An Evaluation of Subcounty Population Forecasts in Florida

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Abstract
Population forecasts for subcounty areas are used for a wide variety of planning and budgeting purposes. Given the importance of many of these uses, it is essential to investigate which techniques and procedures produce the most accurate forecasts. In this report, we describe several simple trend extrapolation techniques and several averages and composite methods based on those techniques. We evaluate the precision and bias of forecasts derived from these techniques using data from 1970–2005 for subcounty areas in Florida. We also evaluate the effects of differences in population size, growth rate, length of base period, and length of forecast horizon on forecast errors, and investigate the impact of adjusting forecasts to account for the effects of annexations and changes in institutional populations. We believe the findings presented in this report will help practitioners make informed decisions when they construct population forecasts for subcounty areas.

Introduction

Demographic forecasts are produced and used for many levels of geography. In the United States, the US Census Bureau creates forecasts for the nation and all states at irregular intervals. State forecast are also produced by many members of the Federal-State Cooperative Program for Population Projections (FSCPP), and the FSCPP affiliates are the primary producers or county forecast as well. A few states such as Arizona, Massachusetts, and Wisconsin also create forecast for municipalities, though at the sub-county level population forecasts are more commonly executed by local governments and planning agencies.

Because population forecasts are often used to inform local comprehensive plans, forecast accuracy is of great concern. Population forecast accuracy has been evaluated mostly for counties and states (see e.g. Campbell 2002; Murdock et al. 1984; Rayer 2007; Smith 1987; Smith and Sincich 1988, 1992). Studies at the subcounty level include Isserman 1987; Murdock et al. 1991; Smith and Shahidullah 1995; Tayman 1996; and Tayman, Schafer, and Carter 1998.

In this study we evaluate forecasts made for subcounty areas in Florida using data from 1970 to 2005. We start the analysis with a discussion of the role of the length of the base period on forecast accuracy. Next, we investigate whether accounting for institutional populations and annexations can help to improve forecast accuracy. While special populations such as prisoners and college students can impact forecasts of larger areas such as counties, they are of special concern at the subcounty level. This is even truer for annexations, which occur almost exclusively at the subcounty level. We then turn to an analysis of forecast error by population size and rate of growth. Both characteristics have previously been found to impact forecast accuracy, but most of the analyses were executed for larger areas of geography. In the final part of the analysis we develop composite averaging techniques to see whether these can improve on the performance of the individual techniques. The composites are developed based on the error structures of the individual techniques by size and growth rate. The paper concludes with a summary of findings and recommendations for producing population forecast for subcounty areas.

Data and Techniques

This study analyzes forecast errors at the subcounty level for Florida for the period 1970 to 2005. The population data come from two sources: 1) Census counts for 1970, 1980, 1990, and 2000 from the U.S. Census Bureau, and 2) Mid-decade estimates for 1975, 1985, 1995, and 2005 produced by the Bureau of Economic and Business Research (BEBR). The estimates for 2005 were those published by BEBR, but we made new estimates for 1975, 1985, and 1995 in order to make those estimates consistent with census counts at the end of each decade. The intercensal estimates for each area were based on an annual series of active residential electric customers, decennial census counts, and interpolated population/electric customer ratios. We adjusted these estimates in some areas to account for apparent data problems. We believe the revised mid-decade population estimates are more accurate estimates than those originally published by BEBR.

The subcounty areas used in the study cover the entire territory of each county and consist of incorporated places and unincorporated areas. The former include cities, towns, and villages; the latter make up the remainder of each county. Only places that have been incorporated throughout the entire study period are included in the analysis, resulting in a sample of 449 subcounty units. Twenty-nine places that incorporated after 1970 were assigned to the unincorporated area of their respective counties.

With reference to Smith, Tayman, and Swanson (2001), the following terminology is used to describe population forecasts:

1) Base year: the year of the earliest population size used to make a forecast.

2) Launch year: the year of the latest population size used to make a forecast.

3) Target year: the year for which population size is forecasted.

4) Base period: the interval between the base year and launch year.

5) Forecast horizon: the interval between the launch year and target year.

For example, if data from 1970 and 1980 were used to forecast population in 1990, then 1970 would be the base year, 1980 would be the launch year, 1990 would be the target year, 1970–1980 would be the base period, and 1980–1990 would be the forecast horizon.

Using data for the period 1970 to 2005, the analysis involves 56 forecast horizon / base period / target year combinations, including 21 five-year forecasts, 15 ten-year forecasts, 10 fifteen-year forecasts, six twenty-year forecasts, three twenty-five year forecasts, and one thirty-year forecast. For each of these, a total of six commonly used techniques were applied, including three simple extrapolation techniques and three ratio techniques. The former include linear (LIN), exponential (EXP), and constant (CON); the latter include share-of-growth (SHR), shift-share (SFT), and constant-share (COS). The methods were calculated as follows:

LIN: In the linear extrapolation technique, it is assumed that the population will increase (decrease) by the same number of persons in each future year as the average annual increase (decrease) observed during the base period:

$$P_t = P_l + (x / y) * (P_l – P_b),$$

where P_t is the population in the target year, P_l is the population in the launch year, P_b is the population in the base year, x is the number of years in the forecast horizon, and y is the number of years in the base period.

EXP: In the exponential technique, it is assumed that the population will grow (decline) by the same rate in each future year as the average annual rate during the base period:

$$P_t = P_l e^{rx}, \qquad r = [ln\ (P_l / P_b)] / y,$$

where e is the base of the natural logarithm and ln is the natural logarithm.

CON: In the constant technique, it is assumed that the population in the target will be the same as in the launch year:

$$P_t = P_l.$$

Ratio techniques express the population (or population change) of a smaller area as a proportion of the population (or population change) of a larger area in which the smaller area is located. These techniques require independent forecasts of the populations of the larger areas in which the smaller areas are located. In this study, we use counties as the larger areas and produce county population forecasts by applying the linear and exponential trend extrapolation techniques to the county populations for each of the 56 forecast horizon / base period / target year combinations. Final county forecasts are calculated as the average of these two forecasts and are used in applying the ratio techniques. In the following formulas, subscripts denote subcounty-level values, and superscripts denote county-level values.

SHR: In the share-of-growth technique, it is assumed that a subcounty area's share of county population growth will be the same over the forecast horizon as it was during the base period:

$$P_t = P_l + [(P_l - P_b) / (P^l - P^b)] * (P^t - P^l)$$

SFT: In the shift-share technique, it is assumed that the average annual change in each subcounty area's share of the county population observed during the base period will continue throughout the forecast horizon:

$$P_t = P^t * [P_l / P^l + (x / y) * (P_l / P^l - P_b / P^b)]$$

COS: In the constant-share technique, it is assumed that a subcounty area's share of the county population will be the same in the target year as it was in the launch year:

$$P_t = (P_l / P^l) * P^t$$

We construct two more forecasts using the forecasts produced by these six individual techniques: one is an average of the forecasts from all six techniques (AV), and one is an average after the highest and lowest forecasts are excluded (TAV). We refer to the latter as a 'trimmed' mean.

Forecasts from these techniques are analyzed with respect to their error structures. The study examines forecast accuracy in two ways, one reflecting *precision* and the other *bias*. Precision refers to the average percent difference between forecasts and actual census counts, ignoring whether forecasts are too high or low; bias indicates whether forecasts tend to be too high or low by focusing on algebraic errors where positive and negative values offset each other.

With regard to precision, the most popular error measure in population forecasting is the *mean absolute percent error,* or MAPE. It is calculated as follows:

$$MAPE = \Sigma \, |PE_t| \, / \, n, \quad PE_t = [(F_t - A_t) \, / \, A_t] * 100$$

where PE represents the percent error, t the target year, F the population forecast, A the actual population, and n the number of areas. Forecasts that are perfectly precise result in a MAPE of zero. The MAPE has no upper limit – the larger the MAPE, the lower the precision of the forecasts.

For bias, the *mean algebraic percent error* (MALPE) can be calculated analogously to the MAPE, though using algebraic rather than absolute percent errors:

$$MALPE = \Sigma \, PE_t \, / \, n, \quad PE_t = [(F_t - A_t) \, / \, A_t] * 100$$

Negative values on the MALPE indicate a tendency for forecasts to be too low, while positive values indicate a tendency for them to be too high. Being arithmetic means, the MAPE and MALPE are susceptible to outliers, but for practical purposes simple summary measures such as the MAPE and MALPE are sufficient to describe the error distribution of population forecasts (Rayer 2007).

Accuracy by Base Period Length

Choosing the appropriate base data is among the first decisions a population forecaster has to make. For trend extrapolation techniques, this includes specifying the length of the base period. A general recommendation is that the length of the base period should correspond to that of the forecast horizon (Alho and Spencer 1997). However, the few studies that directly investigated this issue did not find support for this recommendation.

Smith and Sincich (1990) found that at the state level base period length mattered little for short forecast horizons. For horizons exceeding ten years, very short base periods were generally associated with lower forecast precision, but extending the base period beyond ten year had little impact. Beaumont and Isserman 1987 found mixed results: forecast precision improved for a sample of fast growing states when the base period was extended from 10 to 40 years for forecasts made with the exponential technique, but did not improve for forecasts made with the linear technique. At the county level, Rayer (2008) found small improvements in precision when the base period was extended from ten to twenty years for 10–30 year forecasts; however, there was a marked improvement for the exponential technique for longer horizons. Further lengthening of the base period yielded no improvements and actually lowered precision slightly. Forecasts made with an average of several base period lengths generally provided a small improvement in precision over the twenty year base period forecasts. None of the studies found a consistent relationship between base period length and forecast bias.

Tables 1a and 1b show MAPEs and MALPEs for the eight techniques by horizon and base period length. For example, for forecasts with a five-year horizon and a five-year base period, the tables present the average MAPEs and MALPEs of forecasts for the six target years 1980 to 2005. The data in Table 1a demonstrate that for most techniques forecast precision improves with increasing base period lengths, with the biggest improvement coming from extending the base period from five to 10 years. Extending the base period beyond 10 years generally reduces the MAPE only marginally; in some instances, increasing the base period actually causes the MAPE to increase. The reductions in MAPE resulting from a longer base period are generally greater for long forecast horizons than short horizons. The biggest improvement in MAPE resulting from a longer base period occurs for the exponential technique and, by extension, the overall average; for these techniques, extending the base period beyond five years improves the precision of the forecasts markedly, especially for longer forecast horizons. Previous research has found no consistent relationship between bias and the length of the base period. The data in Table 1b concur, showing no discernible pattern.

While Table 1a provides initial evidence regarding the impact of base period length on forecast precision, the analysis is incomplete because the target years are not the same for all the forecasts within each horizon. Thus, some of the difference in MAPE may be due to the different target years rather than to differences in base period length per se.

To refine the analysis, Tables 2a and 2b focus on forecasts covering the same target years for each horizon and base period combination. That is, these two tables show MAPEs and MALPEs for the same target years with the only difference being the length of the base period. Also shown are results for two base period averages. These were calculated to investigate whether averaging individual base periods can improve forecast accuracy. Because of the restriction on target years, as well as the calculation of base period averages, fewer forecasts could be analyzed. Tables 2a and 2b provide results for base periods and averages ranging from five to 15 years for target years 1990 to 2005.

Similar to the results shown in Table 1a, Table 2a demonstrates that, for most techniques, forecast precision improves when extending the base period from five to 10 years. Extending the base period beyond 10 years provides mixed results. The two base period averages show some improvement over the five-year base periods, but no consistent improvement over 10 and 15 year base periods. Interestingly, the longest base period within each forecast horizon is often associated with relatively large forecast errors, pointing to a u-shaped relationship between forecast precision and base period length, one that was not apparent in Table 1a. Results for bias once again show no consistent patterns (see Table 2b).

While the data presented in Tables 2a and 2b have the advantage of comparing base period precision for the same target years, the different base period lengths include different base years. To determine whether this has an impact on forecast errors, Tables 3a and 3b provide MAPEs and MALPEs for all 56 target year / forecast horizon / base period combinations. As can be seen, for most horizons and base period lengths, forecasts for the earliest target year have the highest forecast errors. This is related to the high population growth rates that occurred during the early 1970s in Florida. Of the seven five-year periods from 1970 to 2005, the subcounty areas used in this study had a mean growth rate of 43.6% in 1970–1975, which was far higher than at later points in time when growth rates ranged from a high of 17.7% in 1975–1980 to a low of 10.2% in 1995–2000 (data not shown). Thus, forecasts that include base data from the early 1970s tend to have lower forecast precision. This is reflected in the higher MAPEs for the longest base periods within each horizon shown in Table 2a, which include 1970 as the base year. Thus, base periods of 15 or 20 years do not necessarily lead to larger forecast errors; rather, their larger MAPEs primarily reflect the impact of including population data from a high growth period.

This finding complicates the analysis. When comparing base periods of different lengths, either the target years or the base years will be different, and if any of the periods involve unique growth patterns, their impact will be reflected in the results. The analyses shown here, though, lead to the general conclusion that increases in length of base period beyond 10 years have only a modest impact on forecast precision. This is in accordance with previous research at the county and state level. While very short base periods (five years or less) tend to be associated with larger forecast errors, extending the base period beyond 10 years generally results in only minor improvements in precision. This is good news, because it means that in most instances long data series are not necessary for constructing population forecasts using simple extrapolation or ratio techniques.

This does not mean, however, that the analyst need not pay attention when choosing base data, because population growth patterns can be erratic and one should avoid basing any population forecast on unusual trends. In this respect, using an average of various base periods can lead to lower forecast errors. While the base period averages analyzed in this study often showed only a moderate improvement in forecast precision, conceptually it makes sense to use data from different base periods, because this can mediate against unique short term trends associated with any particular base period.

For the remainder of the study we only report results for forecasts made with 10-year base periods. As shown in Tables 1a through 3b, forecasts with 10-year base periods are more accurate than forecasts with five-year base periods for most methods and forecast horizons. Longer base periods and the two base period averages do not provide consistently more accurate forecasts, and including them would restrict the analysis because fewer forecast horizons and target years could be examined.

Accounting for Institutions

Institutional (or group quarters) populations present a challenge to population forecasters because these populations often follow different growth trajectories than the non-institutional population. College students, for example, always maintain the same general age profile, i.e. they do not age in place. The prison population and the military are other groups with unique characteristics. A common approach in population forecasting is to take out the institutional population, forecast the non-institutional population, and later add the institutional population back in. The institutional population is either held constant or is forecasted separately.

In this section, we investigate whether accounting separately for institutional populations improves forecast accuracy. The institutional populations considered here are inmates and patients in institutions operated by the federal government, the Florida Department of Corrections, and the Florida Department of Children and Family Services. Because this analysis investigates past forecast errors for which all the data are already known, we use the actual institutional population for each target year rather than projecting it or holding it constant. This obviously is an ideal case scenario, but it is useful for exposition because it highlights what that can be achieved with perfect information.

Table 4 is split into six panels that investigate the impact of accounting for institutions on forecast precision and bias. To facilitate interpretation, results are only shown for the trimmed average (TAV); results for the other techniques are generally very similar (see Appendix Tables 1–4). The results are presented by forecast horizon for forecasts with 10-year base period lengths. A total of 141 subcounty areas had institutional populations during the study period, which amounts to slightly less than a third of the total. In addition to this overall subsample of subcounty areas with institutions, data are also shown for three subsets where the institutional population exceeded 1%, 2.5%, and 5% of the total population. Table 4a presents MAPEs for forecasts of total population made *without* accounting for institutional populations while Table 4b shows MAPEs for forecasts of total population that *do* account for the institutional population separately. Table 4c displays the percentage point difference in MAPE between Tables 4b and 4a. A negative sign in Table 4c indicates that accounting for the institutional population reduces the MAPE; a positive sign means the opposite. Tables 4d through 4f show analogous data for forecast bias.

