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Wages, Rent, Unemployment and Amenities

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Abstract. The intent of this applied research project is to build on the Roback-Blanchflower-Oswald model linking rent, wages and unemployment to amenities. Using non-metropolitan county level US data and detailed measures of natural and built amenities I estimate a structural model testing for trade-offs between rent, wages, unemployment and amenities. Results do not strictly confirm the Roback-Blanchflower-Oswald (RBO) model but there is sufficient evidence to suggest that amenities plays an important role in explaining observed levels rent, wages and unemployment.

1. Introduction

It has been widely argued that rural areas, along with inner cities, tend to lag behind the rest of the U.S. in terms of job growth, earnings and general economic well-being (Jensen and McLaighlin, 1995; Mazie and Killan, 1991; Sofranko, 1991; Sofranko and Samy, 2003; Stabler, 1999). Some have argued that the much acclaimed rural turn-around of the 1970s was but a simple slowing of the long-term decline of rural America (Lasley et.al., 1995). Davidson (1990) has even compared the long-term economic viability of much of rural America to the Great Depression. Weber and his colleagues (2005) argue that high and persistent poverty counties are disproportionately found in rural areas.

Several hypotheses have been advanced to explain why rural America remains at risk. These range from the lack of adequate scale to capture agglomeration economies (Stabler, 1999) to asset fixity in a spatial sense (Hite, 1999) to lower opportunities in rural areas that lead to lower wages and higher unemployment (Deller and Harris, 1993) to fundamental structural shifts in the economy that favor urban areas (Mazie and Killan, 1991). Indeed, the "New Economic Geography" has delineated a theoretical foundation predicting the decline of rural in favor of urban (Fujita, Krugman and Venables, 1999). In this latter view of the world rural is reduced to agriculture and the extraction of natural resources needed to support cities. Clearly, these are not exhaustive, and all play some role in explaining the general stagnation and decline of rural areas.

But more current writers have suggested that there are really two rural Americas: a depressed rural America that is still dependent upon traditional extractive industries such as mining and agriculture which fits the prediction of the New Economic Geography, and a growing rural America that is within commuting distance to larger growing cities (Lasley and Hanson, 2003). There are really three characteristics of rural America including those just described and areas that can be described as rich with natural, cultural and historic amenities. It is now becoming widely accepted that amenities, broadly defined, are playing now and will play a more important role in rural economic growth and development (Nelson, 1997; Jepson et al., 1998; Johnson and Beale, 1998; McGranahan, 1999; Rudzitis, 1999; Dissart and Deller, 2000; Deller et.al., 2001; Green, 2001; Marcouiller, Clendenning and Kedzior, 2002; Deller and Lledo, 2007; Deller, Lledo and Marcouiller, 2008).

Unfortunately, much of the current thinking on how amenities are related to economic performance is based on empirical evidence with little if any theoretical foundations (Power, 1996, 2005; Marcouiller, 1998; Marcouiller and Clendenning, 2005). The analysis presented in this study is intended to offer one potential theoretical framework to help think about amenities and economic structure in rural areas. I do this by building on the work of Roback (1982 and 1988) and

Blanchflower and Oswald (1994 and 1995). Roback argues that people living in high amenity areas are willing to accept lower wages and pay higher rents. Blanchflower and Oswald extend this argument to include unemployment and suggest that people living in high amenity areas will be willing to accept higher levels of unemployment. What the Roback-Blanchflower-Oswald (RBO) model offers is a theoretical microeconomic foundation for how amenities fit into regional economic structure.

If the RBO framework is correct it has powerful ramifications on the arguments of rural advocates. For example, the elegant arguments of Stabler (1999) may be misdirected because in the presence of amenities (both positive and negative) comparisons of income, poverty levels and unemployment rates will lead to incorrect conclusions. The RBO approach argues that a regional economic system can be in equilibrium where wages, rents and unemployment rates do not converge to a system-wide average.

Beyond these introductory comments the study is composed of five additional sections. In the next section I outline the logic of the RBO model employing a graphical summary. I then present the empirical model to be estimated followed by a discussion of my amenity measures. The empirical results are presented and the study concludes with a summary of results along with a discussion of policy implications and additional theoretical and empirical issues to be addressed.

2. A Theoretical framework

By mapping wages, rents and unemployment into a four quadrant figure I follow the logic of the Roback-Blanchflower-Osward (RBO) theory relating amenities to economic well-being. The RBO approach is rooted on traditional hedonic pricing analysis where amenities are capitalized in land rents and wages, but with the presence of unemployment in the labor market. People and firms are free to locate on the economic landscape in a manner that maximizes utility and profits, respectively. This spatial allocation process can be traced through wages and rents and, in the presence of unemployment programs, the unemployment rate.

