—Las Vegas—which grew nearly 3000% between 1950 and 2000).[24] Wayne County, the central county of the Detroit MSA lost 15% of its population over the 1950-2000 period and lost another 5% between 2000 and 2008.

replaced by the USDA's Economic Research Service's natural amenity index that runs from 1 (low) to 7 (high). The natural amenities associated with Orlando receive a value of 5 while Detroit earns a 3. In this case, a nonmetropolitan county with Detroit's natural amenities would have been expected to grow about 70% less than a county with Orlando's natural amenity score. The gap is an even larger—150%--for metropolitan counties. For perspective, the last row shows that the remoteness from correspondingly larger cities reduced expected growth about 100% (*ceteris paribus)* for nonmetropolitan and small MSAs. The results suggest that even modest natural amenity differences can lead to large variations in growth.

In interpreting these results, with state fixed effects accounted for, any common amenity effect such as Florida having more amenities than North Dakota would show up in the state fixed effects. The amenity coefficients only account for *within* state effects—i.e., the January temperature coefficient only picks up differences within a given state, not between states. Thus, if anything, Partridge et al.'s amenity results actually understate their true effects because some of those effects are captured by the state effects.

5. And the Winner is…..

Our referees have determined the winner. The results clearly suggest that despite conditions favorable to concentration under the predictions of a core-NEG framework, the core U.S. regions of the Great Lakes and Northeast have faced relative decline. Likewise, large U.S. MSAs have greatly underperformed other MSAs, with a particularly weak performance among those in the historic core region. Thus, the standard (Krugman-style) NEG model completely failed to predict the massive redistribution of U.S. population away from the core to the periphery. The clear weakness of NEG models is that they generally only rely on one explanation—pecuniary externalities—and like any one explanation model, they will have a difficult time explaining the complexities behind regional growth (Neary, 2001).[25] Likewise, those who suggest that global U.S. cities have fared relatively well in recent years (e.g., S&S, 2009; Glaeser and Pancetto, 2007) have also overstated their success as many U.S. large MSAs (based on their 1969 population) have often underperformed the typical rural (nonmetropolitan)

[25]NEG models appear to have a better track record in describing past movements in EU migration (e.g., Head and Mayer, 2006), though I argue below that amenity-led migration is growing in the EU as well. However, in a paper written after the first draft of this paper, Krugman (2010) states the following about NEG, "…the stories it tells seem more suited to the U.S. economy of 1900 than that of 2010." (Krugman, 2010, p.14). However, Krugman is much more optimistic that NEG will be a strong descriptive tool for newly industrializing countries such as China.

county (a major exception is Washington, DC).[26]

The results show that amenity-led growth has taken what was once the periphery that faced either extreme remoteness or extreme historical baggage into 50 years of robust growth. Thus, the prize for the best theory is awarded to Philip Graves. Working in the mid 1970s, Graves was one of the first economists to envision that the American landscape was being transformed from one where economic activity was virtually the sole driver of regional dynamics to one where natural amenities would become a major determinant. If Nobel Prizes were decided on the basis of foreseeing and describing major redistributions of American Economic Geography—i.e., for the largest most important economy over the last Century with some of the world's highest mobility rates—Graves would be a winner.

6. Why Should the Rest of the World Care about the Race?

U.S. regional dynamics are of course interesting to Americans, but why should the rest of the world care? As of yet, natural amenities have not been a major factor in most other countries. For example, in neighboring Canada, amenity migration has not been a major factor (Ferguson, et al. 2007), but there are signs that this is changing in parts of British Columbia and for many sea-side communities of Atlantic Canada (Polese, 2009). Likewise, Cheshire and Magrini (2006) find that using data from the 1990s, *within-country* EU migration flows tend to be from north to south to warmer climate (*ceteris paribus*). Yet, they also find evidence that such migration has not been a factor determining the relatively small flows across countries. They argue that national boundaries are still too "thick" for amenity migration to matter because of language and cultural barriers.

Even so, amenity migration is likely become a force in the EU and elsewhere. First, rising incomes, economic integration, and falling costs of migration will increasingly imply that quality of life factors

[26]There are many explanations for particular MSAs faring relatively well (poorly) including idiosyncratic factors related to agglomeration (S&S, 2009; Polese, 2010). For example, Glaeser (2007) contends that zoning could limit the growth of certain cities. While this is certainly true for places like Manhattan, it has less relevance for (say) the entire New York City metropolitan area, which is lightly settled in its outer reaches with room for growth. That is, even in the densely settled Northeastern U.S., population densities are still not that dense by global standards (Partridge and Olfert, 2009). For example, density in the *urban* portions of the Boston MSA is roughly the same as those in Tulsa, Oklahoma MSA (also see Storper and Manville 2006 p. 1254, p. 1261). Thus, zoning may not be as binding for overall MSA growth as some have suggested (e.g., Glaeser, 2007), though it is certainly binding in certain municipalities *within* a MSA. See Puga (2010) for a review of general agglomeration factors.

including natural amenities will be a growing factor. In fact, another factor identified by Graves and Clawson (1981) will accelerate this process. They noted that the increases in U.S. travel allowed people to experience different regions with differing baskets of job opportunities and amenities. Thus people learned more about their migration preferences toward high-amenity regions. Likewise, low-cost EU airlines like Ryan Air and Easy Jet allow millions of people to taste life in high-amenity, but initially more peripheral locales such as parts of Spain, the South of France, and parts of Italy. Polese (2009) describes how amenity (he terms it "hedonic") migration is already taking hold in these European regions. With all of the factors that drove amenity migration in the U.S. now emerging in the EU, it is likely that amenity migration will become a major factor among the wealthy EU countries.