Table 4a demonstrates that for all but the longest horizons, forecasting the non-institutional population separately from the institutional population only leads to a slight improvement in forecast precision. The counter-intuitive results for the 25-year horizon forecasts should be interpreted cautiously, because only one forecast for a single target year was available. The improvements are largest for forecasts with 10- and 15-year horizons and smallest for forecast with five- and 20-year horizons. When subcounty areas with negligible institutional populations are excluded, the reductions in MAPE become greater. In general, however, it appears that accounting for institutions results only in a marginal improvement in forecast precision. Appendix Tables 1–4 show that this finding holds for the other forecasting techniques as well. One should note, though, that Table 4c and the corresponding panels in Appendix Tables 1–4 show the *percentage point* difference in MAPE, the interpretation of which is dependent on the level of the MAPE. When viewed as proportional changes, rather than as changes in percentage points, the reductions in MAPE become more pronounced, ranging from a 6.1% to 18.3%

improvement for forecasts with a five-year horizon to a 1.6% to 4.3% improvement for forecast with a 20-year horizon (data not shown).

With respect to forecast bias, the results of Tables 4d–4f show that accounting for institutions appears to actually *increase* bias; for all forecast horizons, the MALPEs go up compared to forecasts made without accounting for the institutional population separately. However, this finding may be specific to the present data set, because all forecasts made with the TAV technique show a positive bias; the same result may not be found in other data sets. The higher MALPEs in Table 4e compared to Table 4d can be explained by the faster growth of the institutional than the noninstitutional population in Florida over the study period.

Once again, the corresponding panels in Appendix Tables 1–4 show that the results for the trimmed average are generally comparable to those obtained with the other trend extrapolation techniques. In contrast to forecast precision, however, the linear and constant techniques stand out in showing improvements in the MALPE when institutional populations are accounted for. Again, these results have to be taken in context. For the constant technique, forecasts for all horizons are negatively biased throughout. Because of the different growth patterns of the institutional vis-à-vis the noninstitutional population, when institutions are accounted for separately, the forecasts become less negatively biased. In that sense, the reduction in bias for forecasts made with the constant, and to a lesser extent the linear technique, is no more real than is the increase in bias for the other techniques.

Collecting data on the institutional population involves additional work. The results shown in Table 4 and Appendix Tables 1 through 4 suggest that accounting for institutions will lead to a slight improvement in precision for small areas, especially for short- to medium-term forecasts, while results were mixed with respect to bias. Whether the small gains in precision are worth the required additional effort can be debated. On a positive note, the reductions in MAPE increase for subcounty areas where the institutional population comprises a non-trivial proportion of total population. Also, when analyzed using proportional changes rather than percentage points as a measure of comparison, the improvement in precision is larger than it first appears. Consequently, in areas where the institutional population exceeds a small proportion of the total, and where it exhibits a different growth pattern than the non-institutional population, we believe it is advisable to treat it separately from the non-institutional population when preparing population forecasts. That said, it needs to be reiterated that the analysis shown here represented a best case scenario, because the institutional population for each target year was already known. In actual practice, one would have to develop independent forecasts of the institutional population; therefore, the improvement in precision resulting from accounting separately for institutional populations is likely to be less than is shown here.

Accounting for Annexations

In addition to institutional populations, annexations provide a challenge when making forecasts for small areas. While annexations are rare at the county level, in many states – including Florida – annexations are a common occurrence at the subcounty level. They are a challenge because annexations make it difficult to figure out how past growth patterns will impact future population changes. Some incorporated places have a history of annexing geographically adjacent territory – usually from the unincorporated area of the county – on a regular basis; here, annexations will likely continue in the future as long as there remains territory to be annexed, and annexations can thus be considered part of the general growth pattern. More often, however, annexations occur infrequently, in which case it may make sense to treat the annexed population separately when making forecasts.

In order to evaluate the effect of accounting separately for annexations, we compare forecasts made for the total population with those where we take out the annexed population at the launch year, forecast the non-annexed population separately, and add back the annexed population to the target year population as a final step. Once again, we focus on the trimmed average and differentiate between the sample including all areas with annexations and three subsets involving annexations greater than 1%, 2.5%, and 5% of total population.

Evaluating the impact of annexations on forecast precision and bias involves one complication that did not arise in the analysis of institutional populations. As stated above, annexations usually mean that an incorporated place gains in population at the expense of an unincorporated area that loses population by the same amount. Because of these different scenarios, we investigate the impact of annexations separately for incorporated places and for unincorporated areas. Tables 5 and 6 are structured analogously to Table 4, though focusing on annexations rather than institutions; Table 5 shows results for incorporated places and Table 6 for unincorporated areas. Appendix Tables 5–12 follow the layout of Appendix Tables 1–4, with Appendix Tables 5–8 focusing on incorporated places and Appendix Tables 9–12 on unincorporated areas. One should note that Appendix Tables 5–12 show results only for four of the trend extrapolation techniques and the two averages. No results are provided for the constant-share and constant techniques, because accounting for annexations separately would have no impact on the forecasts for these two techniques.

As Table 5 shows, with the exception of very short-term forecasts, accounting for annexations improves precision for incorporated places. The improvements in MAPE are more pronounced than was the case for institutions. MAPEs decrease more strongly with increasing proportions of the total population affected by annexations, showing that accounting for annexations becomes more important the larger the proportion of total population annexed. This makes sense intuitively and mirrors the results for institutions. The results for the other techniques are generally similar, though the improvements in MAPE are strongest for the exponential and weakest for the linear technique (see Appendix Tables 5–8).

With respect to bias, the results mirror those for precision. Forecasts for horizons exceeding five years are less biased when annexations are accounted for. Once again, however, one needs to look at the overall bias of the forecasts made without accounting for annexations. Table 5d shows that, with only one exception, forecasts made with the trimmed average had a positive bias for all horizons and all subsets of incorporated places. This positive bias becomes smaller when annexations are accounted for separately. Incorporated areas almost always gain population through annexations. It therefore makes sense that the MALPEs in Table 5e are lower than those in Table 5d. The results for the trimmed average generally mirror those of the other techniques (see Appendix Tables 5–8).

As we have shown, accounting for annexations improves forecast precision for incorporated places. The percentage point differences for annexations reported in Table 5c are quite a bit larger than those reported in Table 4c for institutions. However, when looked at from the perspective of proportional changes rather than percentage point differences, accounting for annexations yields quantitatively similar results to those obtained for institutions. The differences between the proportional change and the percentage point analysis highlight an interesting relationship between the two subsamples of areas with institutions and annexations and forecast error. The MAPEs for areas with institutions reported in Table 4a are quite a bit lower than those shown in Table 5a for incorporated places that annexed population. Institutional populations are often located in the unincorporated area of a county, which tends to have a larger population size than the average incorporate place. Furthermore, incorporated places that annex surrounding territory tend to be more growth oriented. Both factors account for the higher MAPEs shown in Table 5a versus those in Table 4a.

While Table 5 presents results for incorporated places, Table 6 shows corresponding results for unincorporated areas. The results are strikingly different: whereas accounting for annexations increases precision and reduces bias for incorporated places, it appears to have the opposite effects for unincorporated areas. The increase in bias for unincorporated areas can be explained analogously to the decrease in bias for incorporated places, but the decrease in precision is puzzling and we do not have a good explanation for this finding. We note, however, that the impact of accounting for annexations in forecasts of unincorporated areas is fairly small for all but the longest forecast horizons.

To summarize, as was true for institutional populations, we believe it generally makes sense to collect the necessary data and to forecast the non-annexed population separately, especially for subcounty areas where annexations involve more than a trivial proportion of total population. Once again, however, one has to weigh the relatively small gain in forecast precision against the cost of collecting the additional data. A further complication with respect to annexations is their differential impact on incorporated places versus unincorporated areas. Future research should shed light on the counterintuitive decrease in precision for unincorporated areas. Finally, one also has to consider the generally haphazard nature of annexations. Whereas changes in the institutional population generally occur gradually and, in the case of the prison population, are often planned ahead of time, annexations are difficult, if not impossible, to predict. That said, annexations of a significant magnitude should be considered carefully, for in most instances it would be prudent not to forecast that similar annexations will occur in the future.

Forecast Accuracy by Growth Rate

We turn next to an examination of forecast errors by rate of population growth. Previous research has found population growth to have a consistent impact on both precision and bias. In general, forecasts tend to be most precise for areas with slow but positive population growth, and least precise for areas experiencing large population losses or rapid population growth. With respect to bias, forecasts tend to be too high in areas that grew rapidly over the base period and too low in areas that declined or grew very slowly.

Tables 7a and 7b show MAPEs and MALPEs by forecast horizon and growth rate for the six trend extrapolation techniques and the two averages. To keep the discussion of results succinct, only results for 10- and 20-year horizons are reported. The growth rate refers to the rate of population growth over the base period. We calculated forecast accuracy for six growth-rate categories: two reflecting population declines and four reflecting population increases. These categories were chosen to maximize meaningful differences in growth patterns while at the same time ensuring that enough areas fall into each category to provide reliable results.

The data in Table 7a show the well known u-shaped relationship between rate of growth and forecast precision. For all except the constant-share technique, MAPEs are highest for areas with rapidly declining and rapidly growing populations, and lowest for areas experiencing slow to moderate population growth. However, error levels differ substantially from one forecasting technique to another. For areas with declining populations, the constant and exponential techniques provide the most precise forecasts, and shift-share the least precise. For areas that grew rapidly, on the other hand, linear performs the best and exponential the worst. We will return to these findings later in the analysis when we discuss the issue of composite forecasts.

With respect to bias, the data shown in Table 7b confirm the findings reported in previous studies for counties and states. That is, there is a strong tendency for forecasts to be too low in areas that declined during the base period and too high in areas that grew rapidly. This is true for all techniques except constant-share and constant. Constant-share exhibits a positive bias that declines as the growth rate increases while constant exhibits a negative bias that becomes greater as the growth rate increases. In general, the MALPEs follow a stepwise pattern for each technique: with increasing rates of population growth most techniques' MALPEs become more positive (again, constant-share and constant are exceptions). Extending the forecast horizon from 10 to 20 years accentuates this pattern.

Forecast Accuracy by Population Size

Previous research has found population size to affect the precision but not the bias of population forecasts. In general, forecasts become more precise as population size increases. Consequently, forecasts for the nation tend to be more precise than forecasts for states, forecasts for states tend to be more precise than forecasts for counties, and forecasts for counties tend to be more precise than forecasts for subcounty areas.

Tables 8a and 8b are structured analogously to Tables 7a and 7b but focus on population size. Whereas the rate of population growth shown in Tables 7a and 7b was calculated over the base period, the population size categories shown in Tables 8a and 8b refer to size at the launch year. MAPEs and MALPEs are presented for nine size categories, ranging from less than 500 persons to more than 50,000. As expected, for most techniques the forecasts become more precise as population size increases. The only exception is the constant technique, which shows a weak u-shaped relationship between precision and population size.

The largest improvements in precision occur primarily in the smallest size categories. MAPEs are very large for the smallest places (especially for the 20-year horizon), but decline considerably as population size increases to around 3,000. Beyond that, they decrease only slightly with further increases in population size. In fact, the MAPEs actually increase for several techniques for the 10,000 to 25,000 and the 25,000 to 50,000 size categories. This apparent anomaly can be explained with the confounding influence of population growth. Table 9 shows the average population growth rate during each 10-year base period by population size at the launch year. All five 10-year base periods from 1970 to 2000 are shown plus an average per decade growth rate over the entire 30-year period. As the table shows, the 10,000 to 25,000 and 25,000 to 50,000 size categories generally had the highest rates of population growth of any size category, especially during the first half of the study period. Thus, the elevated MAPEs shown for these two size categories in Table 8a can be explained by the high rates of population growth these areas experienced. We do not believe that increases in population size per se lead to larger MAPEs.

Population size has not been found to be consistently related to forecast bias. This is confirmed in Table 8b, which shows no clear pattern in the MALPE for most techniques. The two exceptions are the constant-share and constant methods. Constant-share has positive MALPEs that decline with increases in population size and constant has negative MALPEs that become larger. For constant-share, the MALPE pattern mirrors that of the MAPE. The increasing MALPEs for the constant technique with increasing population size can largely be explained by the underlying growth patterns; as Table 9 shows, there is a generally inverse relationship between population size and growth. Consequently, holding the population constant results in a more negative bias for subcounty areas with larger populations, because these generally grow faster than smaller areas. In general, though, judging from the results shown in Table 8b, we conclude that population size cannot reliably be used to indicate forecast bias.

Forecast Accuracy by Population Growth and Population Size

The preceding discussion touched on the interrelationship between population size and rate of growth. To further investigate this relationship, Tables 10a and 10b display forecast errors by combined size and growth categories. For most techniques, forecast precision increases with increasing population size within each growth category (see Table 10a). Within each size category, MAPEs are highest for areas with either declining or rapidly growing populations and lowest for areas with moderate growth rates. Both results confirm findings from previous studies at the county and state level. Once again, there is a substantial improvement in forecast precision from the smallest to the middle size category, and a much smaller improvement from the middle to the largest category.

With respect to bias, the data in Table 10b show two separate results. Within each size category, there is a strong positive relationship between MALPEs and population growth for all techniques except constant and constant-share: errors are large and negative for areas with negative growth rates and become positive and larger as the growth rates increases. These results are consistent with those shown in Table 7b. Within growth rate categories, however, there is no clear relationship between MALPEs and population size. In some instances MALPEs decline as population size increases, but in other instances they increase. These results provide further evidence that population size is not closely related to forecast bias.

Combining Individual Trend Extrapolation Techniques

Practitioners in many fields have developed forecasts by combining the results of several different individual techniques. These "combined" forecasts have often been found to be more precise and less biased than the individual forecasts used in their construction. Overall averages or trimmed averages have been the most common techniques used in combining forecasts, but other approaches can be used as well.

In this study, we investigated forecast accuracy for subcounty areas in Florida using six individual extrapolation techniques and two averages. The two averages showed mixed results. The overall average was strongly affected by the large errors associated with the exponential technique for longer forecast horizons, especially when using short base periods, often leading to very large MAPEs and MALPEs. We believe this shows that it is generally not advisable to simply calculate an overall average, because outliers associated with any particular individual technique can strongly affect that average. The trimmed average fared substantially better than the overall average, generally producing errors that were smaller than those found for most of the individual techniques. However, in many instances the trimmed average was not quite as accurate as the most accurate individual technique.

The analyses summarized in Tables 7a through 10b showed that some techniques perform better than others for areas with particular size and growth rate characteristics. This information can be used to develop composite forecasts based on specific combinations of individual techniques.

Tables 7a and 7b show MAPEs and MALPEs by growth rate for 10- and 20-year forecast horizons. To extend the analysis, we examine results by growth rate for all possible combinations of target years and horizon lengths for forecasts with 10-year base periods. In addition to actual values of the MAPE, we also rank the six individual trend extrapolation techniques for each horizon and target year within each growth category.

We further calculate an overall average rank by growth rate for each horizon; that is, we average the results for all target years within each horizon length. The detailed data can be seen in Appendix Tables 13 through 17.

While there are some differences by target year, these tables show a remarkable degree of similarity in the performance of the six individual techniques. The results are similar for the various target years within each forecast horizon; between the various horizons; and between actual MAPE values and MAPE ranks. Tables 11a and 11b provide an overall summary that shows average MAPEs and average ranks for all horizons and target years. As one can see, for areas that declined in population the constant technique performs best, and shift-share worst. For the remaining four categories reflecting various rates of population growth the linear technique performs best; for moderate growth rates constant-share performs worst while for high growth rates exponential is associated with the largest forecast errors.

From these results we developed five composite forecasts. Tables 12a and 12b show MAPEs and MALPEs by forecast horizon for the six individual techniques, the overall average and the trimmed average, as well as for the five composites. Composite forecasts can be either inclusive or exclusive. C1 and C2 are *inclusive* composites that include only the individual techniques that performed particularly well for places in a particular growth category; C1 includes the single best performing technique for each category, while C2 includes an average of the two best performing techniques. C3 and C4 are *exclusive* composites that exclude the individual techniques that performed particularly poorly for places in a particular growth category; C3 excludes the single worst performing technique and C4 excludes the two worst performing techniques.

Finally, C5 is an inclusive composite based on the combined size and growth rate analysis shown in Tables 10a and 10b. The notes at the bottom of Table 12b explain which techniques were included in the five composite forecasts.

The data in Table 12a demonstrate that inclusive composite forecasts perform better than exclusive composite forecasts with respect to precision. C1 and C2 display lower MAPEs than C3 and C4 for all forecast horizons. C1 and C2 also perform well compared to the six individual forecasting techniques and the overall and trimmed averages. Both inclusive composites outperform the two averages for all forecast horizons and outperform most of the individual techniques with the exception of linear and constant, which show low MAPEs for the longest forecast horizons.