In the upper-right-hand quadrant (Figure 1) we see the Roback hypothesis outlining the inverse relationship that is expected between rent and wages in the presence of amenities. Regions offer, in equilibrium, wages and rents that exactly offset their natural advantages. Roback assumes that a representative firm is a profit-maximizing price-taker facing constant returns to scale technology. Inputs into the production process are labor and land. The firm's profits are a decreasing function of wages and land rents and worker's utility is an increasing function of wages and a decreasing function of rent. Given free mobility the region must provide firms and workers with the going market level of profit and utility. In other words, in equilibrium profits and utility levels must be identical across all regions regardless of the distribution of amenities.

The unique wage-rent combination that satisfies this equilibrium is given by the intersection of a downward sloping firm isoprofit contour with an upward sloping worker indifference curve in wage-rent space. Because amenities enter directly into the isoprofits and indifference contours, regions with different amenities will yield different equilibrium wage and land rent levels. In the labor market it is clear: workers are willing to accept lower wages and pay higher rents to live in high amenity areas.

The firm side is unfortunately not as clear. Since disamenities harm both workers and firms, the value of land should always increase with an increase in amenities. This occurs because both workers and firms are willing to pay higher land prices to enjoy living in a high amenity area. The change in wage depends on the shape of the indifference curves for workers and isocost curves for firms. Workers will accept lower wages to enjoy a higher level of amenity but firms will also be willing to pay higher wages. For firms, if they view the amenity as unproductive, increase in the amenity may raise land value thus having the possible negative effect on the firm's choice of location. To compensate the firm for higher land rents, wages must be reduced. Thus firms in an area with high levels of unproductive amenities will offer lower wages than in an area with low levels of these same amenities. The net change in wages depends on which effect is stronger, and the effect may vary across different types of amenities. In the end Roback suggests that the trade-off reduces to an empirical question.

The Roback approach has been used in a wide range of studies that have attempted to quantify quality of life (Berger and Blomquist, 1988; Giannis, 1997; Gyourko and Tracy, 1991; Hoehn et al., 1997; and Stover and Leven, 1992). Specifically, studies have used the Roback approach to rank the quality of life in largest U.S. cities (Blomquist et al., 1988), cities in Southern Ontario (Giannis, 1996) and to compare rural and urban areas in the U.S. (Ottem and Deller, 2000). These studies, however, have been aimed at applying the Roback approach as opposed to providing rigorous tests of the underlying theoretical principals.

Blanchflower and Oswald build on Roback by explicitly incorporating Smith's (1985) notion of compensating differentials in the presence of unemployment. This relationship is seen in the upper-left-hand quadrant of Figure 1. The free mobility of labor and firms underpins the wage-rent trade-off identified by Roback. If migration is costly, however, firms and workers are likely to view the decision to migrate as an investment. Agents will be inclined to base the decision to migrate on expected or permanent returns and costs. Blanchflower and Oswald accomplished this expansion of the theoretical construct by allowing workers to maximize utility by either working and earning a wage or becoming unemployed and collecting unemployment and participating in other public and/or private support programs. By explicitly introducing unemployment as an option for workers the notion of a wage-unemployment trade-off is captured.