Greater amenity migration also means that EU migration researchers will increasingly need to incorporate a spatial equilibrium approach. For example it is common that European modelers only use per-capita income differentials as a key factor in determining migration flows (or NEG models). While that may be a useful simplification when there are still large economic differences across regions (say the North and South of Italy), it is increasingly less useful when those gaps decline and rising income increases the demand for natural amenities. Indeed, much U.S. net migration for the last 50 years has been from what was the very wealthy Northeast and manufacturing belt to the relatively poor Sunbelt—which is nearly impossible to explain in purely economic models.

7. Conclusions

The awarding of Paul Krugman the 2008 Nobel Prize and the reinvigoration of Regional Science presents an opportune time to examine what theories are most useful in explaining regional growth differentials. The U.S. is a particularly interesting case because it is by far the largest developed economy with extremely high migration rates that can generate significant regional growth differentials. Clearly, with the dynamic U.S. economy as a backdrop, it is appropriate to assess which of these leading contenders accurately describe American growth processes—i.e., "a Race." To determine the winner of this duel, we first asked whether falling transportation and commuting costs led to a strengthening of U.S. core regions as predicted by core NEG models? Conversely, did other factors such as amenity migration—first studied

in detail by Philip Graves in the mid 1970s—lead to a geographical realignment favoring the American periphery? However, there are those who argue amenity migration is at most an insignificant determinant of American growth—most particularly Michael Storper and Allen Scott (S&S, 2009)—perhaps the two most influential economic geographers of our day.

The evidence is fairly clear that since the middle of the 20th Century, there has been a massive deconcentration out of the traditional American core of the Great Lakes states and the Northeast to what was periphery of the country in the South, Southwest, and Rocky Mountain region. Indeed, the evidence is almost exactly the opposite of what core NEG models would predict. Likewise, the largest American MSAs based on their 1969 population have greatly underperformed other MSAs (even since 1990), suggesting that those who argued that cold large MSAs have experienced a rebirth were premature in their assessment (Glaeser and Ponzetto, 2007; Storper and Manville, 2006; S&S, 2009).

In contrast, growth patterns have been very consistent with amenity-led migration to places endowed with high levels of natural amenities such as nice climates, pleasant landscapes, lakes/oceans and mountains. Probably the strongest evidence of this is the growth in the Rocky Mountain region. As Figure 7 shows, as one moves east to west from the Plains to the Mountain regions, population growth becomes much more positive in rural and urban counties alike. This pattern is obviously systematic and is inconsistent with the predictions made by those who argue that growth patterns are idiosyncratic and cannot be explained by amenity migration—i.e., S&S (2009).

Thus, in what has turned out to be a runaway victory, Graves is the winner of the race to explain growth across space. Amenity migration has led to a fundamental transformation of American geography. Though Philip Graves may not win a Nobel Prize, accurately predicting a fundamental realignment of the American spatial economy over the course of the last century is worth something. Indeed, it may come to pass that the winner of this prestigious duel will garner much more fame than from winning the Nobel prize. However, going forward, much as amenity migration would have not been predictable right after World War II, we do not know how technological change, climate change, or even capitalization of amenities into wages and housing costs will affect future migration. While amenity migration redefined U.S. geography, the future is hard to predict.

In terms of the rest of the world, there are many lessons from this duel. First, the obvious conclusion is that economists should not rely on uni-dimensional explanations for growth such as the pecuniary externalities that underlie the NEG. Second, as moving costs (both pecuniary and nonpecuniary) decline with the ongoing integration of the EU, and income levels allow amenities and quality of life to play prominent roles in location decisions, amenity migration will likely take an important role. Not only will this reshape EU economic geography as the core and blue banana regions face increasing dispersal forces, but migration and growth modeling based solely on economic factors will have to change as well. Yet, while I am making bold predictions about EU integration and economic geography, I recall that regional growth is hard to predict. That means, of course, more research is needed.

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Figure 1a: Labor Demand Shift