The best performance overall, however, comes from C5, which is a slight variation of C1. Whereas C1 uses the linear technique for all subcounty areas that experienced population growth over the base period, C5 uses the linear technique only for areas that also had a population greater than 2,000; otherwise, C5 uses the constant technique. Forecasts made with the C5 composite have smaller MAPEs than any other individual, average, or composite forecast for every length of forecast horizon.

With respect to bias, Table 12b shows that the exclusive composites perform about the same as the inclusive composites. All five composites are associated with very low bias throughout; the higher MALPEs for the 20 and 25 year horizons are really caused by the higher MAPEs for these longer-term forecasts. Most of the individual techniques have higher MALPEs with the exception of linear, which shows low levels of bias throughout. While the constant technique was among the most precise of the individual techniques, Table 12b shows that it is also quite biased. Because the constant technique exhibits a negative bias throughout, it is not surprising to see the negative MALPEs associated with C5. More surprising, though, is the fact that the MALPEs for C5 stay small even for longer forecast horizons. This appears to be caused by the low levels of bias for the constant technique for small areas with high growth rates, which tend to be forecasted much too high with the other techniques (see Table 10b). This demonstrates that, although growth rates generally have a greater impact on forecast accuracy than population size does, both factors should be taken into consideration when developing composite forecasts.

Combining has been successfully used in many areas of forecasting, but has not been used very often for population forecasts. The results obtained in this study provide further support to the notion that combining often improves forecast accuracy. While the overall average can be greatly impacted by outliers, the trimmed average was associated with higher precision and lower bias than most of the individual techniques. The inclusive composites further improved upon the trimmed average, with the best performance coming from C1 and especially C5. The composites demonstrate that combining individual techniques based on their performance with respect to population size and rate of growth can lead to the best overall forecasts.

Summary and Conclusions

We have presented a substantial amount of information on population forecasting techniques and forecast accuracy in this report. What general conclusions can we draw that might help practitioners improve their subcounty population forecasts?

1) For simple extrapolation and ratio techniques such as those evaluated in this report, 10 years of base data are generally necessary to achieve the greatest possible forecast accuracy. In most instances, 10 years is also sufficient, as increases beyond 10 years were found to lead to little if any further improvement in forecast accuracy.

2) Precision declines steadily with the length of the forecast horizon, but bias follows no clear pattern. We found MAPEs to grow about linearly with increases in the forecast horizon, but MALPEs sometimes increased and other times declined. We also found that forecast errors for subcounty areas are often very large, especially for places with small populations, either very high or large negative growth rates, and long forecast horizons,.

3) Accounting separately for changes in the institutional population may improve the average accuracy of population forecasts, but probably not by much. We found that accounting separately for the institutional population reduced MAPEs slightly in most instances, but often raised MALPEs as well. We believe the increases in MALPEs were caused by the high rate of growth of the institutional population in Florida since 1970; we do not believe it is a general characteristic of population forecasts. Nevertheless, we believe it is generally useful to account separately for changes in the institutional population because it may have a significant impact on forecast accuracy in a few places, even though it does not appear to have much effect on the overall average performance of population forecasts. Further research is required before we can draw firm conclusions on this point.

4) Accounting for the demographic impact of annexations appears to have a greater impact on forecast accuracy than accounting for changes in the institutional population, especially for places in which the annexations are relatively large. We found that

accounting for annexations separately improved the precision and reduced the bias of forecasts for incorporated places; these improvements became greater as the forecast horizon became longer and as the annexations became larger relative to the population size of the incorporated place. However, we found the opposite results for unincorporated areas, where accounting for the demographic impact of annexations reduced precision and increased bias for horizons longer than 10 years. These conflicting results are somewhat puzzling, but it should be noted that in most instances the impact of annexations on the populations of unincorporated areas is typically very small. We believe it is generally advisable to account for the demographic impact of annexations when making subcounty population forecasts, at least when those annexations are relatively large compared to size of the population of the annexing area.

5) Population growth rates over the base period have often been found to have a substantial impact on forecast accuracy. For every technique we evaluated, MAPEs displayed a u-shaped relationship with the growth rate: Errors were smallest for places with moderate growth rates and increased as growth rates deviated in either direction from those moderate levels. For all but the constant and constant-share techniques, MALPEs were large and negative for places with the largest negative growth rates and increased as the growth rate increased, becoming large and positive for places that grew rapidly during the base period. For the constant and constant-share techniques, MALPEs generally declined as the growth rate increased.

6) Forecast precision is positively related to population size, but bias is not. For every technique, the MAPE was larger for places with fewer than 500 residents than for places in any other size category, often by a substantial amount. For most techniques, MAPEs

declined fairly steadily as population size increased to around 3,000, but beyond that did not change consistently with population size until reaching the largest size category, when they again declined for every technique. Except for the constant and constant-share techniques, MALPEs did not exhibit any clear relationship with population size; for constant and constant-share the relationship was negative, reflecting the generally positive correlation between size and growth rates for those two techniques.

7) Taking averages of forecasts from several techniques has often been found to improve forecast accuracy. We found the trimmed average to produce errors that were smaller than the errors for most (sometimes all) of the individual techniques. However, we also found that a composite approach – using particular techniques or averages for places with particular characteristics – worked even better. Although further research is needed, we believe the use of averaging and the development of composite techniques hold a great deal of promise for small-area forecasting.

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An Evaluation of Subcounty Population Forecasts in Florida

(Tables)

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Table 1a. MAPE by Projection Horizon and Base Period

Horizon	Base	N	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
5	5	6	10.9	11.6	13.0	15.8	13.2		10.6	10.6
5	10	5	9.9	10.4	12.1	12.7	11.9		9.5	9.6
5	15	4	8.9	9.5	11.7	11.6	11.1		8.6	8.8
5	20	3	8.2	8.8	11.8	11.2	10.2		8.2	8.2
5	25	2	7.8	8.4	12.1	11.0	9.9		7.9	7.9
5	30	1	7.4	8.1	12.8	11.1	9.2		7.5	7.4
5	All	21	9.4	10.0	12.2	12.9	11.5	12.1	9.2	9.3
10	5	5	19.8	22.4	27.5	53.0	25.6		23.0	19.9
10	10	4	17.1	19.0	24.1	30.0	23.0		17.4	17.1
10	15	3	14.7	19.0	23.4	25.9	24.0		15.5	15.6
10	20	2	14.1	19.0	24.5	26.1	23.9		15.5	15.5
10	25	1	12.6	14.8	23.9	25.3	18.9		13.7	13.3
10	All	15	16.8	19.9	25.2	36.0	23.9	19.8	18.4	17.3
15	5	4	29.2	35.8	46.6	272.3	41.5		66.6	30.8
15	10	3	23.6	28.5	38.9	71.2	35.6		28.9	24.7
15	15	2	20.7	25.7	36.7	53.2	33.2		24.2	22.2
15	20	1	19.2	25.6	39.5	56.7	32.6		24.5	22.0
15	All	10	24.8	30.6	41.6	146.6	37.2	26.0	42.6	26.4
20	5	3	37.4	51.5	67.2	2,388.7	62.3		427.4	42.8
20	10	2	30.5	40.2	56.1	231.5	51.8		61.6	34.1
20	15	1	25.2	36.4	51.5	133.9	50.0		42.0	30.1
20	All	6	33.1	45.2	60.9	1,293.8	56.7	31.6	241.2	37.8
25	5	2	49.2	79.9	101.8	23,256.3	99.2		3,921.0	64.9
25	10	1	41.4	64.3	89.3	1,216.7	80.9		238.0	53.5
25	All	3	46.6	74.7	97.6	15,909.7	93.1	36.7	2,693.3	61.1
30	5	1	56.4	141.5	169.7	198,055.9	204.5	40.2	33,088.9	107.6

Table 1b. MALPE by Projection Horizon and Base Period

Horizon	Base	N	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
5	5	6	0.5	1.5	0.2	7.4	6.1		1.3	1.1
5	10	5	-0.6	0.6	-1.4	4.9	5.2		0.2	0.2
5	15	4	-1.2	0.2	-2.7	4.1	4.9		-0.4	-0.3
5	20	3	-1.9	-0.2	-3.9	4.0	4.4		-0.9	-0.7
5	25	2	-1.9	-0.1	-4.5	4.3	4.1		-0.9	-0.7
5	30	1	-3.2	-0.9	-5.9	4.1	3.0		-1.9	-1.6
5	All	21	-0.8	0.5	-2.1	5.2	5.1	-7.8	0.0	0.1
10	5	5	1.7	5.2	1.2	39.3	15.0		8.1	4.0
10	10	4	-0.2	3.3	-2.2	17.8	13.2		3.1	2.1
10	15	3	-1.7	4.5	-1.6	14.4	16.6		3.1	2.4
10	20	2	-2.2	5.4	-1.9	15.0	17.2		3.3	2.7
10	25	1	-2.7	2.5	-7.3	15.9	10.9		0.8	0.7
10	All	15	-0.3	4.4	-1.3	23.8	14.8	-14.0	4.6	2.8
15	5	4	3.6	11.8	3.8	253.8	28.4		47.0	9.2
15	10	3	0.4	7.7	-2.4	55.4	23.4		10.9	5.2
15	15	2	-1.6	6.5	-6.1	38.6	22.2		6.7	3.8
15	20	1	-2.3	7.9	-6.8	42.9	22.5		7.3	4.4
15	All	10	1.0	9.1	-1.1	130.2	25.1	-19.3	24.2	6.4
20	5	3	8.0	24.6	13.8	2,369.4	47.6		406.5	18.9
20	10	2	3.9	17.6	4.7	215.3	37.8		42.6	12.8
20	15	1	1.6	17.8	-0.1	120.7	38.5		25.6	11.9
20	All	6	5.5	21.1	8.4	1,276.6	42.8	-24.1	221.8	15.7
25	5	2	15.5	50.6	39.0	23,235.7	82.5		3,899.1	38.4
25	10	1	12.4	42.1	28.9	1,201.4	67.0		220.6	31.7
25	All	3	14.5	47.8	35.6	15,890.9	77.4	-28.4	2,673.0	36.2
30	5	1	29.3	121.9	103.9	198,043.9	193.4	-33.7	33,076.4	89.7

Table 2a. MAPE by Projection Horizon and Base Period (Including Averages)

Target Years	Horizon	Base	N	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
1990-2005	5	5	4	8.8	9.1	10.2	10.3	10.7	10.7	8.1	8.4
1990-2005	5	10	4	8.9	9.2	10.6	10.4	10.7	10.7	8.4	8.6
1990-2005	5	15	4	8.9	9.5	11.7	11.6	11.1	10.7	8.6	8.8
1990-2005	5	AV5-10	4	8.5	8.7	9.8	10.0	10.7	10.7	8.0	8.2
1990-2005	5	AV5-15	4	8.4	8.7	10.1	10.2	10.7	10.7	8.0	8.2
1995-2005	10	5	3	16.2	17.7	21.8	24.9	20.2	17.9	15.6	15.7
1995-2005	10	10	3	14.7	16.0	20.5	21.2	19.8	17.9	14.2	14.4
1995-2005	10	15	3	14.7	19.0	23.4	25.9	24.0	17.9	15.5	15.6
1995-2005	10	AV5-10	3	14.5	15.9	19.8	22.1	19.9	17.9	14.2	14.3
1995-2005	10	AV5-15	3	14.1	15.9	19.7	22.6	21.0	17.9	14.1	14.1
2000-2005	15	5	2	23.6	27.5	36.7	50.6	31.8	24.2	25.0	23.7
2000-2005	15	10	2	20.6	23.8	33.0	38.1	30.4	24.2	20.9	20.7
2000-2005	15	15	2	20.7	25.7	36.7	53.2	33.2	24.2	24.2	22.2
2000-2005	15	AV5-10	2	20.8	24.0	33.0	42.9	31.0	24.2	22.0	21.0
2000-2005	15	AV5-15	2	19.7	23.4	32.5	45.3	31.6	24.2	22.0	20.5

Table 2b. MALPE by Projection Horizon and Base Period (Including Averages)

Target Years	Horizon	Base	N	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
1990-2005	5	5	4	-1.3	-0.7	-1.9	1.9	4.3	-7.5	-0.8	-0.8
1990-2005	5	10	4	-1.5	-0.7	-2.5	2.2	4.2	-7.5	-1.0	-0.9
1990-2005	5	15	4	-1.2	0.2	-2.7	4.1	4.9	-7.5	-0.4	-0.3
1990-2005	5	AV5-10	4	-1.4	-0.7	-2.2	2.1	4.2	-7.5	-0.9	-0.9
1990-2005	5	AV5-15	4	-1.3	-0.4	-2.4	2.7	4.5	-7.5	-0.7	-0.7
1995-2005	10	5	3	-2.0	0.1	-3.3	10.2	10.4	-13.7	0.3	-0.4
1995-2005	10	10	3	-2.8	-0.3	-5.5	8.0	10.3	-13.7	-0.7	-1.0
1995-2005	10	15	3	-1.7	4.5	-1.6	14.4	16.6	-13.7	3.1	2.4
1995-2005	10	AV5-10	3	-2.4	-0.1	-4.4	9.1	10.3	-13.7	-0.2	-0.7
1995-2005	10	AV5-15	3	-2.2	1.4	-3.5	10.9	12.4	-13.7	0.9	0.3
2000-2005	15	5	2	-3.9	0.7	-6.9	29.0	19.5	-19.2	3.2	0.0
2000-2005	15	10	2	-4.3	0.9	-9.6	19.8	18.1	-19.2	1.0	-0.6
2000-2005	15	15	2	-1.6	6.5	-6.1	38.6	22.2	-19.2	6.7	3.8
2000-2005	15	AV5-10	2	-4.1	0.8	-8.2	24.4	18.8	-19.2	2.1	-0.3
2000-2005	15	AV5-15	2	-3.3	2.7	-7.5	29.1	19.9	-19.2	3.6	1.0

Table 3a. MAPE by Target Year, Projection Horizon, and Base Period

Target Year	Horizon	Base	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
1980	5	5	14.6	16.8	19.2	27.7	22.2	15.3	15.5	15.4
1985	5	5	15.7	16.1	17.8	25.6	14.2	14.7	15.4	14.6
1990	5	5	8.7	9.0	9.9	10.4	13.6	12.1	8.5	8.5
1995	5	5	10.6	11.2	12.8	12.8	11.1	10.6	9.6	10.2
2000	5	5	7.1	7.3	8.0	8.3	9.8	10.5	6.8	6.8
2005	5	5	8.8	8.9	9.9	9.8	8.5	9.7	7.7	8.2
1985	5	10	13.8	15.0	17.8	21.8	16.7	14.7	13.9	13.7
1990	5	10	9.5	9.7	10.9	11.1	13.0	12.1	9.1	9.2
1995	5	10	9.9	10.6	12.4	11.8	11.1	10.6	9.2	9.5
2000	5	10	7.9	8.1	9.4	9.4	10.2	10.5	7.6	7.8
2005	5	10	8.3	8.5	9.8	9.2	8.3	9.7	7.6	8.0
1990	5	15	10.7	11.6	14.0	15.9	14.7	12.1	10.6	10.7
1995	5	15	8.8	9.6	12.3	11.6	10.7	10.6	8.6	8.8
2000	5	15	8.5	8.9	10.6	10.2	10.6	10.5	8.1	8.2
2005	5	15	7.7	7.9	9.8	8.6	8.3	9.7	7.3	7.5
1995	5	20	8.7	9.9	13.5	14.3	11.6	10.6	9.1	9.0
2000	5	20	8.0	8.5	11.1	10.4	10.4	10.5	8.0	8.0
2005	5	20	7.8	8.1	10.7	9.0	8.5	9.7	7.4	7.5
2000	5	25	8.3	9.2	12.8	12.9	11.3	10.5	8.6	8.5
2005	5	25	7.4	7.6	11.3	9.2	8.5	9.7	7.2	7.2
2005	5	30	7.4	8.1	12.8	11.1	9.2	9.7	7.5	7.4
1985	10	5	24.6	31.8	40.5	96.4	41.6	22.4	34.5	27.6
1990	10	5	26.1	27.3	32.0	93.8	26.0	22.8	33.7	24.6
1995	10	5	15.0	16.9	21.2	22.5	22.5	18.2	14.1	14.5
2000	10	5	19.9	22.1	27.6	33.5	22.3	18.7	19.8	19.8
2005	10	5	13.6	14.2	16.5	18.6	15.6	16.9	12.8	12.9
1990	10	10	24.3	28.1	34.8	56.5	32.6	22.8	27.2	25.0
1995	10	10	13.8	14.7	19.3	21.4	20.8	18.2	13.3	13.3
2000	10	10	17.5	19.7	24.7	25.1	22.4	18.7	17.1	17.4
2005	10	10	12.8	13.4	17.6	17.1	16.2	16.9	12.2	12.5
1995	10	15	15.1	18.4	24.9	34.1	24.7	18.2	16.6	16.0
2000	10	15	15.9	18.1	24.6	24.9	21.3	18.7	16.3	16.4
2005	10	15	13.1	20.4	20.8	18.6	25.9	16.9	13.7	14.6
2000	10	20	15.7	19.4	27.8	33.4	24.0	18.7	18.0	17.2
2005	10	20	12.4	18.7	21.3	18.7	23.8	16.9	13.0	13.9
2005	10	25	12.6	14.8	23.9	25.3	18.9	16.9	13.7	13.3