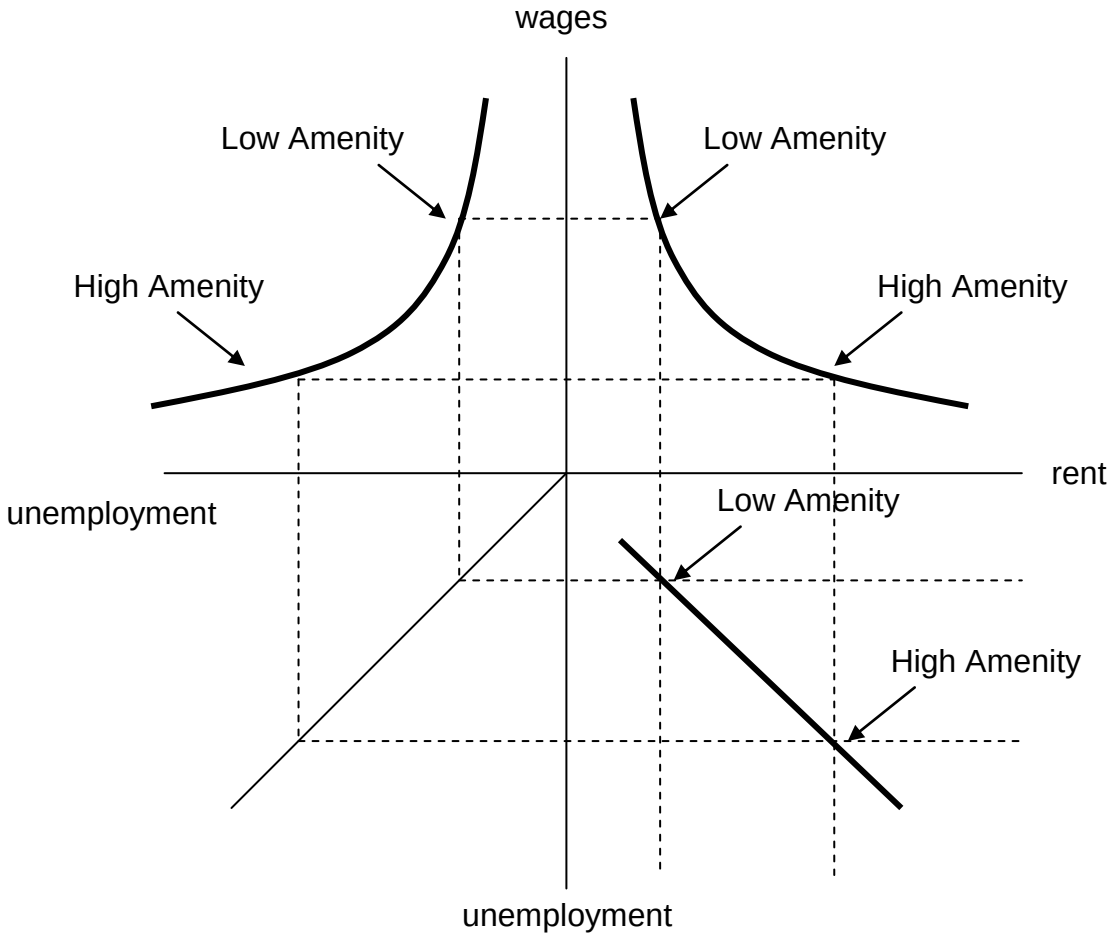

Figure 1. An expanded wage curve analysis

Blanchflower and Oswald advance two key concepts that are directly related to the amenity, growth and development research. First, regions have different equilibrium levels of wages and unemployment levels, and high amenity regions have lower wages. This proposition is intuitive and is consistent with Roback. If a worker places high values on consuming amenities, such as climate or nature-based recreational activities, the decision to remain in a high amenity area and become unemployed is perfectly rational. Second, there is a negatively sloped function (i.e., wage curve) linking wages and unemployment. As depicted in Figure 1, the Roback result is extended to allow for unemployment as an option for the worker.

The logic is straightforward. From Roback I have the result that high amenity regions will tend to pay lower wages. Conversely, low amenity areas will have to pay higher wages to compensate workers for living in a low amenity region. If migration is costly workers in high amenity areas are looking at a trade-off between working for low wages and remaining in the area collecting unemployment, but continuing to consume the amenity. For low amenity regions the gap between high wages and minimal income from

support programs should be sufficiently large to discourage unemployment as an option.

To test their theoretically derived relationship between wages and unemployment rates Blanchflower and Oswald use national survey data from 16 countries to estimate a number of wage curve specifications. They conclude that the consistency of their empirical results supports the existence of the wage curve. The "empirical law" can be expressed as $\ln W = -.1\ln U + e$ where $\ln W$ is the natural log of wage and $\ln U$ is the natural log of the unemployment rate Given this empirical result on the *unemployment elasticity of pay* Blanchflower and Oswald conclude that a one unit decrease in the unemployment rate will result in a ten percent increase in wages.

The wage curve offered by Blanchflower and Oswald has garnered significant attention in the labor literature (Card, 1995) and is only now finding its way into the regional economics and economic development literature. Beyond Blanchflower and Oswald's own empirical work which is extensive, the wage curve has been uncovered in Japan (Montgomery, 1993), India (Bhalorta, 1993), Sweden (Edin, Holmlund and Ostros, 1994), the Netherlands (Groot, Mekkelholt and Oosterbeek, 1992), Germany (Wagner, 1994; Baltagi and Blien, 1998), Austria (Winter-Ebmer, 1996), the United Kingdom (Collier, 2000; Bell, Nickell and Quintini, 2002), the United States (Bartik, 2000; Deller and Tsai, (1998), Turkey (Ilkaracan and Selim, 2002), Chile (Berg and Contreras, 2002) and Norway (Johansen, 2002). Indeed, Nijkamp and Poot (2005) provide a detailed meta analysis of a sample of 208 separate wage curve elasticities and find remarkable consistencies within the literature.

There is a competing view on the wage-unemployment trade-off that is best captured by the early theoretical work of Harris and Todaro (1970) and empirical work of Hall (1970, 1972). What has become known as the Harris-Todaro model argues that regions with high wages will also experience high unemployment. In the simplest view unemployment is traditionally the result of prevailing wages higher than the equilibrium wage: regions with higher wages will see more people willing to work than there are jobs available and unemployment is the result. Harris-Todaro also uses the notion of compensating differentials and maintains that regions with higher unemployment are less desirable and in order to keep people in the area employers must pay higher wages. There are empirical studies that challenge the conclusion of the wage curve, including Albaek, et al. (1999) using Nordic data, Lucifora and Origo (1999) using Italian data, and Partridge and Rickman (1997) using U.S. data. But Nijkamp and Poot (2005) conclude that these latter studies represent a small minority of the large empirical literature.

I complete the relationship between wages, rent and unemployment by projecting the upper two quadrants into the lower-right-hand quadrant by using the identity in quadrant three. Here we see that low amenity areas could be characterized as having low rents and unemployment levels, but high amenity areas will have high rents and high levels of unemployment. While this latter relationship has not been empirically tested it provides a complete picture that is rooted on solid microeconomic foundations of individuals and firms.