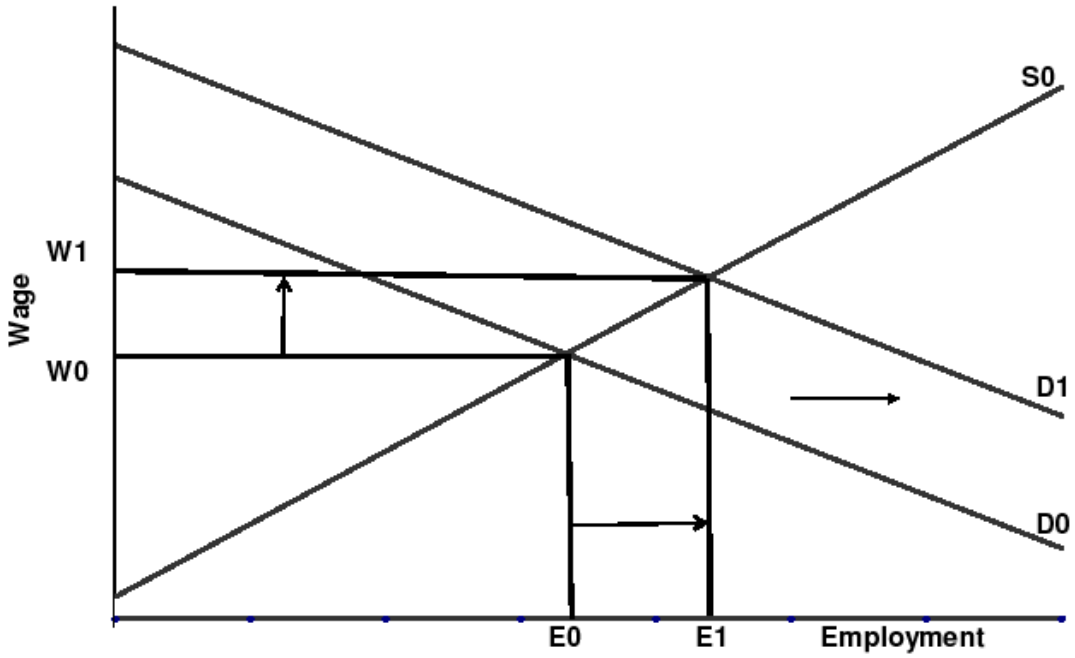


Figure 1b: Labor Supply Shift

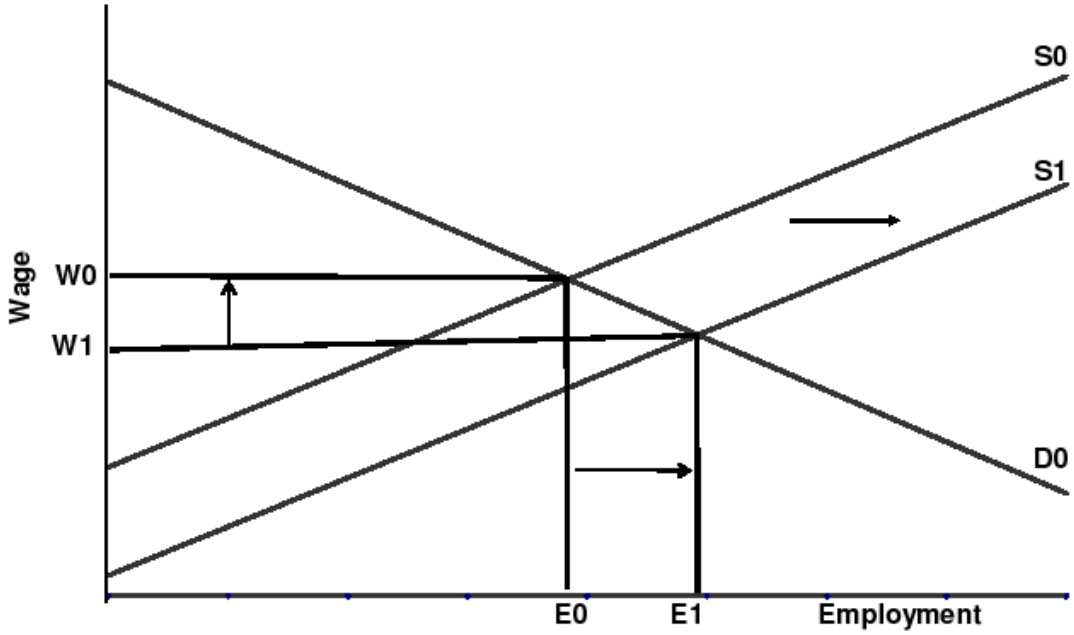
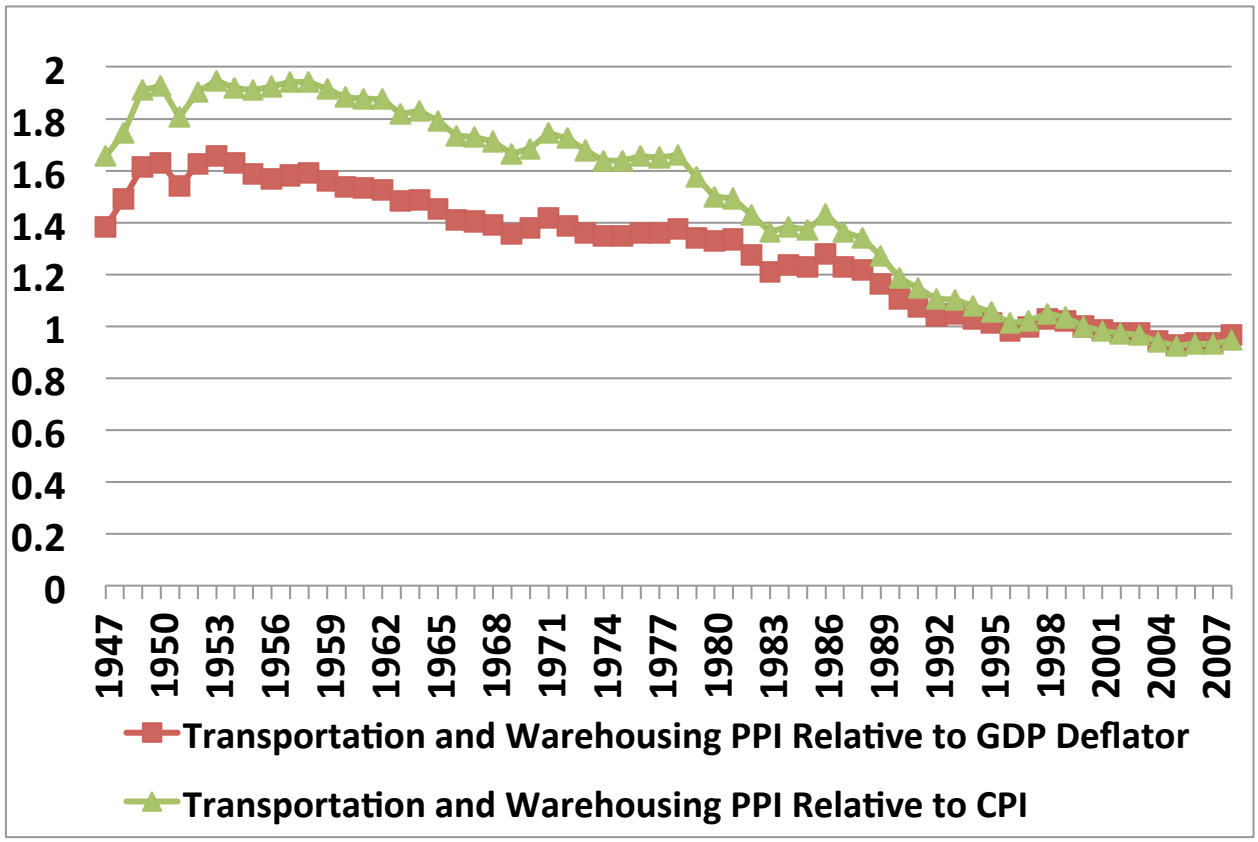