Table 3a. MAPE by Target Year, Projection Horizon, and Base Period
(Continued)

Target Year	Horizon	Base	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
1990	15	5	37.1	53.0	67.6	448.7	68.5	28.4	104.8	44.8
1995	15	5	32.4	35.4	45.2	539.1	33.8	27.4	111.7	31.1
2000	15	5	22.4	26.2	33.6	40.0	34.4	24.6	22.1	22.1
2005	15	5	24.8	28.7	39.9	61.2	29.1	23.8	27.8	25.3
1995	15	10	29.7	38.0	50.6	137.5	45.8	27.4	44.9	32.8
2000	15	10	19.4	22.2	30.7	38.2	31.4	24.6	20.0	19.4
2005	15	10	21.7	25.4	35.4	37.9	29.5	23.8	21.7	22.0
2000	15	15	21.2	28.0	38.5	68.6	38.6	24.6	27.4	23.7
2005	15	15	20.1	23.4	35.0	37.8	27.8	23.8	20.9	20.6
2005	15	20	19.2	25.6	39.5	56.7	32.6	23.8	24.5	22.0
1995	20	5	43.6	74.2	94.1	2,824.0	99.2	32.9	511.8	60.0
2000	20	5	41.6	47.1	63.1	4,279.4	44.9	33.0	741.2	41.0
2005	20	5	27.1	33.1	44.4	62.8	42.9	28.9	29.1	27.5
2000	20	10	37.2	52.2	71.1	402.0	64.8	33.0	96.5	44.2
2005	20	10	23.7	28.1	41.1	61.1	38.7	28.9	26.7	24.1
2005	20	15	25.2	36.4	51.5	133.9	50.0	28.9	42.0	30.1
2000	25	5	51.6	104.9	128.2	21,539.5	146.4	37.3	3,648.2	82.1
2005	25	5	46.7	55.0	75.4	24,973.0	52.0	36.1	4,193.8	47.6
2005	25	10	41.4	64.3	89.3	1,216.7	80.9	36.1	238.0	53.5
2005	30	5	56.4	141.5	169.7	198,055.9	204.5	40.2	33,088.9	107.6

Table 3b. MALPE by Target Year, Projection Horizon, and Base Period

Target Year	Horizon	Base	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
1980	5	5	7.4	10.5	8.1	23.2	15.2	-9.0	9.2	9.0
1985	5	5	0.4	1.3	0.5	13.9	4.3	-8.0	2.1	0.8
1990	5	5	0.2	1.0	-0.7	3.9	7.3	-6.8	0.8	0.8
1995	5	5	-2.0	-1.3	-2.7	1.7	4.6	-7.9	-1.3	-1.4
2000	5	5	-0.2	0.2	-0.5	2.5	3.9	-6.5	-0.1	0.1
2005	5	5	-3.1	-2.7	-3.6	-0.5	1.4	-8.8	-2.9	-2.8
1985	5	10	3.3	5.7	3.2	15.6	9.3	-8.0	4.9	4.6
1990	5	10	-0.2	0.8	-1.4	4.5	6.0	-6.8	0.5	0.5
1995	5	10	-2.3	-1.2	-3.6	2.2	5.0	-7.9	-1.3	-1.3
2000	5	10	-0.6	0.1	-1.5	2.4	4.7	-6.5	-0.2	-0.2
2005	5	10	-3.1	-2.4	-3.6	-0.2	1.1	-8.8	-2.8	-2.7
1990	5	15	2.0	4.3	0.6	10.8	8.8	-6.8	3.3	3.4
1995	5	15	-2.1	-0.9	-4.0	3.0	4.3	-7.9	-1.3	-1.2
2000	5	15	-1.2	-0.1	-2.8	3.1	5.2	-6.5	-0.4	-0.3
2005	5	15	-3.5	-2.6	-4.7	-0.4	1.4	-8.8	-3.1	-2.9
1995	5	20	-0.7	1.7	-2.7	7.9	6.3	-7.9	0.8	0.9
2000	5	20	-1.0	0.3	-3.2	3.8	4.9	-6.5	-0.3	-0.1
2005	5	20	-3.8	-2.7	-5.8	0.2	1.9	-8.8	-3.2	-3.0
2000	5	25	0.0	2.3	-2.5	7.7	6.6	-6.5	1.3	1.5
2005	5	25	-3.8	-2.5	-6.5	0.8	1.7	-8.8	-3.2	-2.9
2005	5	30	-3.2	-0.9	-5.9	4.1	3.0	-8.8	-1.9	-1.6
1985	10	5	12.2	21.4	13.5	89.8	32.8	-16.3	25.6	17.6
1990	10	5	2.3	4.6	2.2	76.2	11.0	-12.9	13.9	3.5
1995	10	5	-1.3	1.0	-4.0	9.8	13.7	-13.7	0.9	0.4
2000	10	5	-1.8	0.7	-2.6	15.2	12.3	-12.8	1.8	0.5
2005	10	5	-2.8	-1.5	-3.3	5.5	5.1	-14.5	-1.9	-2.0
1990	10	10	7.8	13.8	7.7	47.1	21.8	-12.9	14.2	11.3
1995	10	10	-2.1	0.7	-4.7	10.5	11.1	-13.7	0.3	-0.2
2000	10	10	-2.3	0.7	-5.4	9.7	13.1	-12.8	0.5	0.0
2005	10	10	-4.1	-2.2	-6.3	3.8	6.7	-14.5	-2.7	-2.9
1995	10	15	2.1	7.8	-0.7	26.7	17.2	-13.7	6.6	5.6
2000	10	15	-2.5	0.8	-6.1	11.2	11.7	-12.8	0.4	0.0
2005	10	15	-4.6	5.0	1.9	5.3	20.9	-14.5	2.3	1.6
2000	10	20	0.5	6.5	-3.5	23.5	16.1	-12.8	5.0	4.4
2005	10	20	-4.8	4.2	-0.3	6.5	18.3	-14.5	1.6	1.1
2005	10	25	-2.7	2.5	-7.3	15.9	10.9	-14.5	0.8	0.7

Table 3b. MALPE by Target Year, Projection Horizon, and Base Period (Continued)

Target Year	Horizon	Base	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
1990	15	5	19.8	38.7	26.1	439.9	58.1	-20.0	93.8	31.6
1995	15	5	2.4	7.0	2.8	517.4	16.4	-18.7	87.9	5.1
2000	15	5	-1.8	2.8	-6.0	22.2	23.0	-18.2	3.7	1.8
2005	15	5	-6.1	-1.3	-7.8	35.8	16.0	-20.2	2.7	-1.8
1995	15	10	9.7	21.3	11.9	126.5	34.1	-18.7	30.8	16.9
2000	15	10	-2.4	2.5	-7.4	23.1	18.9	-18.2	2.7	0.9
2005	15	10	-6.2	-0.7	-11.7	16.5	17.3	-20.2	-0.8	-2.2
2000	15	15	3.5	13.8	-0.1	58.7	29.1	-18.2	14.5	10.0
2005	15	15	-6.6	-0.8	-12.1	18.5	15.3	-20.2	-1.0	-2.4
2005	15	20	-2.3	7.9	-6.8	42.9	22.5	-20.2	7.3	4.4
1995	20	5	23.6	57.9	42.5	2,814.6	88.5	-25.1	500.3	45.7
2000	20	5	5.2	13.2	8.3	4,253.9	25.2	-22.3	713.9	10.3
2005	20	5	-4.9	2.7	-9.5	39.6	29.2	-24.8	5.4	0.7
2000	20	10	13.5	33.2	21.2	389.8	52.1	-22.3	81.3	26.2
2005	20	10	-5.8	2.0	-11.8	40.7	23.6	-24.8	4.0	-0.6
2005	20	15	1.6	17.8	-0.1	120.7	38.5	-24.8	25.6	11.9
2000	25	5	28.6	87.2	68.7	21,529.5	135.5	-28.3	3,636.9	66.7
2005	25	5	2.5	14.0	9.2	24,941.9	29.6	-28.5	4,161.4	10.2
2005	25	10	12.4	42.1	28.9	1,201.4	67.0	-28.5	220.6	31.7
2005	30	5	29.3	121.9	103.9	198,043.9	193.4	-33.7	33,076.4	89.7

Table 4a. MAPE, Total Population, TAV Technique, 10 Year Base Period, Not Accounting Separately for Institutions

Horizon	N	All	> 1%	> 2.5%	> 5%
5	5	6.9	8.2	8.8	8.7
10	4	12.0	14.2	15.2	15.1
15	3	17.3	20.1	21.2	21.0
20	2	23.4	25.1	26.1	25.7
25	1	35.7	34.6	34.1	32.7
All	15	14.5	16.2	17.0	16.7

Table 4b. MAPE, Total Population, TAV Technique, 10 Year Base Period, Accounting Separately for Institutions

Horizon	N	All	> 1%	> 2.5%	> 5%
5	5	6.4	7.2	7.6	7.1
10	4	11.2	12.4	12.8	12.2
15	3	16.5	18.2	18.9	18.5
20	2	23.1	24.2	25.0	24.9
25	1	36.4	36.5	36.9	36.2
All	15	13.9	15.0	15.5	15.0

Table 4c. Percentage Point Difference in MAPE (4b minus 4a)

Horizon	N	All	> 1%	> 2.5%	> 5%
5	5	-0.4	-1.0	-1.3	-1.6
10	4	-0.8	-1.8	-2.4	-2.9
15	3	-0.8	-1.9	-2.4	-2.5
20	2	-0.4	-0.9	-1.1	-0.8
25	1	0.7	1.9	2.8	3.5
All	15	-0.5	-1.2	-1.5	-1.7
	N	141	61	45	36

Note: This table is restricted to the subset of subcounty areas with institutions. Columns titled "1%, 2.5%, 5%" further restrict the analysis to subcounty areas where the institutional population exceeds 1%, 2.5%, and 5%, of total population.

Table 4d. MALPE, Total Population, TAV Technique, 10 Year Base Period, Not Accounting Separately for Institutions

Horizon	N	All	> 1%	> 2.5%	> 5%
5	5	0.2	0.5	0.4	0.4
10	4	1.9	1.9	1.2	0.7
15	3	4.8	3.3	1.8	0.6
20	2	9.4	8.9	6.8	5.4
25	1	23.3	21.2	19.3	18.2
All	15	4.3	3.9	3.0	2.4

Table 4e. MALPE, Total Population, TAV Technique, 10 Year Base Period, Accounting Separately for Institutions

Horizon	N	All	> 1%	> 2.5%	> 5%
5	5	0.4	1.0	1.1	1.2
10	4	2.6	3.5	3.3	3.2
15	3	6.7	7.7	7.6	7.5
20	2	12.3	15.5	15.6	15.9
25	1	26.7	29.3	30.1	31.3
All	15	5.6	6.8	6.9	6.9

Table 4f. Percentage Point Difference in MALPE (4e minus 4d)

Horizon	N	All	> 1%	> 2.5%	> 5%
5	5	0.2	0.5	0.6	0.8
10	4	0.7	1.6	2.1	2.5
15	3	1.9	4.4	5.8	6.9
20	2	2.9	6.6	8.8	10.5
25	1	3.5	8.2	10.8	13.2
All	15	1.2	2.9	3.8	4.6
	N	141	61	45	36

Note: This table is restricted to the subset of subcounty areas with institutions. Columns titled "1%, 2.5%, 5%" further restrict the analysis to subcounty areas where the institutional population exceeds 1%, 2.5%, and 5%, of total population.

Table 5a. MAPE, Total Population, TAV Technique, 10 Year Base Period, Not Accounting Separately for Annexations (Incorporated Places)

Horizon	N	All	> 1%	> 2.5%	> 5%
5	5	9.2	10.0	11.1	12.9
10	4	16.8	18.1	21.2	25.3
15	3	24.8	26.9	35.5	42.9
20	2	33.5	37.4	66.2	83.4
25	1	49.1	57.3	168.4	219.9
All	15	20.2	22.3	36.5	45.4

Table 5b. MAPE, Total Population, TAV Technique, 10 Year Base Period, Accounting Separately for Annexations (Incorporated Places)

Horizon	N	All	> 1%	> 2.5%	> 5%
5	5	9.6	10.5	11.8	13.9
10	4	16.6	17.8	20.4	24.1
15	3	23.8	25.3	31.9	37.7
20	2	31.0	33.4	56.3	69.0
25	1	45.0	50.2	158.7	203.9
All	15	19.5	21.1	33.9	41.4

Table 5c. Percentage Point Difference in MAPE (5b minus 5a)

Horizon	N	All	> 1%	> 2.5%	> 5%
5	5	0.4	0.6	0.7	0.9
10	4	-0.2	-0.4	-0.8	-1.2
15	3	-1.0	-1.6	-3.6	-5.1
20	2	-2.5	-4.1	-9.9	-14.4
25	1	-4.2	-7.1	-9.7	-16.1
All	15	-0.7	-1.2	-2.7	-4.0
	N	183	131	100	71

Note: This table is restricted to the subset of incorporated places with annexations. Columns titled "1%, 2.5%, 5%" further restrict the analysis to incorporated places where the annexed population exceeds 1%, 2.5%, and 5%, of total population.

Table 5d. MALPE, Total Population, TAV Technique, 10 Year Base Period, Not Accounting Separately for Annexations (Incorporated Places)

Horizon	N	All	> 1%	> 2.5%	> 5%
5	5	-0.3	0.0	0.6	0.8
10	4	1.9	2.9	5.3	6.5
15	3	6.2	8.3	16.1	20.2
20	2	12.2	16.5	45.0	58.5
25	1	25.9	34.8	145.1	193.5
All	15	5.0	6.9	20.5	26.7

Table 5e. MALPE, Total Population, TAV Technique, 10 Year Base Period, Accounting Separately for Annexations (Incorporated Places)

Horizon	N	All	> 1%	> 2.5%	> 5%
5	5	0.6	1.2	2.0	2.4
10	4	1.6	2.3	4.3	5.0
15	3	4.5	5.6	11.3	13.6
20	2	8.6	10.8	33.0	41.7
25	1	19.8	24.6	131.2	172.3
All	15	4.0	5.2	17.2	21.9

Table 5f. Percentage Point Difference in Absolute Values of MALPE (5e minus 5d)

Horizon	N	All	> 1%	> 2.5%	> 5%
5	5	0.3	1.2	1.4	1.7
10	4	-0.3	-0.6	-1.1	-1.5
15	3	-1.7	-2.7	-4.7	-6.6
20	2	-3.6	-5.6	-11.9	-16.8
25	1	-6.1	-10.2	-13.8	-21.2
All	15	-1.0	-1.7	-3.3	-4.8
	N	183	131	100	71

Note: This table is restricted to the subset of incorporated places with annexations. Columns titled "1%, 2.5%, 5%" further restrict the analysis to incorporated places where the annexed population exceeds 1%, 2.5%, and 5%, of total population.