3. Methods and Data

In order to estimate the theoretical structure outlined in Figure 1 I specify a simple three equation simultaneous model:

$$\ln W = \beta_{WR}\ln R + \beta_{WU}\ln U + \Sigma\alpha_W X^W + \Sigma\delta_W A + \varepsilon_W \quad (1a)$$

$$\ln R = \beta_{RW}\ln W + \beta_{RU}\ln U + \Sigma\alpha_R X^R + \Sigma\delta_R A + \varepsilon_R \quad (2a)$$

$$\ln U = \beta_{UW}\ln W + \beta_{UR}\ln R + \Sigma\alpha_U X^U + \Sigma\delta_U A + \varepsilon_U \quad (3a)$$

where $W \equiv$ Wages;
$R \equiv$ Rent;
$U \equiv$ Unemployment
$X^i \equiv$ Set of control variables for i= W, R, U;
$A \equiv$ Set of amenity variables

and ε is a set of error terms. Given the simultaneous nature of the model three stage least squares is used to estimate the model. To ensure that the model is properly identified at least two control variables contained in X must be removed (hence $X^W \neq X^R \neq X^U$). To determine which control variables to remove, a reduced form of each of the three equations is estimated. Those control variables that have the lowest level of significance in each of the reduced formed equations is removed from the set of controls.

Based on the logic of the RBO model I expect to find the following results:

$$\beta_{WR} < 0; \quad \beta_{WU} < 0; \quad \delta_W < 0; \quad (1b)$$

$$\beta_{RW} < 0; \quad \beta_{RU} > 0; \quad \delta_R > 0; \quad (2b)$$

$$\beta_{UW} < 0; \quad \beta_{UR} > 0; \quad \delta_U > 0. \quad (3b)$$

Note that I do not express any prior expectations on the set of control variables (X). Still, the estimated coefficients on the control variables should be consistent with theory. For example, higher levels of education should have a positive influence on wages and

higher levels of poverty should be associated with higher levels of unemployment.

The data used to estimate the model is drawn from the NORSIS (National Outdoor Recreation Statistical Information System) compiled by the USDA Forest Service, which contains a wide range of data on outdoor recreational facilities, natural resources and cultural/historical attraction, among other variables, opening a wide range of research possibilities. As an outflow of the 1998 Resource Planning Act, the Forest Service maintains an extensive county-level data set documenting facilities and resources that support outdoor recreation activities. Many of these same resources are precisely the amenities that contribute to overall regional quality of life. The NORSIS data set contains over three hundred separate variables ranging from population density and the proportion of county acres in cropland, forest, pasture/range-land, mountains and water surface, to employment and income levels in recreational industries, and to the number of public libraries. The NORSIS data set is complemented with employment and income data from BEA-REIS and other socioeconomic data from the Census. The data reflect the year 1990 and is at the county level. Finally, I use only non-metropolitan counties in the analysis.

A potential problem with the data is related to the county as the unit of analysis. Some amenity attributes, such as a museum and/or historical sites, are specific to one spatial location while other natural amenities, such as a forest or ecosystem, cover large regions. Further complicating the issue is the range of influence of the attribute under consideration. For example the Art Institute of Chicago has a much larger geographic draw than does the Elvehjem Museum in Madison, Wisconsin. Unfortunately, the data available for this research is reported at the municipal and/or county level. The issue has two elements: what is the relevant unit of analysis, and should location specific amenities such as golf courses be grouped together and compared to regional amenities such as a national forest? For the analysis reported here the problem is acknowledged, and future work needs to focus on the spatial dimension of amenities.

Within the literature the empirical representation of amenity attributes has tended to be single dimensional, simplistic and to a large extent *ad hoc* (Gottlieb 1994). One of the two methods proposed here builds on the work of Wagner and Deller (1998), English, Marcouiller and Cordell (2000), Deller et al. (2001), Goe and Green (2005), and Gunderson and Ng (2006), among others. The approach we adopt was advanced by Miller (1976), who suggested that blocks of variables describing a particular attribute can be condensed into a single scalar measure that captures the information contained in the original data. More recently, Henry, Barkley and Bao (1997) compressed several blocks of variables into single regressor components to isolate the influence of local quality of life attributes on the spread effects of metropolitan growth on surrounding rural areas. Wagner and Deller (1998) use principal component analysis to compress 29 separate variables into five broad indicators of regional economic structure that are then used as controls in a study of the influence of economic diversity on regional economic performance.

Principal component analysis is a method of compressing a set of related variables into a single scalar measure. These measures are, in essence, linear combinations of the original variables where the linear weights are the eigenvectors of the correlation matrix among the set of factor variables. Each factor is constructed orthogonal to the others. In other words, principal component is a mechanical method of inspecting the sample data for directions of variability and using this information to reduce a collection of variables into a single measure. Ideally, the final measure captures the essence of the original collection of variables. While the pros and cons of principal component analysis are well known, and a range of alternative approaches are available, we suggest that the approach used here moves the literature forward.