Figure 2: Relative Transportation and Warehousing Costs Compared to the CPI and GDP Deflator 1947 - 2009 (2000 = 1)



Notes: Transportation and Warehousing producer price index relative to the GDP deflator and Consumer Price Index. Source for the Transportation and Warehousing Producer Price Index and the GDP deflator is the U.S. Bureau of Economic Analysis [downloaded from http://www.bea.gov/industry/gpotables/gpo_action.cfm on February 16, 2010] and the source for the Consumer Price Index is the U.S. Bureau of Labor Statistics [downloaded from http://data.bls.gov/cgi-bin/surveymost?cu on February 16, 2010].

Figure 3a: 1969-2007 Growth By Metro Area Size in 1969 (%)

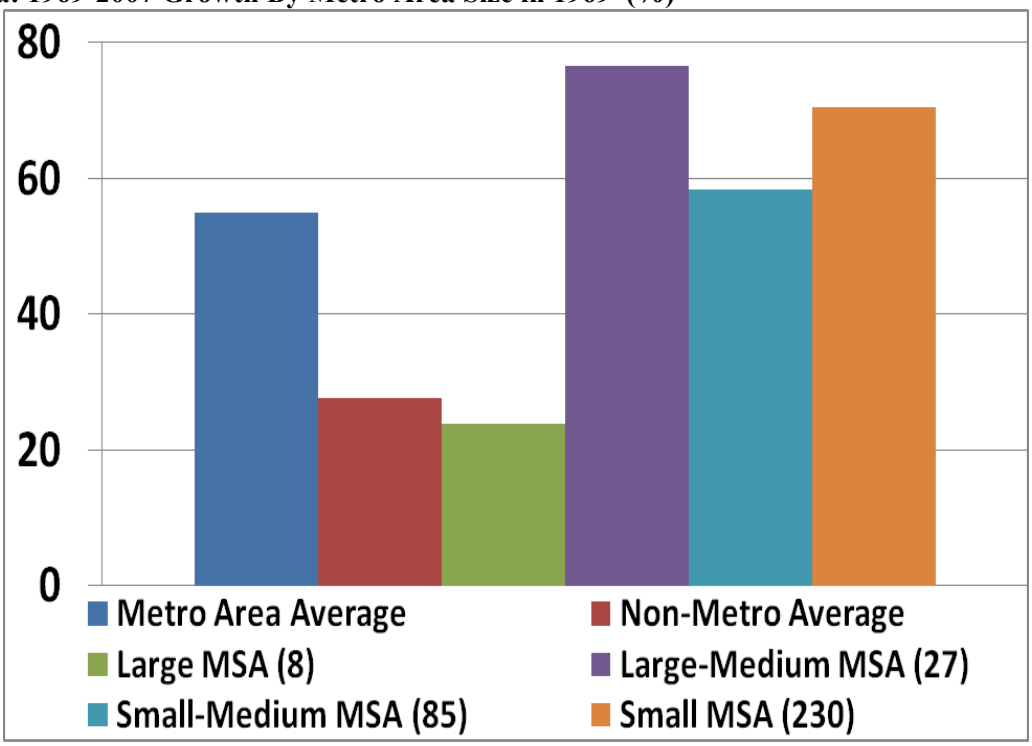
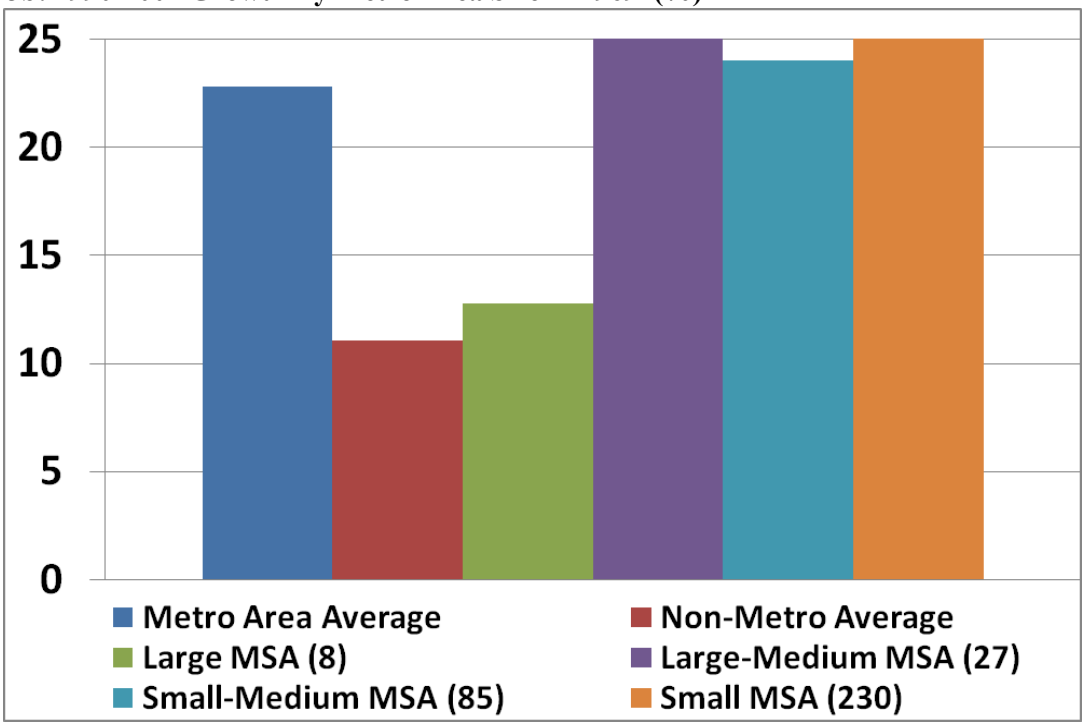
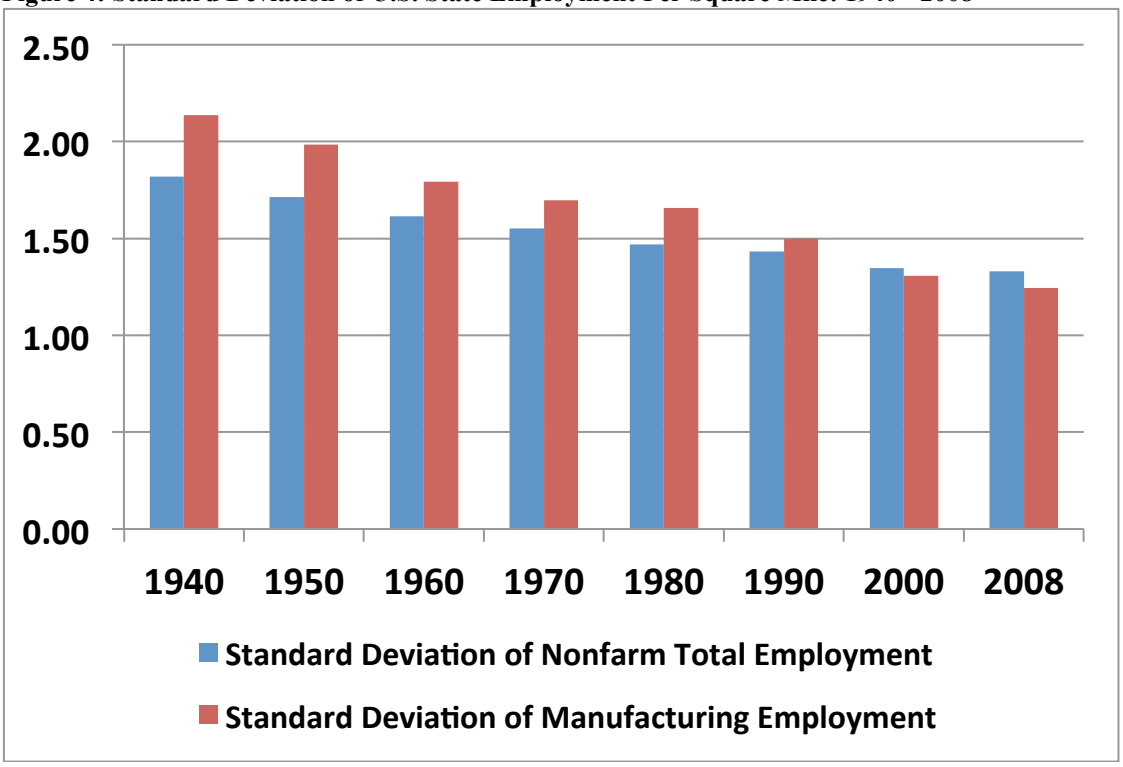