Table 6a. MAPE, Total Population, TAV Technique, 10 Year Base Period,
Not Accounting Separately for Annexations (Unincorporated Areas)

Horizon	N	All	> 1%	> 2.5%	> 5%
5	5	6.1	7.4	7.8	14.6
10	4	12.2	14.4	14.3	22.5
15	3	20.4	23.9	22.6	30.8
20	2	31.3	36.6	34.0	51.0
25	1	63.8	76.4	67.5	124.1
All	15	17.8	21.1	20.0	32.1

Table 6b. MAPE, Total Population, TAV Technique, 10 Year Base Period,
Accounting Separately for Annexations (Unincorporated Areas)

Horizon	N	All	> 1%	> 2.5%	> 5%
5	5	6.1	7.4	7.9	15.1
10	4	12.3	14.7	14.7	23.6
15	3	20.9	24.9	23.9	34.1
20	2	32.8	39.5	38.3	64.9
25	1	68.0	84.2	78.9	160.2
All	15	18.4	22.2	21.7	37.5

Table 6c. Percentage Point Difference in MAPE (6b minus 6a)

Horizon	N	All	> 1%	> 2.5%	> 5%
5	5	0.0	0.0	0.0	0.5
10	4	0.1	0.3	0.3	1.0
15	3	0.5	1.0	1.3	3.4
20	2	1.6	2.9	4.3	13.9
25	1	4.2	7.8	11.4	36.1
All	15	0.6	1.2	1.7	5.4
	N	51	27	17	4

Note: This table is restricted to the subset of unincorporated areas with annexations. Columns titled "1%, 2.5%, 5%" further restrict the analysis to unincorporated areas where the annexed population exceeds 1%, 2.5%, and 5%, of total population.

Table 6d. MALPE, Total Population, TAV Technique, 10 Year Base Period, Not Accounting Separately for Annexations (Unincorporated Areas)

Horizon	N	All	> 1%	> 2.5%	> 5%
5	5	1.8	1.9	2.6	6.9
10	4	5.4	5.5	6.0	10.7
15	3	12.3	12.8	12.0	17.3
20	2	23.4	25.1	24.1	40.4
25	1	57.7	65.5	61.3	124.1
All	15	11.5	12.4	12.2	22.3

Table 6e. MALPE, Total Population, TAV Technique, 10 Year Base Period, Accounting Separately for Annexations (Unincorporated Areas)

Horizon	N	All	> 1%	> 2.5%	> 5%
5	5	1.3	1.1	1.4	3.9
10	4	5.6	6.0	6.7	12.3
15	3	13.4	14.7	14.8	24.9
20	2	25.8	29.3	30.2	58.8
25	1	62.5	74.1	73.5	160.2
All	15	12.2	13.8	14.1	28.1

Table 6f. Percentage Point Difference in Absolute Values of MALPE (6e minus 6d)

Horizon	N	All	> 1%	> 2.5%	> 5%
5	5	-0.4	-0.8	-1.1	-3.1
10	4	0.3	0.5	0.6	1.5
15	3	1.1	1.9	2.7	7.6
20	2	2.3	4.2	6.1	18.5
25	1	4.8	8.6	12.2	36.1
All	15	0.8	1.4	2.0	5.8
	N	51	27	17	4

Note: This table is restricted to the subset of unincorporated areas with annexations. Columns titled "1%, 2.5%, 5%" further restrict the analysis to unincorporated areas where the annexed population exceeds 1%, 2.5%, and 5%, of total population.

Table 7a. MAPE by Projection Horizon and Growth Rate, 10 Year Base Period

Horizon	Growth Rate	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
10	< -10%	36.3	39.4	54.8	28.8	27.7	17.0	26.2	28.6
10	-10% to 0%	12.7	13.0	26.2	12.5	23.9	10.7	11.1	12.0
10	0% to 10%	10.6	10.8	16.6	10.7	24.4	10.8	10.7	10.6
10	10% to 25%	12.0	12.8	14.0	12.7	22.0	14.2	12.1	11.9
10	25% to 50%	15.3	17.3	17.4	19.6	20.2	20.2	15.2	15.9
10	> 50%	22.1	26.2	31.3	68.0	23.2	32.9	26.1	23.9
10	Total	17.1	19.0	24.1	30.0	23.0	19.1	17.4	17.1
20	< -10%	62.3	70.1	88.4	48.9	83.9	26.7	41.4	49.6
20	-10% to 0%	17.5	18.9	57.8	16.9	53.5	14.7	15.1	16.5
20	0% to 10%	15.1	16.0	40.4	15.4	52.2	15.5	15.5	14.9
20	10% to 25%	20.1	24.3	32.0	22.7	51.4	22.9	21.1	20.3
20	25% to 50%	27.2	37.6	34.3	43.5	49.0	30.9	29.2	30.5
20	> 50%	41.4	59.2	80.8	604.6	45.5	50.8	130.7	52.5
20	Total	30.5	40.2	56.1	231.5	51.8	31.0	61.6	34.1

Table 7b. MALPE by Projection Horizon and Growth Rate, 10 Year Base Period

Horizon	Growth Rate	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
10	< -10%	-34.8	-38.0	-53.9	-27.0	17.5	-5.9	-23.7	-26.4
10	-10% to 0%	-8.5	-9.1	-23.9	-8.2	19.9	-4.0	-5.6	-7.5
10	0% to 10%	-0.6	0.0	-11.7	-0.4	20.5	-4.9	0.5	-1.2
10	10% to 25%	2.7	4.9	-4.0	5.0	15.9	-10.1	2.4	2.6
10	25% to 50%	5.8	10.2	6.2	13.8	11.7	-16.2	5.3	7.5
10	> 50%	6.8	16.0	23.1	64.3	1.8	-28.1	14.0	11.8
10	Total	-0.2	3.3	-2.2	17.8	13.2	-13.5	3.1	2.1
20	< -10%	-57.5	-66.2	-88.4	-43.0	71.2	-6.6	-31.7	-43.3
20	-10% to 0%	-14.1	-16.1	-56.5	-13.4	49.3	-5.8	-9.4	-12.3
20	0% to 10%	-2.2	0.3	-37.0	-1.4	47.8	-10.4	-0.5	-3.0
20	10% to 25%	3.3	10.9	-19.0	9.7	40.0	-19.4	4.3	3.9
20	25% to 50%	13.2	28.6	9.4	36.8	38.4	-25.4	16.8	19.4
20	> 50%	16.4	46.2	69.5	601.3	17.9	-42.4	118.2	37.2
20	Total	3.9	17.6	4.7	215.3	37.8	-23.5	42.6	12.8

Table 8a. MAPE by Projection Horizon and Population Size, 10 Year Base Period

Horizon	Population Size	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
10	< 500	43.1	47.4	57.3	65.5	41.2	26.9	42.1	41.2
10	500 to 1,000	20.3	22.3	30.3	25.9	29.6	15.7	19.6	20.0
10	1,000 to 2,000	19.5	21.3	27.4	30.8	24.6	18.2	20.0	19.5
10	2,000 to 3,000	16.8	18.4	21.7	26.6	23.4	16.2	17.0	16.7
10	3,000 to 5,000	11.7	13.2	16.4	15.2	20.8	15.3	11.6	12.0
10	5,000 to 10,000	13.4	14.2	18.0	19.8	21.9	17.7	12.8	13.0
10	10,000 to 25,000	11.2	12.9	17.2	32.9	19.1	19.3	13.1	11.7
10	25,000 to 50,000	11.3	12.9	17.1	33.0	16.4	20.9	13.1	11.8
10	> 50,000	9.0	11.0	14.0	19.1	12.3	20.7	9.3	9.7
10	Total	17.1	19.0	24.1	30.0	23.0	19.1	17.4	17.1
20	< 500	76.8	94.6	128.4	589.2	89.7	35.9	154.8	82.2
20	500 to 1,000	34.8	42.6	57.0	62.0	68.4	27.8	38.2	35.8
20	1,000 to 2,000	33.8	44.1	63.5	193.1	52.1	29.1	60.1	39.1
20	2,000 to 3,000	35.1	45.8	53.5	175.0	52.3	25.4	55.1	38.5
20	3,000 to 5,000	18.8	25.1	32.4	44.3	47.4	26.2	21.5	20.6
20	5,000 to 10,000	22.9	26.8	36.5	53.3	47.8	31.0	23.6	22.4
20	10,000 to 25,000	19.7	29.8	46.2	472.8	42.9	31.3	93.6	24.3
20	25,000 to 50,000	19.8	32.0	52.0	379.6	36.1	35.2	79.0	27.7
20	> 50,000	15.0	25.0	37.8	60.3	29.8	34.6	21.7	20.4
20	Total	30.5	40.2	56.1	231.5	51.8	31.0	61.6	34.1

Table 8b. MALPE by Projection Horizon and Population Size, 10 Year Base Period

Horizon	Population Size	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
10	< 500	1.1	4.4	-4.5	32.8	30.3	-1.8	10.4	7.0
10	500 to 1,000	0.3	1.7	-10.2	8.5	22.2	-6.1	2.7	1.9
10	1,000 to 2,000	-0.1	2.7	-3.7	14.7	13.7	-12.3	2.5	1.5
10	2,000 to 3,000	1.5	4.2	-1.7	15.4	14.0	-10.1	3.9	2.7
10	3,000 to 5,000	-2.0	0.9	-6.2	6.0	12.1	-13.0	-0.4	-0.8
10	5,000 to 10,000	-2.4	0.4	-5.9	9.5	9.5	-15.3	-0.7	-1.3
10	10,000 to 25,000	-0.4	3.9	1.0	26.6	7.7	-18.5	3.4	1.5
10	25,000 to 50,000	-0.3	4.6	3.2	26.5	6.5	-20.4	3.4	2.3
10	> 50,000	0.3	5.5	5.4	15.2	6.2	-20.1	2.1	3.4
10	Total	-0.2	3.3	-2.2	17.8	13.2	-13.5	3.1	2.1
20	< 500	22.0	38.1	34.5	545.8	76.7	-3.8	118.9	37.6
20	500 to 1,000	2.6	9.6	-16.2	37.7	56.0	-14.4	12.5	7.8
20	1,000 to 2,000	7.8	20.7	9.4	176.7	37.5	-22.4	38.3	15.9
20	2,000 to 3,000	10.8	23.0	5.0	159.8	40.7	-15.1	37.4	17.2
20	3,000 to 5,000	-3.5	7.7	-13.9	30.7	33.7	-24.3	5.1	1.5
20	5,000 to 10,000	-5.4	4.9	-15.5	38.1	25.9	-27.8	3.4	-0.5
20	10,000 to 25,000	1.0	17.4	7.0	464.8	28.6	-30.7	81.4	10.9
20	25,000 to 50,000	3.8	23.8	22.7	374.4	24.4	-35.0	69.0	16.9
20	> 50,000	-0.3	17.4	13.7	54.3	22.4	-33.8	12.3	11.7
20	Total	3.9	17.6	4.7	215.3	37.8	-23.5	42.6	12.8

Table 9. Mean % Population Growth during Base Period by Population Size at Launch Year

Population Size at Launch Year	% Growth 1970-1980	% Growth 1975-1985	% Growth 1980-1990	% Growth 1985-1995	% Growth 1990-2000	% Growth 1970-2000
< 500	68.5	10.1	4.7	7.6	36.9	25.6
500 to 1,000	38.5	13.9	6.7	15.3	15.1	17.9
1,000 to 2,000	92.4	28.4	13.9	14.4	13.6	32.6
2,000 to 3,000	65.3	29.8	17.0	22.5	26.6	32.2
3,000 to 5,000	47.0	25.2	36.2	14.3	18.7	28.3
5,000 to 10,000	51.8	39.1	36.7	27.3	23.5	35.7
10,000 to 25,000	165.8	55.0	47.8	39.0	27.3	67.0
25,000 to 50,000	153.3	69.3	39.2	31.9	32.1	65.1
> 50,000	62.5	47.3	51.4	35.0	26.4	44.5
Total	85.0	36.3	30.3	24.9	24.8	40.2

Table 10a. MAPE by Projection Horizon and Population Size and Growth Rate, 10 Year Base Period

Horizon	Size	Growth Rate	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
10	< 2,000	< 0%	29.8	32.0	48.2	24.8	30.3	17.2	23.1	24.8
10	2,000 to 10,000	< 0%	13.2	13.8	24.0	12.2	18.4	8.9	10.2	11.5
10	> 10,000	< 0%	10.5	11.1	24.7	10.0	22.2	6.2	7.9	9.2
10	< 2,000	0% to 50%	19.1	20.3	23.1	21.1	29.4	17.3	19.0	19.4
10	2,000 to 10,000	0% to 50%	11.6	12.6	14.9	13.1	21.9	13.6	11.8	11.8
10	> 10,000	0% to 50%	8.8	9.7	11.4	10.6	16.8	14.8	8.8	8.9
10	< 2,000	> 50%	43.8	53.0	59.7	107.1	43.4	33.8	52.1	48.6
10	2,000 to 10,000	> 50%	21.9	24.2	26.6	55.6	24.8	34.8	23.0	22.5
10	> 10,000	> 50%	13.4	16.6	21.9	57.4	14.9	31.6	17.1	14.9
20	< 2,000	< 0%	48.6	54.3	81.2	40.6	84.7	25.3	34.9	41.0
20	2,000 to 10,000	< 0%	23.6	25.7	55.6	19.3	43.4	16.7	17.4	19.3
20	> 10,000	< 0%	17.5	20.1	59.5	15.3	49.3	5.6	12.5	14.3
20	< 2,000	0% to 50%	29.1	35.8	45.2	37.5	61.9	24.4	30.4	30.5
20	2,000 to 10,000	0% to 50%	20.7	26.3	31.9	27.3	49.2	22.1	22.1	22.2
20	> 10,000	0% to 50%	14.9	19.8	28.8	21.1	42.0	24.7	15.9	15.8
20	< 2,000	> 50%	78.2	103.1	140.1	818.0	67.4	52.5	200.6	95.4
20	2,000 to 10,000	> 50%	38.2	47.7	53.0	273.6	50.6	54.6	64.9	41.0
20	> 10,000	> 50%	22.3	39.9	60.5	649.1	30.2	47.8	124.1	33.9

Table 10b. MALPE by Projection Horizon and Population Size and Growth Rate, 10 Year Base Period

Horizon	Size	Growth Rate	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
10	< 2,000	< 0%	-25.7	-28.1	-45.7	-20.5	20.6	-5.9	-17.6	-20.0
10	2,000 to 10,000	< 0%	-11.5	-12.2	-23.3	-10.3	15.9	-3.2	-7.4	-9.3
10	> 10,000	< 0%	-9.8	-10.5	-24.7	-9.2	19.7	-4.3	-6.5	-8.4
10	< 2,000	0% to 50%	6.2	8.7	-2.2	9.4	22.9	-6.4	6.4	6.4
10	2,000 to 10,000	0% to 50%	2.0	4.4	-3.7	5.3	15.5	-10.3	2.2	2.3
10	> 10,000	0% to 50%	0.4	3.0	-3.1	4.6	11.0	-14.0	0.3	0.9
10	< 2,000	> 50%	28.8	40.8	48.8	100.5	23.3	-13.7	38.1	35.3
10	2,000 to 10,000	> 50%	-1.6	6.0	10.6	49.3	-8.0	-33.8	3.7	1.5
10	> 10,000	> 50%	1.6	10.7	18.2	55.9	-1.9	-31.4	8.8	7.1
20	< 2,000	< 0%	-41.8	-48.6	-79.9	-33.0	72.3	-8.2	-23.2	-32.9
20	2,000 to 10,000	< 0%	-22.2	-24.9	-55.6	-17.6	40.3	-2.6	-13.7	-16.8
20	> 10,000	< 0%	-17.4	-19.9	-59.5	-15.1	49.3	-4.2	-11.1	-14.2
20	< 2,000	0% to 50%	10.9	20.8	-11.7	22.5	53.3	-14.4	13.6	13.4
20	2,000 to 10,000	0% to 50%	4.8	13.4	-12.3	15.1	39.2	-18.6	6.9	6.7
20	> 10,000	0% to 50%	0.8	9.8	-17.3	12.4	33.5	-23.7	2.6	3.1
20	< 2,000	> 50%	53.6	85.7	126.4	813.0	39.3	-24.3	182.3	76.2
20	2,000 to 10,000	> 50%	-3.1	22.3	27.3	265.7	2.4	-52.2	43.7	11.4
20	> 10,000	> 50%	4.7	34.9	57.4	648.9	12.8	-47.7	118.5	27.2