To build my amenity measures I use the NORSIS data set developed and maintained by the Forest Service's Southern Research Station. A total of 59 separate variables are compressed into nine amenity indices including measures to describe camping opportunities in the county, clubs such as golf courses and tennis clubs, coastal characteristics, climate, tourism opportunities broadly considered, water characteristics associated with rivers, terrain of the county, the presence of tour operators and, finally, a measure to capture skiing opportunities. The results of these measures are presented in Tables 1 through 9.

Rather than provide a thorough discussion of each principal components derived measure, clearly a tedious task for obvious reasons, consider the climate index (Table 4). There are a total of seven individual variables that are combined into a single climate index. These measures range from average hours of sunlight in the month of January and average July humidity to average annual snowfall. Based on the values of the eigenvector, counties that tend to have higher overall temperatures and January temperature in particular and little if any snowfall tend to score higher on this amenity index. In contrast, colder counties that experience significant snowfall tend to score

lower on this index. A review of each of the measures suggests that there are no apparent inconsistencies within each measure nor are there any results that would cast doubt on the robustness of the measures.

Table 1. Principal Component Eigenvectors: Campgrounds

Campground Variables	Eigenvector
Number of campgrounds with more than 5 employees (ABI)	0.3345
Number of campgrounds with fewer than 5 employees (ABI)	0.3462
Number of campgrounds with more than $500,000 in sales (ABI)	0.3201
Number of campgrounds with less than $500,000 in sales (ABI)	0.3538
Number of private campgrounds (ABI)	0.3665
Number of private campgrounds (WOODALLS)	0.3507
Number of private campground sites (WOODALLS)	0.3206
USDA-FS campground acres (1987)	0.1789
USDA-FS number of campgrounds (1987)	0.1947
USDA-FS number of tent sites (1987)	0.2009
USDA-FS number of trailer sites (1987)	0.1901
State park number of campsites	0.1569
State park with primitive camping available	0.0976

Table 2. Principal Component Eigenvectors: Clubs

Country Club Variables	Eigenvector
Number of private golf courses (ABI)	0.4462
Number of public golf courses (ABI)	0.4789
Number of golf practice ranges (ABI)	0.4722
Number of private tennis courts (ABI)	0.4535
Number of public tennis courts (ABI)	0.3779

Table 3. Principal Component Eigenvectors: Coastal

Coastal Variables	Eigenvector
NRI Bay, Gulf, or Estuary >= 40 acres (%)	0.4623
ln(water area)	0.3746
NORSIS87 1 if coastal county, 0 otherwise	0.3776
Percent of surface area covered by water	0.4254
NRI water acres	0.3831
NRI water body >= 40 acres as an estuary	0.4190

Table 4. Principal Component Eigenvectors: Climate

Climate Variables	Eigenvector
Average hours January sunlight	0.2090
Average January temperature	0.4306
Average July humidity	0.1559
NORSIS87 average temperature	0.4592
Average July temperature	0.4192
NORSIS87 average annual snowfall	-0.4230
NORSIS87 1 if snow country <16 in./yr, 0 otherwise	-0.4255

Table 5. Principal Component Eigenvectors: Tourism

Tourism Variables	Eigenvector
ABI Number of amusement /entertainment tourist attractions	0.4678
ABI Number of historic /cultural tourist attractions	0.5363
ABI Number of natural res. tourist attractions	0.4733
ABI Number of museums	0.5192

Table 6. Principal Component Eigenvectors: Rivers

River Variables	Eigenvector
NRI river miles with fish value	0.3884
NRI Total river miles, outstanding value	0.4117
NRI river miles with recreational value	0.3985
NRI river miles with elig. class Scenic	0.3123
NRI river miles with scenic value	0.4150
NRI river miles with elig. class Wild	0.3225
NRI river miles with wildlife value	0.3835

Table 7. Principal Component Eigenvectors: Land

Land Variables	Eigenvector
USDA-FS miles road open to public (1987)	0.4226
NWPS acreage: Total 1993	0.4338
NWPS acreage: USDA-FS 1993	0.4643
USDA-FS National Forest acres	0.4879
Bailey: Acres of mountains	0.4239

Table 8. Principal Component Eigenvectors: Tour Operators

Tour Variables	Eigenvector
Tour & sightseeing operators per 1Kpop	0.1489
ABI Number of tour operators with fewer than 5 employees	0.5751
ABI Number of tour operators with 5-9 employees	0.5756
ABI Number of tour operators with 10 or more employees	0.5620

Table 9. Principal Component Eigenvectors: Skiing

Skiing Variables	Eigenvector
ABI Number of ski equipment rental firms	0.3136
ISS Skiable acreage	0.3674
ISS Skiable acreage (%)	0.3253
ISS Number of destination resorts	0.3226
ISS Average top elevation at the highest lift	0.3249
ISS Number of downhill skiing areas	0.3028
ISS Number of publicly owned ski resorts	0.3187
ISS Average vertical drop at ski areas	0.3452
ISS Total vertical transfer feet (mm)	0.3726

4. Data Analysis

Two sets of the RBO model are presented: with and without the amenity measures. I do this to see if the results are sensitive to the explicit inclusion of amenities. The results of the non-amenity augmented RBO model are provided in Table 10 and the amenity augmented results are in Table 11. Consider first the selected set of control variables for non-amenity augmented models.