Figure 3b: 1990-2007 Growth By Metro Area Size in 1969 (%)



Notes: Large MSA is > 3 million population in 1969. There are 8 MSAs in this category: New York, Los Angeles, Chicago, Philadelphia, Detroit, Boston, San Francisco and Washington DC. The Large-Medium MSA have a 1969 population of 1 million - 3 million (27 MSAs). The Small-Medium Metro Areas are 250,000 - 1 million 1969 population (85 MSAs). Small MSAs have a 1969 population of 50,000 - 250,000 (230 MSAs). 17 Metros with less than 50,000 in 1969 were omitted due to a small base. These were generally in UT, NV, and FL and grew very rapidly. Big metro growth is dominated by Washington DC's growth. We use 2008 MSA definitions, which makes nonmetro growth appear especially small. Source: U.S. Bureau of Economic Analysis: www.bea.gov.

Figure 4: Standard Deviation of U.S. State Employment Per Square Mile: 1940 - 2008



Notes: The graph reports the standard deviation per square mile in the reported year for nonfarm total employment and manufacturing employment across all states including the District of Columbia and excluding Alaska and Hawaii. For example, a state that had twice the nonfarm employment per square mile of the national average would have a value of 2.

Sources:

1940, 1980, 1990, 2000, 2008 data - www.bls.gov, downloaded March 5, 2010.

1950 data - pg. 176 (1951 - US Census Statistical Abstract). No. 209 - Employees in Non-Agricultural Establishments by State: 1947-1950 (in thousands) & 1953 U.S. Census Statistical Abstract, Table 211--same title as 1952.

1970 data - pg. 218 (1971 - US Census Statistical Abstract). No. 344 - Employees in Non-Agricultural Establishments Annual Averages (in thousands).

1940 Non-Farm Employment and Manufacturing Data for Illinois, Michigan and Minnesota were not on the BLS website. To interpolate, we use the 1950 ratio of nonfarm (or manufacturing employment) as reported in BLS employment survey to the 1950 nonfarm and manufacturing workers in the 1950 Census applied to the 1940 Census number of workers in nonfarm and manufacturing employment. The data was obtained from the 1944 and 1953 U.S. Statistical Abstract.

Figure 5a: 1969-2007 Growth For Representative Metro Type (%)