Table 11a. MAPE by Target Year and Growth Rate, 10 Year Base Period

Year	Horizon	Growth Rate	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
All	All	< -10%	41.0	44.9	59.0	32.5	42.6	18.8	28.6	32.7
All	All	-10% to 0%	12.8	13.4	32.3	12.5	30.2	10.9	11.3	12.2
All	All	0% to 10%	10.8	11.1	21.9	10.9	29.8	11.1	10.9	10.7
All	All	10% to 25%	12.8	14.7	17.8	14.1	29.0	14.8	13.2	12.8
All	All	25% to 50%	17.1	21.6	20.4	24.6	26.8	20.9	17.7	18.5
All	All	> 50%	25.8	34.7	44.6	354.0	28.3	34.4	77.7	31.1

Table 11b. Average Rank by Growth Rate, 10 Year Base Period

Year	Horizon	Growth Rate	LIN	SHR	SFT	EXP	COS	CON
All	All	< -10%	3.6	4.8	5.9	2.3	3.3	1.1
All	All	-10% to 0%	3.1	4.1	5.6	2.1	5.2	1.0
All	All	0% to 10%	1.5	3.2	5.0	2.3	6.0	3.1
All	All	10% to 25%	1.3	3.3	4.0	2.8	5.8	3.8
All	All	25% to 50%	1.4	2.9	2.9	4.9	4.9	4.1
All	All	> 50%	1.5	3.1	4.4	5.9	2.1	4.1

Table 12a. MAPE by Projection Horizon and Technique, 10 Year Base Period

Horizon	LIN	SHR	SFT	EXP	COS	CON	AV6	AV4	C1	C2	C3	C4	C5
5	9.9	10.4	12.1	12.7	11.9	11.5	9.5	9.6	9.0	9.4	10.5	10.2	8.7
10	17.1	19.0	24.1	30.0	23.0	19.1	17.4	17.1	15.5	16.4	19.0	17.9	14.4
15	23.6	28.5	38.9	71.2	35.6	25.2	28.9	24.7	21.1	22.8	27.8	25.2	19.0
20	30.5	40.2	56.1	231.5	51.8	31.0	61.6	34.1	27.9	30.5	38.3	33.8	24.1
25	41.4	64.3	89.3	1,216.7	80.9	36.1	238.0	53.5	38.8	44.3	57.2	48.5	30.3

Table 12b. MALPE by Projection Horizon and Technique, 10 Year Base Period

Horizon	LIN	SHR	SFT	EXP	COS	CON	AV6	AV4	C1	C2	C3	C4	C5
5	-0.6	0.6	-1.4	4.9	5.2	-7.6	0.2	0.2	0.9	0.0	-0.9	-1.6	-1.3
10	-0.2	3.3	-2.2	17.8	13.2	-13.5	3.1	2.1	2.4	1.2	-0.3	-1.6	-2.0
15	0.4	7.7	-2.4	55.4	23.4	-19.1	10.9	5.2	4.1	2.7	1.3	-0.8	-3.0
20	3.9	17.6	4.7	215.3	37.8	-23.5	42.6	12.8	7.8	7.1	6.7	3.2	-3.3
25	12.4	42.1	28.9	1,201.4	67.0	-28.5	220.6	31.7	16.1	18.9	21.1	14.5	-2.3

Note: Composite averages were created from the following techniques

C1 = CON when growth rate < 0%
= LIN when growth rate > 0%

C2 = Average of EXP & CON when growth rate < 0%
= Average of LIN & EXP when growth rate 0% to 25%
= Average of LIN & SFT when growth rate 25% to 50%
= Average of LIN & COS when growth rate > 50%

C3 = Average of LIN/SHR/EXP/COS/CON when growth rate < 0%
= Average of LIN/SHR/SFT/EXP/CON when growth rate 0% to 50%
= Average of LIN/SHR/SFT/COS/CON when growth rate > 50%

C4 = Average of LIN/EXP/COS/CON when growth rate < -10%
= Average of LIN/SHR/EXP/CON when growth rate -10% to 25%
= Average of LIN/SHR/SFT/CON when growth rate 25% to 50%
= Average of LIN/SHR/COS/CON when growth rate > 50%

C5 = CON when growth rate < 0%
= CON when growth rate > 0% and size < 2,000
= LIN when growth rate > 0% and size > 2,000

Appendix Table 1a. MAPE, Total Population, 10 Year Base Period,
Not Accounting Separately for Institutions (Subcounty Areas with Institutions; n=141)

Horizon	N	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
5	5	6.9	7.2	8.0	8.5	8.4	11.5	6.7	6.9
10	4	11.9	13.2	15.7	17.9	16.5	19.8	11.6	12.0
15	3	15.8	20.0	25.1	32.0	26.1	27.1	16.7	17.3
20	2	20.3	28.1	36.3	54.2	37.5	33.9	24.4	23.4
25	1	24.5	44.9	57.9	111.9	59.1	39.4	40.8	35.7
All	15	13.0	16.7	20.6	28.7	21.4	21.7	14.6	14.5

Appendix Table 1b. MAPE, Total Population, 10 Year Base Period,
Accounting Separately for Institutions (Subcounty areas with Institutions; n=141)

Horizon	N	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
5	5	6.5	6.8	7.5	7.9	8.0	10.8	6.3	6.4
10	4	10.9	12.3	14.7	16.9	15.8	18.7	10.8	11.2
15	3	14.8	19.0	23.8	31.2	25.1	25.4	16.0	16.5
20	2	19.2	27.5	35.3	54.1	36.9	32.0	24.2	23.1
25	1	24.1	45.3	57.8	113.8	59.4	37.4	41.8	36.4
All	15	12.2	16.0	19.7	28.2	20.8	20.5	14.2	13.9

Appendix Table 1c. Percentage Point Difference in MAPE (1b minus 1a)

Horizon	N	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
5	5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.7	-0.4	-0.4
10	4	-0.9	-0.9	-1.1	-1.0	-0.7	-1.1	-0.8	-0.8
15	3	-1.1	-1.0	-1.3	-0.9	-1.0	-1.7	-0.7	-0.8
20	2	-1.1	-0.7	-1.0	-0.1	-0.7	-1.9	-0.2	-0.4
25	1	-0.4	0.4	-0.1	1.9	0.4	-2.0	1.0	0.7
All	15	-0.8	-0.7	-0.8	-0.5	-0.6	-1.3	-0.4	-0.5

Appendix Table 1d. MALPE, Total Population, 10 Year Base Period,
Not Accounting Separately for Institutions (Subcounty Areas with Institutions; n=141)

Horizon	N	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
5	5	-0.7	0.8	-0.3	3.2	3.2	-9.3	-0.5	0.2
10	4	-0.7	3.4	0.3	10.3	8.7	-16.7	0.9	1.9
15	3	-0.8	7.8	1.3	22.8	16.2	-23.2	4.0	4.8
20	2	-0.8	14.5	4.3	44.7	26.7	-29.1	10.1	9.4
25	1	2.0	33.2	20.6	104.0	49.2	-35.7	28.9	23.3
All	15	-0.5	6.9	2.2	21.2	13.5	-18.5	4.1	4.3

Appendix Table 1e. MALPE, Total Population, 10 Year Base Period,
Accounting Separately for Institutions (Subcounty areas with Institutions; n=141)

Horizon	N	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
5	5	-0.5	0.9	-0.1	3.2	3.4	-8.7	-0.3	0.4
10	4	0.1	4.0	1.0	10.6	9.2	-15.3	1.6	2.6
15	3	1.3	9.7	3.3	24.4	17.8	-21.0	5.8	6.7
20	2	2.4	17.6	7.6	47.4	29.0	-26.5	12.2	12.3
25	1	5.6	36.9	24.2	107.6	52.1	-32.7	30.3	26.7
All	15	0.8	8.1	3.5	22.3	14.5	-16.9	5.1	5.6

Appendix Table 1f. Percentage Point Difference in Absolute Values of MALPE (1e minus 1d)

Horizon	N	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
5	5	-0.2	0.2	-0.2	0.0	0.1	-0.7	-0.2	0.2
10	4	-0.6	0.6	0.7	0.4	0.5	-1.3	0.7	0.7
15	3	0.5	1.9	2.0	1.6	1.5	-2.2	1.8	1.9
20	2	1.6	3.1	3.2	2.6	2.3	-2.6	2.2	2.9
25	1	3.7	3.7	3.6	3.7	2.9	-3.0	1.4	3.5
All	15	0.3	1.3	1.3	1.0	1.0	-1.6	1.0	1.2

Appendix Table 2a. MAPE, Total Population, 10 Year Base Period,
Not Accounting Separately for Institutions (Subcounty Areas with Institutions
> 1% of Total Population; n=61)

Horizon	N	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
5	5	8.3	8.6	9.0	9.5	8.7	12.2	8.0	8.2
10	4	14.4	15.4	16.8	18.3	16.2	21.1	13.9	14.2
15	3	19.4	22.0	24.3	28.3	24.0	29.2	19.5	20.1
20	2	23.9	28.2	30.8	41.6	31.9	36.0	24.9	25.1
25	1	27.0	41.5	46.9	72.8	44.7	39.4	34.3	34.6
All	15	15.5	17.9	19.6	24.1	19.3	23.0	15.9	16.2

Appendix Table 2b. MAPE, Total Population, 10 Year Base Period,
Accounting Separately for Institutions (Subcounty Areas with Institutions
> 1% of Total Population; n=61)

Horizon	N	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
5	5	7.2	7.6	8.1	8.3	7.7	10.7	7.0	7.2
10	4	12.2	13.4	14.6	15.9	14.7	18.6	12.0	12.4
15	3	17.0	19.7	21.5	26.3	22.0	25.4	17.7	18.2
20	2	21.4	26.7	29.5	41.5	30.8	31.8	23.8	24.2
25	1	26.2	42.7	48.4	77.3	46.4	34.9	36.0	36.5
All	15	13.6	16.5	18.1	23.0	18.1	20.1	14.6	15.0

Appendix Table 2c. Percentage Point Difference in MAPE (2b minus 2a)

Horizon	N	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
5	5	-1.1	-1.1	-1.0	-1.2	-1.0	-1.6	-1.0	-1.0
10	4	-2.2	-2.0	-2.2	-2.4	-1.5	-2.5	-1.9	-1.8
15	3	-2.5	-2.4	-2.7	-2.0	-2.1	-3.8	-1.9	-1.9
20	2	-2.5	-1.5	-1.2	-0.1	-1.1	-4.3	-1.2	-0.9
25	1	-0.9	1.2	1.4	4.5	1.6	-4.4	1.7	1.9
All	15	-1.8	-1.5	-1.5	-1.2	-1.2	-2.8	-1.2	-1.2

Appendix Table 2d. MALPE, Total Population, 10 Year Base Period, Not Accounting Separately for Institutions (Subcounty Areas with Institutions > 1% of Total Population; n=61)

Horizon	N	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
5	5	-0.7	0.7	0.1	2.8	2.9	-8.3	-0.4	0.5
10	4	-1.1	2.4	1.1	7.8	6.7	-14.9	0.3	1.9
15	3	-2.4	4.5	2.0	14.6	10.8	-21.2	1.4	3.3
20	2	-1.0	11.1	7.2	29.8	19.8	-25.7	6.9	8.9
25	1	2.3	26.8	23.3	63.9	35.6	-32.2	20.0	21.2
All	15	-1.0	5.0	3.2	14.2	9.9	-16.6	2.5	3.9

Appendix Table 2e. MALPE, Total Population, 10 Year Base Period, Accounting Separately for Institutions (Subcounty Areas with Institutions > 1% of Total Population; n=61)

Horizon	N	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
5	5	-0.1	1.1	0.5	2.9	3.3	-6.9	0.1	1.0
10	4	0.6	3.9	2.5	8.7	8.0	-11.9	2.0	3.5
15	3	2.4	9.0	6.5	18.4	14.6	-16.2	5.8	7.7
20	2	6.3	18.3	14.6	36.0	25.5	-19.8	13.3	15.5
25	1	10.7	35.6	32.0	72.5	42.6	-25.5	27.4	29.3
All	15	2.1	8.0	6.2	16.6	12.4	-13.0	5.3	6.8

Appendix Table 2f. Percentage Point Difference in Absolute Values of MALPE (2e minus 2d)

Horizon	N	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
5	5	-0.6	0.4	0.4	0.1	0.4	-1.5	-0.3	0.5
10	4	-0.5	1.4	1.5	0.9	1.4	-3.0	1.6	1.6
15	3	-0.1	4.5	4.5	3.8	3.9	-5.0	4.4	4.4
20	2	5.3	7.2	7.4	6.2	5.7	-5.9	6.4	6.6
25	1	8.4	8.9	8.7	8.6	7.1	-6.7	7.5	8.2
All	15	1.2	3.0	3.0	2.4	2.5	-3.5	2.9	2.9

Appendix Table 3a. MAPE, Total Population, 10 Year Base Period,
Not Accounting Separately for Institutions (Subcounty Areas with Institutions
> 2.5% of Total Population; n=45)

Horizon	N	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
5	5	8.9	9.3	9.6	10.1	9.1	12.3	8.6	8.8
10	4	15.6	16.5	17.7	18.9	16.5	21.3	14.9	15.2
15	3	21.4	23.0	24.5	27.7	24.0	29.9	21.0	21.2
20	2	26.4	28.7	30.1	39.6	31.3	36.6	26.1	26.1
25	1	27.8	40.8	44.9	67.9	43.0	38.8	33.5	34.1
All	15	16.8	18.6	19.8	23.8	19.3	23.2	16.7	17.0

Appendix Table 3b. MAPE, Total Population, 10 Year Base Period,
Accounting Separately for Institutions (Subcounty Areas with Institutions
> 2.5% of Total Population; n=45)

Horizon	N	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
5	5	7.5	7.9	8.3	8.5	7.9	10.2	7.3	7.6
10	4	12.7	13.8	14.8	15.6	14.8	17.9	12.4	12.8
15	3	18.2	19.9	21.0	25.1	21.6	24.7	18.6	18.9
20	2	23.0	26.8	28.5	39.5	30.0	30.9	24.6	25.0
25	1	26.6	42.5	46.9	73.6	45.5	32.9	35.8	36.9
All	15	14.3	16.7	17.8	22.2	18.0	19.5	15.1	15.5

Appendix Table 3c. Percentage Point Difference in MAPE (3b minus 3a)

Horizon	N	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
5	5	-1.5	-1.4	-1.3	-1.6	-1.2	-2.1	-1.3	-1.3
10	4	-2.9	-2.7	-2.9	-3.2	-1.7	-3.4	-2.5	-2.4
15	3	-3.3	-3.0	-3.5	-2.6	-2.4	-5.1	-2.4	-2.4
20	2	-3.4	-1.9	-1.6	-0.2	-1.3	-5.7	-1.5	-1.1
25	1	-1.2	1.7	2.0	5.7	2.6	-5.8	2.3	2.8
All	15	-2.4	-1.9	-2.0	-1.6	-1.3	-3.8	-1.6	-1.5

Appendix Table 3d. MALPE, Total Population, 10 Year Base Period,
Not Accounting Separately for Institutions (Subcounty Areas with Institutions
> 2.5% of Total Population; n=45)

Horizon	N	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
5	5	-0.8	0.5	0.0	2.6	2.5	-8.0	-0.5	0.4
10	4	-1.5	1.6	0.6	6.6	5.1	-14.5	-0.4	1.2
15	3	-3.2	2.6	0.7	11.5	7.8	-20.6	-0.2	1.8
20	2	-2.0	8.3	5.0	25.3	16.3	-24.9	4.7	6.8
25	1	1.4	23.8	22.2	57.7	32.2	-31.6	17.6	19.3
All	15	-1.5	3.8	2.4	12.1	8.1	-16.1	1.5	3.0

Appendix Table 3e. MALPE, Total Population, 10 Year Base Period,
Accounting Separately for Institutions (Subcounty Areas with Institutions
> 2.5% of Total Population; n=45)