The density of access to health care measured by number of doctors per 100,000 persons appears to positively influence both wages and rent and has a weak negative association with unemployment. Dependency on the property tax for tax revenues does not appear to influence wages, rents or unemployment. This simple result suggests that the policy of cutting property taxes in the name of economic performance may be misplaced. Crime rates have a positive influence on the unemployment rate, and the poverty rate is

associated with lower rents and higher unemployment rates as expected. The percent of the population non-white is positively associated with rents, while the percent of the population over age 65 has a dampening effect on rents. Percent of the population under age 18 has a positive influence on wages, which is somewhat surprising and plays no role in understanding rent. Education levels, measured by percent of the population over age 25 with at least a high school degree, is positively associated with wages, as expected, but is insignificant in the unemployment equation.

Table 10. Non-Amenty Argmented Simultaneous Model Results			
	Ln_Wage	Ln_Rent	Ln_Unemployment
Ln_unemployment	-0.1079	0.6122	---
	(3.71)	(5.81)	
Ln_rent	0.6750	---	1.1102
	(11.56)		(11.50)
Ln_wage	---	0.0690	-0.3347
		(0.66)	(3.11)
Physicians (active non-fed)/100K population	0.0013	0.0004	-0.0002
	(17.88)	(1.90)	(1.19)
Property taxes as a percent of total tax revenue	-0.0003	0.0002	0.0002
	(0.82)	(0.86)	(0.56)
Crimes per 1K persons	---	---	0.0014
			(2.83)
Percent of persons living under the poverty level	---	-0.0370	0.0489
		(5.80)	(24.22)
Percent of the population non-white	---	0.0011	---
		(2.02)	
Percent of the population over 65	---	-0.0073	---
		(3.05)	
Percent of population under 18	0.0175	-0.0026	---
	(9.02)	(0.85)	
Education 1990: Percent over 25 with at least a high school education	0.0054	---	0.0014
	(4.98)		(1.02)
Percent civilian employed in F.I.RE.	-0.0441	0.0448	-0.0607
	(8.46)	(15.85)	(8.46)
Percent civilian employed in wholesale/retail trd	-0.0106	-0.0085	0.0142
	(4.71)	(2.42)	(5.11)
Percent civilian employed in health services	-0.0137	-0.0218	0.0261
	(4.69)	(4.06)	(6.32)
Percent civilian employed in manufacturing	-0.0027	-0.0077	0.0099
	(3.96)	(4.16)	(10.70)
Intercept	6.0026	4.9521	-2.5595
	(19.87)	(4.90)	(2.48)
Number in parentheses is the absolute value of the t-statistic.			

The four measures of economic structure are all statistically significant in each of the wage, rent and unemployment equations. Percent of the civilian employment in finance, insurance and real estate (F.I.R.E.) is negatively associated with wages and unemployment but positively associated with rents. The share of employment in wholesale and retail trade is associated with lower wages and rents and higher levels of unemployment, which is as expected. Surprisingly, the share of employment in health care follows the same pattern as wholesale and retail trade. I suspect that once doctors are accounted for separately, the share of civilian employment in health care is capturing the wide range of lower paying service providers such as hospital food service workers and nursing aides. Also somewhat surprisingly, higher dependency on manufacturing for employment is associated with lower wages and rents and higher unemployment rates. This result hints at the changing role of manufacturing in the rural economy. Traditionally viewed as a source of well-paying jobs, rural-based manufacturing is facing increased competition from lower cost overseas manufacturers.

Of more interest to this analysis are the hypotheses outlined in equations (1b-3b). Consider first the structural relationships outlined in Figure 1. All but one (β_{RW}) of the six structural parameters are statistically significant, but the signs of the estimated coefficients are not completely consistent with the theory. In equations (1c-3c) the hypothesized relationship is reported along with the estimated coefficient:

$\beta_{WR} < 0$ (0.6750); $\beta_{WU} < 0$ (-0.1079) (1c)

$\beta_{RW} < 0$ (0.0690); $\beta_{RU} > 0$ (0.6122) (2c)

$\beta_{UW} < 0$ (-0.4437); $\beta_{UR} > 0$ (1.1102) (3c)

First, I expect wages to be inversely related to rent ($\beta_{WR} < 0$ and $\beta_{RW} < 0$), but the data support a positive and significant relationship in the rent on wages equation and a statistically insignificant relationship in the wages on rent equation. This result is inconsistent with the relationship outlined by Roback, but recall there is uncertainty in how firms will trade-off between wages and rents in the presence of amenities. Roback concludes that it is an empirical question. Second, I expect to find wages to be inversely related to unemployment ($\beta_{WU} < 0$ and $\beta_{UW} < 0$), and the data supports this hypothesis. Third, I would expect to find rent directly related to unemployment ($\beta_{RU} > 0$ and $\beta_{UR} > 0$) and again the data supports a positive and significant relationship. Returning to Figure 1, the data supports the relationship outlined in the upper-left and lower right quadrants, but rejects the relationship predicted in the upper-right quadrant. On face value, there is some, but not conclusive, support for the RBO model.