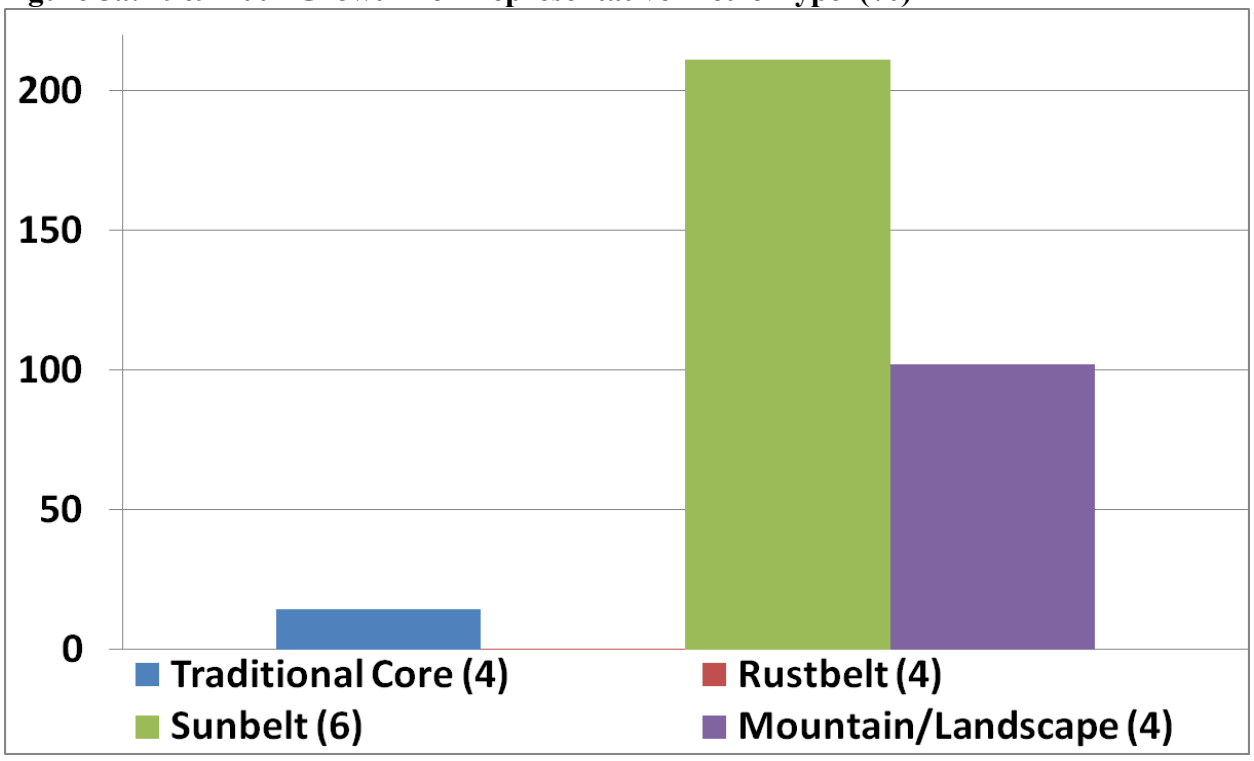
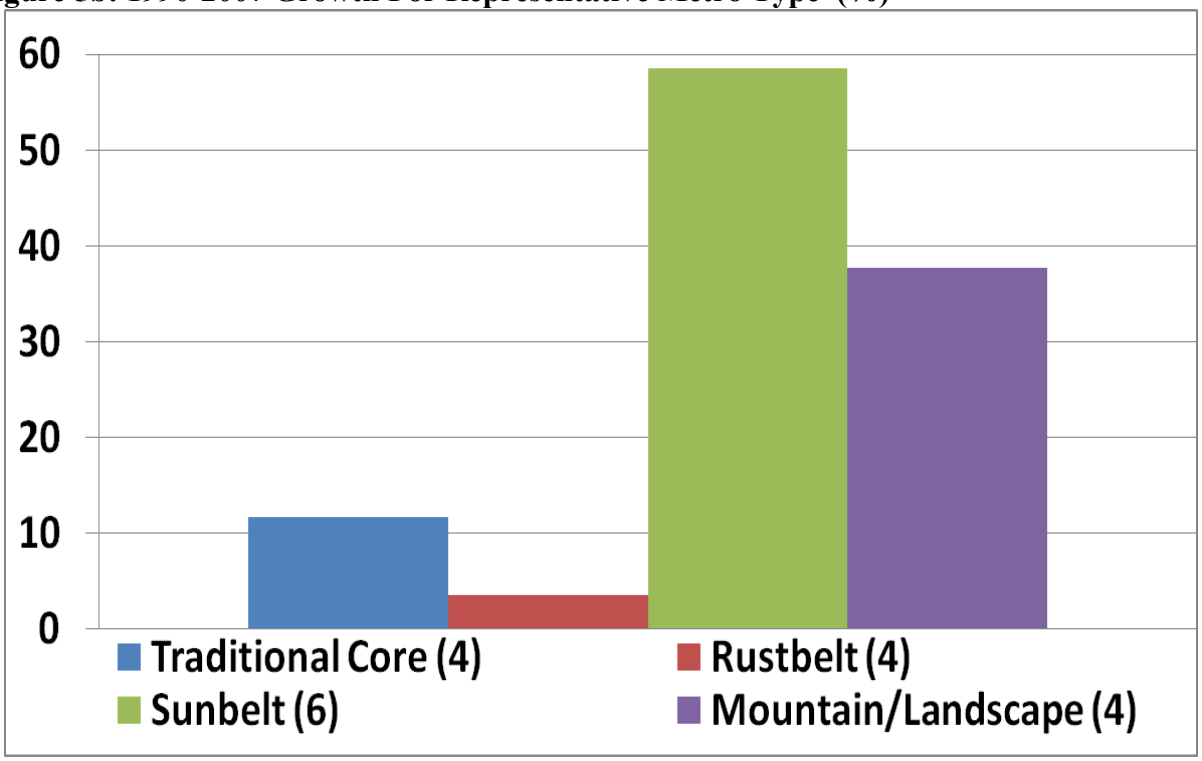
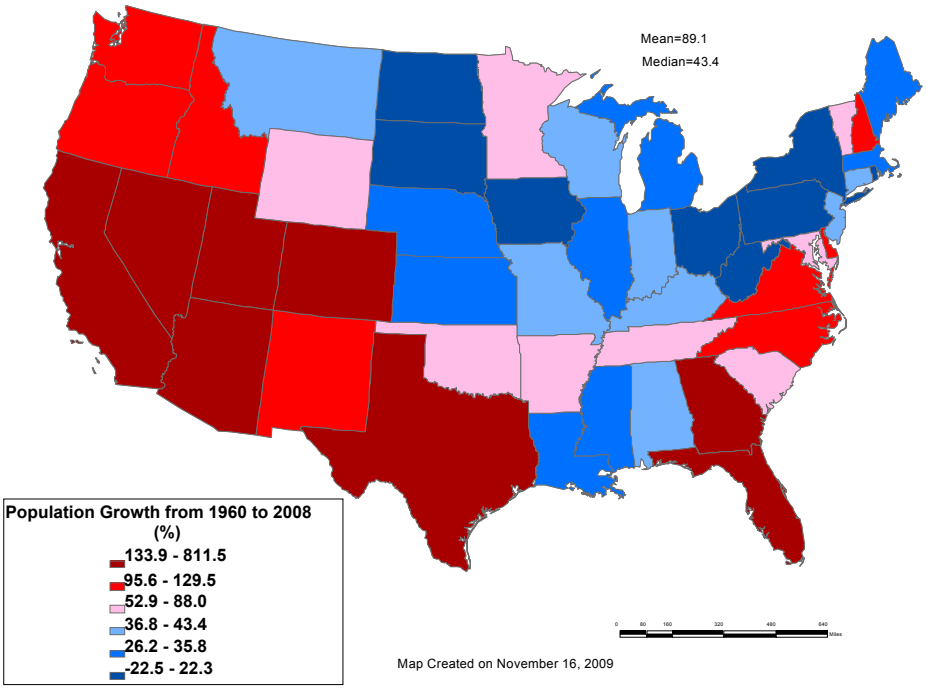


Figure 5b: 1990-2007 Growth For Representative Metro Type (%)



Notes: The Traditional Core includes New York, Boston, Philadelphia and Chicago. The Rustbelt includes Detroit, Cleveland, Pittsburgh and St Louis. Sunbelt includes Miami, Atlanta, Phoenix, Tampa, Orlando and Las Vegas. Mountain/Landscape includes Seattle, Denver, Portland, and Salt Lake. Source: U.S. Bureau of Economic Analysis: www.bea.gov.