Horizon	N	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
5	5	0.0	1.0	0.5	2.7	3.1	-6.1	0.2	1.1
10	4	0.7	3.5	2.4	7.7	7.2	-10.6	1.8	3.3
15	3	3.2	8.6	6.7	16.7	13.1	-14.1	5.7	7.6
20	2	7.7	17.9	14.8	33.5	23.9	-17.3	13.2	15.6
25	1	12.4	35.6	33.7	68.9	41.7	-22.9	27.4	30.1
All	15	2.7	7.7	6.4	15.4	11.5	-11.5	5.3	6.9

Appendix Table 3f. Percentage Point Difference in Absolute Values of MALPE
(3e minus 3d)

Horizon	N	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
5	5	-0.7	0.5	0.5	0.1	0.6	-1.9	-0.3	0.6
10	4	-0.8	1.9	1.8	1.1	2.1	-3.9	1.4	2.1
15	3	0.0	6.0	6.0	5.2	5.3	-6.5	5.5	5.8
20	2	5.7	9.6	9.8	8.2	7.6	-7.6	8.5	8.8
25	1	11.0	11.8	11.5	11.2	9.5	-8.7	9.8	10.8
All	15	1.2	4.0	3.9	3.2	3.5	-4.6	3.8	3.8

Appendix Table 4a. MAPE, Total Population, 10 Year Base Period,
Not Accounting Separately for Institutions (Subcounty Areas with Institutions
> 5% of Total Population; n=36)

Horizon	N	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
5	5	8.8	9.2	9.2	10.0	8.9	12.6	8.4	8.7
10	4	15.8	16.4	17.1	19.0	16.2	22.2	14.8	15.1
15	3	22.0	22.7	22.9	27.9	23.0	31.4	20.8	21.0
20	2	27.7	28.4	27.0	40.1	30.5	38.4	25.8	25.7
25	1	29.2	39.5	40.9	66.9	41.2	39.9	32.1	32.7
All	15	17.2	18.4	18.6	23.8	18.7	24.2	16.5	16.7

Appendix Table 4b. MAPE, Total Population, 10 Year Base Period,
Accounting Separately for Institutions (Subcounty Areas with Institutions
> 5% of Total Population; n=36)

Horizon	N	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
5	5	7.0	7.4	7.7	8.0	7.6	10.1	6.9	7.1
10	4	12.3	13.1	13.7	14.9	14.3	18.2	11.8	12.2
15	3	18.2	19.4	19.7	24.7	20.6	25.4	18.3	18.5
20	2	23.8	26.3	26.9	39.6	29.7	31.7	24.4	24.9
25	1	27.7	41.3	45.1	72.9	44.7	32.9	34.6	36.2
All	15	14.3	16.1	16.8	21.7	17.4	19.7	14.7	15.0

Appendix Table 4c. Percentage Point Difference in MAPE (4b minus 4a)

Horizon	N	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
5	5	-1.8	-1.7	-1.5	-2.0	-1.3	-2.5	-1.6	-1.6
10	4	-3.5	-3.3	-3.4	-4.1	-1.9	-4.0	-3.0	-2.9
15	3	-3.8	-3.3	-3.1	-3.2	-2.3	-6.0	-2.5	-2.5
20	2	-3.9	-2.0	-0.1	-0.5	-0.8	-6.7	-1.4	-0.8
25	1	-1.6	1.7	4.1	6.0	3.5	-7.0	2.5	3.5
All	15	-2.9	-2.3	-1.8	-2.1	-1.3	-4.5	-1.8	-1.7

Appendix Table 4d. MALPE, Total Population, 10 Year Base Period,
Not Accounting Separately for Institutions (Subcounty Areas with Institutions
> 5% of Total Population; n=36)

Horizon	N	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
5	5	-0.9	0.4	0.0	2.7	2.0	-7.9	-0.6	0.4
10	4	-2.0	1.2	0.2	6.4	3.7	-14.4	-0.8	0.7
15	3	-4.4	1.5	-0.3	10.6	5.3	-20.4	-1.3	0.6
20	2	-3.2	7.1	3.7	24.4	13.0	-24.5	3.4	5.4
25	1	1.3	23.0	20.4	57.0	27.9	-30.9	16.4	18.2
All	15	-2.0	3.2	1.8	11.8	6.3	-15.9	0.9	2.4

Appendix Table 4e. MALPE, Total Population, 10 Year Base Period,
Accounting Separately for Institutions (Subcounty Areas with Institutions
> 5% of Total Population; n=36)

Horizon	N	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
5	5	0.0	1.1	0.6	2.8	3.0	-5.7	0.3	1.2
10	4	0.6	3.4	2.3	7.7	6.6	-9.8	1.8	3.2
15	3	3.2	8.5	6.6	16.6	12.3	-12.8	5.7	7.5
20	2	8.4	18.3	15.3	34.0	23.2	-15.4	13.8	15.9
25	1	14.4	37.1	35.0	69.7	40.9	-20.6	28.9	31.3
All	15	2.9	7.9	6.5	15.5	11.1	-10.5	5.5	6.9

Appendix Table 4f. Percentage Point Difference in Absolute Values of MALPE
(4e minus 4d)

Horizon	N	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
5	5	-0.8	0.6	0.5	0.1	1.0	-2.2	-0.3	0.8
10	4	-1.4	2.2	2.1	1.3	2.9	-4.6	1.0	2.5
15	3	-1.2	6.9	6.3	6.0	7.0	-7.6	4.5	6.9
20	2	5.2	11.2	11.6	9.5	10.3	-9.0	10.4	10.5
25	1	13.2	14.1	14.6	12.8	13.0	-10.3	12.4	13.2
All	15	0.9	4.6	4.7	3.7	4.7	-5.4	4.6	4.6

Appendix Table 5a. MAPE, Total Population, 10 Year Base Period, Not Accounting Separately for Annexations (Incorporated Places with Annexations; n=183)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	8.8	9.1	9.8	11.9	9.6	9.2
10	4	15.2	16.2	19.0	30.0	19.2	16.8
15	3	20.3	23.5	29.6	74.4	35.1	24.8
20	2	25.7	31.3	40.5	246.7	83.1	33.5
25	1	32.6	44.4	60.5	1,376.0	373.6	49.1
All	15	16.6	19.2	23.7	151.5	51.3	20.2

Appendix Table 5b. MAPE, Total Population, 10 Year Base Period, Accounting Separately for Annexations (Incorporated Places with Annexations; n=183)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	9.2	9.5	10.2	12.2	10.0	9.6
10	4	15.2	16.1	18.7	28.7	18.8	16.6
15	3	20.0	22.7	28.5	69.1	33.3	23.8
20	2	24.7	29.2	38.3	231.8	78.2	31.0
25	1	31.3	40.9	56.9	1,349.0	365.4	45.0
All	15	16.5	18.6	23.0	146.4	49.8	19.5

Appendix Table 5c. Percentage Point Difference in MAPE (5b minus 5a)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	0.4	0.4	0.4	0.2	0.4	0.4
10	4	0.0	-0.2	-0.2	-1.3	-0.3	-0.2
15	3	-0.4	-0.8	-1.1	-5.3	-1.8	-1.0
20	2	-1.0	-2.1	-2.2	-14.9	-4.9	-2.5
25	1	-1.3	-3.4	-3.7	-27.1	-8.2	-4.2
All	15	-0.2	-0.6	-0.7	-5.1	-1.5	-0.7

Appendix Table 5d. MALPE, Total Population, 10 Year Base Period, Not Accounting Separately for Annexations (Incorporated Places with Annexations; n=183)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	-1.8	-0.7	-0.7	4.2	0.3	-0.3
10	4	-2.2	1.0	0.7	18.2	4.4	1.9
15	3	-2.1	4.4	3.7	59.9	16.5	6.2
20	2	-1.8	9.3	9.6	230.7	61.9	12.2
25	1	0.1	20.4	24.0	1,359.9	351.1	25.9
All	15	-1.8	3.5	3.6	139.7	36.2	5.0

Appendix Table 5e. MALPE, Total Population, 10 Year Base Period, Accounting Separately for Annexations (Incorporated Places with Annexations; n=183)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	-0.8	0.2	0.2	4.8	1.1	0.6
10	4	-2.2	0.7	0.2	16.7	3.8	1.6
15	3	-3.1	2.8	1.6	54.1	13.8	4.5
20	2	-3.8	6.0	4.9	214.8	55.1	8.6
25	1	-2.9	14.8	15.9	1,331.1	339.0	19.8
All	15	-2.2	2.6	2.1	134.2	34.1	4.0

Appendix Table 5f. Percentage Point Difference in Absolute Values of MALPE (5e minus 5d)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	-1.0	-0.5	-0.5	0.5	0.8	0.3
10	4	0.0	-0.3	-0.4	-1.6	-0.6	-0.3
15	3	1.0	-1.6	-2.1	-5.8	-2.7	-1.7
20	2	2.0	-3.3	-4.7	-15.9	-6.8	-3.6
25	1	2.8	-5.6	-8.0	-28.8	-12.1	-6.1
All	15	0.4	-0.9	-1.4	-5.4	-2.1	-1.0

Appendix Table 6a. MAPE, Total Population, 10 Year Base Period,
Not Accounting Separately for Annexations (Incorporated Places with Annexations > 1% of Total Population; n=131)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	9.4	9.8	10.6	12.6	10.4	10.0
10	4	16.0	17.5	20.3	30.5	20.3	18.1
15	3	21.5	25.6	31.4	68.0	35.1	26.9
20	2	27.2	35.1	44.5	175.7	68.2	37.4
25	1	34.7	52.8	68.9	671.1	202.5	57.3
All	15	17.7	21.3	25.7	94.1	38.5	22.3

Appendix Table 6b. MAPE, Total Population, 10 Year Base Period,
Accounting Separately for Annexations (Incorporated Places with Annexations > 1% of Total Population; n=131)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	9.9	10.4	11.2	13.0	10.9	10.5
10	4	16.0	17.2	19.9	28.7	19.8	17.8
15	3	21.0	24.2	29.7	60.6	32.4	25.3
20	2	25.8	31.7	41.1	155.0	60.9	33.4
25	1	32.9	47.1	61.9	633.4	190.2	50.2
All	15	17.4	20.3	24.6	87.0	36.2	21.1

Appendix Table 6c. Percentage Point Difference in MAPE (6b minus 6a)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	0.6	0.5	0.6	0.3	0.5	0.6
10	4	0.0	-0.3	-0.4	-1.8	-0.5	-0.4
15	3	-0.5	-1.3	-1.7	-7.4	-2.7	-1.6
20	2	-1.4	-3.5	-3.4	-20.7	-7.3	-4.1
25	1	-1.8	-5.7	-6.9	-37.7	-12.3	-7.1
All	15	-0.2	-1.0	-1.2	-7.1	-2.3	-1.2

Appendix Table 6d. MALPE, Total Population, 10 Year Base Period,
Not Accounting Separately for Annexations (Incorporated Places with Annexations > 1% of Total Population; n=131)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	-1.7	-0.4	-0.4	4.4	0.5	0.0
10	4	-1.7	1.9	1.8	18.4	5.1	2.9
15	3	-1.1	6.5	6.0	53.4	16.2	8.3
20	2	-0.2	13.6	13.1	160.2	46.7	16.5
25	1	2.2	29.8	31.9	655.1	179.7	34.8
All	15	-1.1	5.5	5.4	82.1	23.0	6.9

Appendix Table 6e. MALPE, Total Population, 10 Year Base Period,
Accounting Separately for Annexations (Incorporated Places with Annexations > 1% of Total Population; n=131)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	-0.4	0.8	0.7	5.1	1.6	1.2
10	4	-1.7	1.4	1.0	16.2	4.2	2.3
15	3	-2.4	4.1	2.6	45.4	12.3	5.6
20	2	-3.0	8.5	5.6	138.1	37.1	10.8
25	1	-2.0	20.9	18.2	615.0	162.1	24.6
All	15	-1.6	4.0	3.0	74.5	19.8	5.2

Appendix Table 6f. Percentage Point Difference in Absolute Values of MALPE (6e minus 6d)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	-1.3	0.3	0.3	0.7	1.1	1.2
10	4	0.0	-0.5	-0.8	-2.2	-0.9	-0.6
15	3	1.3	-2.4	-3.4	-8.0	-3.9	-2.7
20	2	2.8	-5.1	-7.5	-22.1	-9.6	-5.6
25	1	-0.1	-8.9	-13.7	-40.2	-17.7	-10.2
All	15	0.5	-1.5	-2.4	-7.6	-3.1	-1.7

Appendix Table 7a. MAPE, Total Population, 10 Year Base Period, Not Accounting Separately for Annexations (Incorporated Places with Annexations > 2.5% of Total Population; n=100)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	10.1	11.0	12.1	14.0	11.6	11.1
10	4	17.3	20.5	24.2	34.8	23.3	21.2
15	3	23.4	34.0	41.4	80.6	43.1	35.5
20	2	29.9	63.9	75.2	216.8	93.5	66.2
25	1	38.5	162.6	182.7	854.0	304.6	168.4
All	15	19.2	35.3	41.0	115.9	51.5	36.5

Appendix Table 7b. MAPE, Total Population, 10 Year Base Period, Accounting Separately for Annexations (Incorporated Places with Annexations > 2.5% of Total Population; n=100)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	10.9	11.6	12.7	14.5	12.2	11.8
10	4	17.3	19.8	23.3	32.4	22.5	20.4
15	3	22.8	30.7	37.2	71.0	39.1	31.9
20	2	28.1	54.5	65.3	189.9	81.7	56.3
25	1	36.2	154.0	172.2	805.2	289.9	158.7
All	15	18.9	32.8	38.1	106.7	48.1	33.9

Appendix Table 7c. Percentage Point Difference in MAPE (7b minus 7a)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	0.8	0.6	0.6	0.4	0.7	0.7
10	4	0.0	-0.7	-1.0	-2.4	-0.8	-0.8
15	3	-0.6	-3.3	-4.2	-9.6	-4.0	-3.6
20	2	-1.8	-9.4	-9.9	-26.9	-11.8	-9.9
25	1	-2.3	-8.6	-10.5	-48.8	-14.7	-9.7
All	15	-0.3	-2.5	-2.9	-9.3	-3.4	-2.7

Appendix Table 7d. MALPE, Total Population, 10 Year Base Period, Not Accounting Separately for Annexations (Incorporated Places with Annexations > 2.5% of Total Population; n=100)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	-1.6	0.2	-0.1	5.4	1.0	0.6
10	4	-1.5	4.3	3.5	22.2	7.1	5.3
15	3	-0.6	14.2	12.9	65.3	23.0	16.1
20	2	1.2	42.0	41.5	201.2	71.5	45.0
25	1	3.7	139.8	142.8	837.4	280.9	145.1
All	15	-0.7	19.0	18.5	103.4	35.1	20.5

Appendix Table 7e. MALPE, Total Population, 10 Year Base Period, Accounting Separately for Annexations (Incorporated Places with Annexations > 2.5% of Total Population; n=100)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	0.0	1.6	1.3	6.3	2.3	2.0
10	4	-1.5	3.4	2.1	19.4	5.7	4.3
15	3	-2.3	9.7	6.6	54.9	16.8	11.3
20	2	-2.4	30.8	25.8	172.5	54.9	33.0
25	1	-1.6	127.2	124.9	785.4	256.2	131.2
All	15	-1.3	16.0	14.1	93.6	30.0	17.2

Appendix Table 7f. Percentage Point Difference in Absolute Values of MALPE (7e minus 7d)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	-1.6	1.4	1.2	0.9	1.3	1.4
10	4	0.0	-1.0	-1.4	-2.8	-1.4	-1.1
15	3	1.7	-4.5	-6.3	-10.4	-6.2	-4.7
20	2	1.2	-11.2	-15.7	-28.7	-16.6	-11.9
25	1	-2.2	-12.6	-17.9	-52.0	-24.8	-13.8
All	15	0.6	-3.0	-4.5	-9.8	-5.0	-3.3

Appendix Table 8a. MAPE, Total Population, 10 Year Base Period,
Not Accounting Separately for Annexations (Incorporated Places with Annexations > 5% of Total Population; n=71)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	11.6	12.8	13.9	16.3	13.4	12.9
10	4	20.0	24.6	28.6	41.5	27.5	25.3
15	3	26.7	41.4	49.5	97.8	51.8	42.9
20	2	33.7	81.5	91.6	271.4	116.8	83.4
25	1	42.4	215.2	231.7	1,112.5	396.0	219.9
All	15	21.9	44.3	49.8	146.4	64.1	45.4