The second set of results presented in Table 11 introduces my specific amenity measures into the core model. In the construction of the theoretical framework amenities are implicit in the wage-rent-unemployment trade-off. By explicitly introducing amenities into the model we can test to see if the theoretical trade-off is stable and directly assess the influence of different types of amenities on wages, rent and unemployment. Consider first the control variables, then the structural parameters, and then the performance of the individual amenity measures.

In terms of the control variables, the results tend be consistent between the amenity and non-amenity augmented models but the t-statistics tend to improve with the amenity augmented models. The number of physicians per 100,000 persons remains positively associated with wages and the negative association with unemployment becomes stronger from a statistical perspective. The relationship with rent, however, flips direction: in the non-amenity model the relationship between doctors and rent is positive but in the amenity augmented model the relationship becomes negative. Property taxes as a share of total tax revenue is insignificant in the non-amenity models but in the amenity model higher property taxes are weakly associated with lower wages but positively associated with rents and lower unemployment rates. These results combined with the non-amenity models again suggest that the policy of lowering property taxes in the name of economic performance may be misdirected.

The percent of the population non-white remains positively related to rents but the significance level declines in the amenity augmented model and percent of the population under age 18 is still negatively associated with rent but the statistical significance level increases. Percent of the population over age 25 with at least a high school degree goes from a positive but statistically insignificant relationship with unemployment to a negative and significant relationship. The latter result is consistent with expectations. The results on the economic structure variables are fairly consistent across the two sets of results. In the rent equation, however, the share of employment in wholesale and retail trade as well as health care service become statistically insignificant.

Turning attention next to the parameters of interest to this analysis outlined in equations (1b-3b), all six of the structural parameters are statistically significant but the signs of the estimated coefficients are consistent with the non-amenity augmented results. In equations (1d-3d) the hypothesized relationship is reported along with the estimated coefficient:

$$\beta_{WR} < 0 \ (0.6307); \quad \beta_{WU} < 0 \ (-0.1021); \tag{1d}$$

$$\beta_{RW} < 0 \ (0.4654); \quad \beta_{RU} > 0 \ (0.2592); \tag{2d}$$

$$\beta_{UW} < 0 \ (-0.2483); \quad \beta_{UR} > 0 \ (1.1974). \tag{3d}$$

Other than the increase in statistical significance of wages on rent, the results are remarkably similar between the amenity augmented and non-amenity models. Again using Figure 1 the data supports the relationship outlined in the upper-left and lower right quadrant, but rejects the relationship predicted in the upper-right quadrant.

But there is additional information to be drawn from the estimated models reported in Table 11, specifically the estimated coefficients on the amenity indices themselves. First, I expect amenities to have a negative impact on wages ($\delta_W < 0$). Of the nine amenity indices six are statistically significant at the 90 percent level of confidence or higher, and four of those six have a negative impact on wages. These include the camping, coastal, climate and river indices. The club index, which is composed mostly of golf courses and tennis clubs, and the tours index, which captures the number of tour operators, have a positive impact on wages.

Second I expect to find amenities to have a positive impact on rents ($\delta_R > 0$). Seven of the nine amenity indices are statistically significant, and four of those seven have a positive coefficient, including the camping, coastal, climate and river indices. But three of the seven statistically significant amenity coefficients are negative, including the broad tourism index, the land index and the tours index.

Finally, I expect to find amenities to have a positive impact on unemployment ($\delta_U > 0$). Only three of the

nine amenity coefficients are statistically significant at any reasonable level of significance, and of those three only the land amenity index has the expected positive coefficient. The climate and ski indices have negative effects on unemployment rates.