Figure 6: U.S. Population Growth by State: 1960-2008.



Source, U.S. Census Bureau.

Figure 7: 1990-2008 Population Growth by County

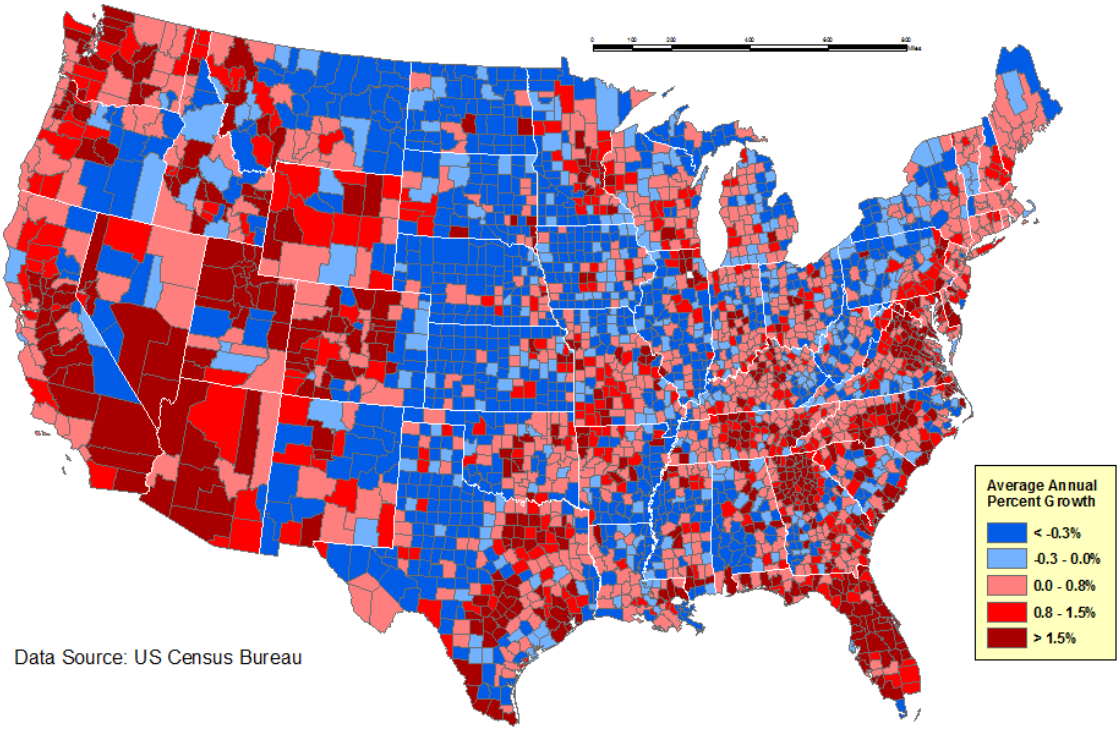


Table 1: Regression Results for 1950-2000 County Population Growth: Selected Variables

Variables\Samples	Non-metro	Small metro	Large metro
Mean pop growth % (std. dev.)	**32.20 (122.93)**	**122.47 (271.64)**	**138.00 (257.38)**
Jan temp (diff Detroit − Orlando)	**-135.58**	**-768.63**	**-731.88**
July temp (diff Detroit − Orlando)	**94.87**	**323.93**	**255.89**
July humidity (diff Detroit − Orlando)	**57.61**	**215.23**	**162.94**
Sunshine hours (diff Detroit−Orlando)	7.69	**-257.88**	**-248.06**
Amenity rank (diff between Detroit (3) and Orlando (5) on a 1-7 amenity scale	**-69.7**	**-153.1**	**-143.1**
Mean 'distance' penalty due to remoteness from urban hierarchy.	**-96.6**	**-99.8**	NA

Note: **Boldface** indicates significant at 10% level. "Small metro" is counties located in MSAs with < 250,000 population and "Large metro" is counties located in MSAs with > 250,000 population, measured in 1990. The difference between Detroit and Orlando uses their actual values. "1 std dev." represents a one-standard deviation change in the variable. Other amenity variables include percent water area, within 50kms of the Great Lakes, within 50kms of the Pacific Ocean, and within 50kms of the Atlantic Ocean, and a 1 to 24 scale of topography—i.e., from coastal plain to extreme mountainous. The models were then re-estimated with USDA Economic Research Service amenity rank replacing all 9 individual climate/amenity variables to calculate the amenity rank effects (available online at USDA ERS). The amenity scale is 1=lowest; 7=highest. Most of the regression results reported here were not reported in Partridge et al. (2008). For more details of the regression specification, see Partridge et al. (2008b).