Table 11. Amenty Argmented Simultaneous Model Results			
	Ln_Wage	Ln_Rent	Ln_Unemployment
Ln_unemployment	-0.1021	0.2592	--
	(3.52)	(5.74)	
Ln_rent	0.6307	--	1.1974
	(10.37)		(12.80)
Ln_wage	--	0.4654	-0.2483
		(9.33)	(2.37)
Physicians (active non-fed)/100K population	0.0013	-0.0003	-0.0005
	(16.91)	(3.26)	(3.09)
Property taxes as a percent of total tax revenue	-0.0005	0.0009	-0.0014
	(1.25)	(4.24)	(3.11)
Crimes per 1K persons	--	--	0.0018
			(3.61)
Percent of persons living under the poverty level	--	-0.0172	0.0506
		(6.04)	(26.67)
Percent of the population non-white	--	0.0003	--
		(1.35)	
Percent of the population over 65	--	-0.0111	--
		(9.72)	
Percent of population under 18	0.0177	-0.0126	--
	(9.18)	(7.79)	
Education 1990: Percent over 25 with at least a high school educat	0.0056	--	-0.0079
	(4.39)		(5.67)
Percent civilian employed in F.I.RE.	-0.0526	0.0440	-0.0407
	(10.29)	(15.91)	(5.30)
Percent civilian employed in wholesale/retail trd	-0.0063	0.0010	0.0130
	(2.94)	(0.68)	(5.28)
Percent civilian employed in health services	-0.0158	-0.0019	0.0300
	(5.50)	(0.71)	(7.40)
Percent civilian employed in manufacturing	-0.0030	-0.0019	0.0098
	(4.42)	(2.07)	(10.34)
Camp Index	-0.0201	0.0152	0.0009
	(6.48)	(7.53)	(0.23)
Club Index	0.0276	-0.0017	-0.0095
	(5.89)	(0.57)	(1.61)
Shore Index	-0.0140	0.0119	0.0051
	(3.84)	(4.92)	(1.21)
Climate Index	-0.0071	0.0211	-0.0635
	(1.76)	(9.45)	(14.98)
Tourism Index	0.0042	-0.0058	0.0012
	(1.00)	(2.81)	(0.27)
River Index	-0.0097	0.0053	-0.0023
	(3.19)	(3.37)	(0.68)
Land Index	0.0016	-0.0071	0.0245
	(0.41)	(3.35)	(6.10)
pctours	0.0123	-0.0089	0.0069
	(2.70)	(3.94)	(1.40)
Ski Index	-0.0006	0.0018	-0.0069
	(0.25)	(1.39)	(2.51)
Intercept	6.2241	1.1640	-3.2561
	(19.42)	(2.36)	(3.30)
Number in parentheses is the absolute value of the t-statistic.			

The results for RBO model are mixed on the one hand but encouraging on the other. On balance, one can conclude that amenities play an important role in the economic structure of rural areas. Previous studies have demonstrated the role of amenities in rural economic growth and development (McGranahan, 1999; Deller et al., 2001; Geo and Green, 2005; Deller and Lledo, 2007) but there is little work looking at how amenities play into the underlying structure of rural economies. The results presented here begin to shed some light on those structural relationships.

5. Conclusions

It has been commonly argued in the literature that rural areas within the U.S., as well as other developed

counties, tend to lag behind urban areas in many metrics of economic well-being. At the same time, structural shifts in the larger macro economy have elevated the role of amenities, broadly defined, in the economic future of rural areas. It is becoming widely accepted that those rural areas that are endowed with an abundance of natural, cultural and historic amenities have a comparative advantage over those rural areas that lack amenities. The current track of research is to shed more focused light on how amenities influence regional economic growth and development through more detailed empirical and theoretical work. The intent of this study is to move those discussions one step forward by introducing a well developed theoretical framework into the rural development literature.

By building on the logic of the Roback-Blanchflower-Oswald (RBO) model, I suggest that amenities are capitalized into wages and rents in a way consistent with Roback and that introducing unemployment along the lines of Blanchflower and Oswald allows us to develop a rigorous microeconomic foundation for how amenities influence regional economic structure. In short, high amenity rural areas may experience more growth but at the same time may experience lower wages, higher rents and higher levels of unemployment. In other words, people are willing to forego wages, pay higher rents and experience higher unemployment levels to live in high amenity areas. The implication of this framework is that descriptive studies comparing rural to urban areas may be misleading. In addition, the implication for economic development policies for rural areas is also significant. Communities that are endowed with high levels of amenities that wish to pursue development policies based on those amenities may need to alter the metrics upon which to measure success of their policies.

The empirical results presented in this study offer mixed results. While the data support many of the hypotheses proposed, the data at the same time also reject some of those same hypotheses. First, I expect wages to be inversely related to rent, but the data support a positive and significant relationship. Second, I expect to find wages to be inversely related to unemployment, and the data supports this hypothesis. Third, I would expect to find rent directly related to unemployment, and again the data supports a positive and significant relationship. The results of the direct relationship between my amenity measures and wages, rents and unemployment are somewhat inconsistent. Clearly these results are promising, but additional work is required.

First, while the graphical presentation of the RBO model is useful in explaining the underlying logic, we must return to the formal derivation of the RBO model to more formally state the underlying structure. Second, the interplay between the three economic metrics (wages, rent and unemployment) and amenities within the empirical specification is not fully developed. For example, should a variable parameter model be used to more clearly identify the underlying relationships? Third, as noted in my discussion of amenity measures, the current model does not address the spatial dependency issue that is widely acknowledged in the amenity and rural economic growth literature. Future work requires spatial econometric techniques to be employed. Finally, the treatment of amenities here could be criticized for grouping natural, cultural, historical and built amenities together. For example, in Deller et al. (2005) there is a clear separation between natural and built amenities. In that work we conclude that for rural areas to benefit economically from amenities there needs to be a commercial base to capture the flow of benefits from those amenities. This makes intuitive sense: if there is no mechanism to capture dollars, the ability of the region to grow is limited (Shaffer et al., 2004).

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