Appendix Table 8b. MAPE, Total Population, 10 Year Base Period,
Accounting Separately for Annexations (Incorporated Places with Annexations > 5% of Total Population; n=71)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	12.7	13.7	14.8	16.8	14.3	13.9
10	4	20.0	23.4	27.2	38.3	26.3	24.1
15	3	25.9	36.6	43.3	84.8	46.1	37.7
20	2	31.3	67.8	76.7	235.1	100.1	69.0
25	1	39.3	200.7	214.7	1,048.4	374.2	203.9
All	15	21.5	40.6	45.4	134.0	59.3	41.4

Appendix Table 8c. Percentage Point Difference in MAPE (8b minus 8a)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	1.1	0.9	0.9	0.6	0.9	0.9
10	4	0.0	-1.1	-1.4	-3.2	-1.2	-1.2
15	3	-0.8	-4.8	-6.2	-13.0	-5.7	-5.1
20	2	-2.5	-13.7	-14.9	-36.3	-16.7	-14.4
25	1	-3.1	-14.5	-17.0	-64.1	-21.8	-16.1
All	15	-0.3	-3.8	-4.5	-12.4	-4.8	-4.0

Appendix Table 8d. MALPE, Total Population, 10 Year Base Period,
Not Accounting Separately for Annexations (Incorporated Places with Annexations > 5% of Total Population; n=71)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	-1.9	0.3	-0.1	6.2	1.1	0.8
10	4	-1.7	5.5	4.3	26.3	8.6	6.5
15	3	-0.5	18.4	16.4	79.3	28.4	20.2
20	2	1.6	56.1	54.8	252.4	91.2	58.5
25	1	4.0	189.2	192.2	1,093.1	369.6	193.5
All	15	-0.7	25.4	24.5	131.5	45.2	26.7

Appendix Table 8e. MALPE, Total Population, 10 Year Base Period,
Accounting Separately for Annexations (Incorporated Places with Annexations > 5% of Total Population; n=71)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	0.2	2.0	1.6	7.3	2.8	2.4
10	4	-1.7	4.2	2.3	22.6	6.6	5.0
15	3	-2.7	12.2	7.6	65.4	20.0	13.6
20	2	-3.0	40.2	32.3	213.9	68.4	41.7
25	1	-2.8	169.8	163.4	1,025.3	334.9	172.3
All	15	-1.5	20.9	17.9	118.4	38.1	21.9

Appendix Table 8f. Percentage Point Difference in Absolute Values of MALPE
(8e minus 8d)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	-1.7	1.7	1.4	1.1	1.6	1.7
10	4	0.0	-1.4	-2.0	-3.8	-2.0	-1.5
15	3	2.2	-6.2	-8.7	-13.9	-8.4	-6.6
20	2	1.5	-15.9	-22.5	-38.5	-22.9	-16.8
25	1	-1.2	-19.4	-28.8	-67.9	-34.8	-21.2
All	15	0.8	-4.5	-6.6	-13.1	-7.0	-4.8

Appendix Table 9a. MAPE, Total Population, 10 Year Base Period,
Not Accounting Separately for Annexations (Unincorporated Areas with Annexations; n=51)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	5.7	6.1	6.1	7.6	6.1	6.1
10	4	9.8	12.2	12.2	17.9	12.2	12.2
15	3	12.4	20.4	20.4	34.3	20.4	20.4
20	2	15.2	31.3	31.3	57.2	31.3	31.3
25	1	20.0	63.8	63.8	120.7	63.8	63.8
All	15	10.4	17.8	17.8	29.8	17.8	17.8

Appendix Table 9b. MAPE, Total Population, 10 Year Base Period,
Accounting Separately for Annexations (Unincorporated Areas with Annexations; n=51)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	5.8	6.1	6.1	7.5	6.1	6.1
10	4	9.8	12.3	12.3	18.2	12.3	12.3
15	3	12.4	20.8	21.1	35.4	20.9	20.9
20	2	15.3	32.5	33.2	60.1	32.9	32.8
25	1	20.7	66.9	69.2	129.5	68.3	68.0
All	15	10.4	18.3	18.6	31.1	18.4	18.4

Appendix Table 9c. Percentage Point Difference in MAPE (9b minus 9a)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	0.1	0.0	0.0	-0.1	0.0	0.0
10	4	0.0	0.1	0.2	0.3	0.1	0.1
15	3	-0.1	0.4	0.7	1.1	0.5	0.5
20	2	0.1	1.2	1.9	2.9	1.6	1.6
25	1	0.7	3.1	5.4	8.8	4.4	4.2
All	15	0.1	0.5	0.8	1.3	0.6	0.6

Appendix Table 9d. MALPE, Total Population, 10 Year Base Period,
Not Accounting Separately for Annexations (Unincorporated Areas with Annexations; n=51)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	-0.9	1.8	1.8	4.4	1.8	1.8
10	4	-2.1	5.4	5.4	12.9	5.4	5.4
15	3	-3.6	12.3	12.3	28.2	12.3	12.3
20	2	-5.4	23.4	23.4	52.2	23.4	23.4
25	1	-2.7	57.7	57.7	118.1	57.7	57.7
All	15	-2.5	11.5	11.5	25.4	11.5	11.5

Appendix Table 9e. MALPE, Total Population, 10 Year Base Period,
Accounting Separately for Annexations (Unincorporated Areas with Annexations; n=51)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	-1.4	1.3	1.3	4.0	1.3	1.3
10	4	-2.1	5.6	5.7	13.3	5.6	5.6
15	3	-3.2	13.2	13.6	29.8	13.3	13.4
20	2	-4.4	25.3	26.2	56.0	25.8	25.8
25	1	-1.3	61.2	63.7	127.1	62.7	62.5
All	15	-2.3	12.0	12.4	26.8	12.2	12.2

Appendix Table 9f. Percentage Point Difference in Absolute Values of MALPE
(9e minus 9d)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	0.5	-0.4	-0.4	-0.4	-0.4	-0.4
10	4	0.0	0.2	0.3	0.4	0.2	0.3
15	3	-0.5	0.9	1.3	1.6	1.1	1.1
20	2	-1.0	1.9	2.8	3.8	2.4	2.3
25	1	-1.4	3.5	6.0	9.0	5.0	4.8
All	15	-0.2	0.6	1.0	1.4	0.8	0.8

Appendix Table 10a. MAPE, Total Population, 10 Year Base Period,
Not Accounting Separately for Annexations (Unincorporated Areas with Annexations > 1% of Total Population; n=27)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	6.8	7.4	7.4	8.8	7.4	7.4
10	4	11.4	14.4	14.4	20.4	14.4	14.4
15	3	14.4	23.9	23.9	38.5	23.9	23.9
20	2	17.9	36.6	36.6	63.9	36.6	36.6
25	1	25.0	76.4	76.4	138.1	76.4	76.4
All	15	12.3	21.1	21.1	33.8	21.1	21.1

Appendix Table 10b. MAPE, Total Population, 10 Year Base Period,
Accounting Separately for Annexations (Unincorporated Areas with Annexations > 1% of Total Population; n=27)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	7.0	7.4	7.4	8.7	7.4	7.4
10	4	11.4	14.6	14.7	21.0	14.6	14.7
15	3	14.3	24.6	25.2	40.5	24.8	24.9
20	2	18.1	38.8	40.2	69.1	39.5	39.5
25	1	26.4	82.1	86.3	154.1	84.6	84.2
All	15	12.4	21.9	22.5	36.1	22.3	22.2

Appendix Table 10c. Percentage Point Difference in MAPE (10b minus 10a)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	0.1	0.0	0.0	-0.1	0.0	0.0
10	4	0.0	0.2	0.3	0.6	0.2	0.3
15	3	-0.1	0.7	1.3	1.9	0.9	1.0
20	2	0.2	2.2	3.6	5.3	2.9	2.9
25	1	1.4	5.7	9.9	16.0	8.2	7.8
All	15	0.1	0.9	1.5	2.3	1.2	1.2

Appendix Table 10d. MALPE, Total Population, 10 Year Base Period,
Not Accounting Separately for Annexations (Unincorporated Areas with Annexations > 1% of Total Population; n=27)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	-1.0	1.9	1.9	4.7	1.9	1.9
10	4	-2.6	5.5	5.5	13.6	5.5	5.5
15	3	-4.5	12.8	12.8	30.0	12.8	12.8
20	2	-6.3	25.1	25.1	56.5	25.1	25.1
25	1	-2.3	65.5	65.5	133.3	65.5	65.5
All	15	-2.9	12.4	12.4	27.6	12.4	12.4

Appendix Table 10e. MALPE, Total Population, 10 Year Base Period,
Accounting Separately for Annexations (Unincorporated Areas with Annexations > 1% of Total Population; n=27)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	-1.9	1.1	1.1	3.9	1.0	1.1
10	4	-2.6	5.9	6.1	14.3	5.9	6.0
15	3	-3.6	14.4	15.0	32.8	14.7	14.7
20	2	-4.5	28.5	30.2	63.3	29.4	29.3
25	1	0.3	71.9	76.4	149.6	74.6	74.1
All	15	-2.6	13.4	14.1	30.1	13.8	13.8

Appendix Table 10f. Percentage Point Difference in Absolute Values of MALPE
(10e minus 10d)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	0.9	-0.8	-0.8	-0.8	-0.8	-0.8
10	4	0.0	0.3	0.6	0.7	0.4	0.5
15	3	-0.9	1.6	2.3	2.8	1.9	1.9
20	2	-1.8	3.4	5.1	6.8	4.3	4.2
25	1	-1.9	6.4	10.9	16.4	9.1	8.6
All	15	-0.3	1.0	1.8	2.5	1.4	1.4

Appendix Table 11a. MAPE, Total Population, 10 Year Base Period,
Not Accounting Separately for Annexations (Unincorporated Areas with Annexations > 2.5% of Total Population; n=17)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	7.4	7.8	7.8	8.9	7.8	7.8
10	4	12.2	14.3	14.3	19.3	14.3	14.3
15	3	15.1	22.6	22.6	35.0	22.6	22.6
20	2	18.1	34.0	34.0	57.5	34.0	34.0
25	1	26.5	67.5	67.5	120.0	67.5	67.5
All	15	12.9	20.0	20.0	30.8	20.0	20.0

Appendix Table 11b. MAPE, Total Population, 10 Year Base Period,
Accounting Separately for Annexations (Unincorporated Areas with Annexations > 2.5% of Total Population; n=17)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	7.6	7.9	7.9	8.8	7.9	7.9
10	4	12.2	14.6	14.7	20.1	14.6	14.7
15	3	14.9	23.6	24.3	37.6	23.9	23.9
20	2	18.5	37.2	39.3	65.1	38.3	38.3
25	1	28.7	75.9	81.9	142.5	79.5	78.9
All	15	13.2	21.2	22.1	34.0	21.7	21.7

Appendix Table 11c. Percentage Point Difference in MAPE (11b minus 11a)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	0.2	0.0	0.0	-0.1	0.1	0.0
10	4	0.0	0.2	0.4	0.8	0.3	0.3
15	3	-0.2	0.9	1.7	2.6	1.2	1.3
20	2	0.4	3.3	5.3	7.6	4.3	4.3
25	1	2.2	8.4	14.4	22.6	12.0	11.4
All	15	0.2	1.3	2.1	3.2	1.7	1.7

Appendix Table 11d. MALPE, Total Population, 10 Year Base Period,
Not Accounting Separately for Annexations (Unincorporated Areas with Annexations
> 2.5% of Total Population; n=17)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	0.1	2.6	2.6	5.0	2.6	2.6
10	4	-0.9	6.0	6.0	13.0	6.0	6.0
15	3	-2.6	12.0	12.0	26.6	12.0	12.0
20	2	-2.3	24.1	24.1	50.5	24.1	24.1
25	1	6.0	61.3	61.3	116.6	61.3	61.3
All	15	-0.6	12.2	12.2	25.0	12.2	12.2

Appendix Table 11e. MALPE, Total Population, 10 Year Base Period,
Accounting Separately for Annexations (Unincorporated Areas with Annexations
> 2.5% of Total Population; n=17)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	-1.2	1.4	1.5	3.9	1.4	1.4
10	4	-0.9	6.5	6.8	13.9	6.6	6.7
15	3	-1.3	14.3	15.2	30.6	14.7	14.8
20	2	0.5	29.0	31.4	60.2	30.3	30.2
25	1	9.8	70.3	76.7	139.5	74.1	73.5
All	15	-0.2	13.6	14.6	28.5	14.1	14.1

Appendix Table 11f. Percentage Point Difference in Absolute Values of MALPE
(11e minus 11d)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	1.1	-1.1	-1.1	-1.1	-1.2	-1.1
10	4	0.0	0.5	0.8	0.9	0.5	0.6
15	3	-1.3	2.3	3.2	4.0	2.7	2.7
20	2	-1.8	4.9	7.3	9.8	6.2	6.1
25	1	3.8	9.0	15.4	22.9	12.8	12.2
All	15	-0.4	1.5	2.5	3.5	2.0	2.0

Appendix Table 12a. MAPE, Total Population, 10 Year Base Period,
Not Accounting Separately for Annexations (Unincorporated Areas with Annexations > 5% of Total Population; n=4)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	13.5	14.6	14.6	16.4	14.6	14.6
10	4	18.1	22.5	22.5	28.6	22.5	22.5
15	3	20.0	30.8	30.8	45.7	30.8	30.8
20	2	29.9	51.0	51.0	81.8	51.0	51.0
25	1	58.3	124.1	124.1	204.9	124.1	124.1
All	15	21.2	32.1	32.1	46.8	32.1	32.1

Appendix Table 12b. MAPE, Total Population, 10 Year Base Period,
Accounting Separately for Annexations (Unincorporated Areas with Annexations > 5% of Total Population; n=4)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	14.4	15.1	15.1	16.4	15.1	15.1
10	4	18.1	23.3	23.8	30.9	23.4	23.6
15	3	19.5	33.0	35.2	52.6	33.9	34.1
20	2	32.3	61.5	68.3	106.0	65.0	64.9
25	1	66.7	150.6	169.7	275.2	162.4	160.2
All	15	22.3	36.1	38.9	56.7	37.6	37.5

Appendix Table 12c. Percentage Point Difference in MAPE (12b minus 12a)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	0.8	0.5	0.5	0.0	0.5	0.5
10	4	0.0	0.8	1.3	2.3	0.9	1.0
15	3	-0.5	2.3	4.5	6.9	3.2	3.4
20	2	2.4	10.6	17.3	24.1	14.1	13.9
25	1	8.3	26.5	45.7	70.3	38.3	36.1
All	15	1.1	4.0	6.7	9.9	5.5	5.4

Appendix Table 12d. MALPE, Total Population, 10 Year Base Period,
Not Accounting Separately for Annexations (Unincorporated Areas with Annexations > 5% of Total Population; n=4)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	4.4	6.9	6.9	9.5	6.9	6.9
10	4	3.4	10.7	10.7	18.0	10.7	10.7
15	3	1.8	17.3	17.3	32.8	17.3	17.3
20	2	9.5	40.4	40.4	71.3	40.4	40.4
25	1	43.3	124.1	124.1	204.9	124.1	124.1
All	15	6.9	22.3	22.3	37.7	22.3	22.3

Appendix Table 12e. MALPE, Total Population, 10 Year Base Period,
Accounting Separately for Annexations (Unincorporated Areas with Annexations > 5% of Total Population; n=4)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	0.9	3.9	3.9	6.4	3.8	3.9
10	4	3.4	11.9	12.6	20.4	12.1	12.3
15	3	5.5	23.8	26.1	44.1	24.9	24.9
20	2	17.9	55.3	62.4	101.4	59.2	58.8
25	1	54.1	150.6	169.7	275.2	162.4	160.2
All	15	8.3	26.6	29.5	48.3	28.2	28.1

Appendix Table 12f. Percentage Point Difference in Absolute Values of MALPE (12e minus 12d)

Horizon	N	LIN	SHR	SFT	EXP	AV	TAV
5	5	-3.5	-3.1	-3.1	-3.1	-3.2	-3.1
10	4	0.0	1.2	1.9	2.4	1.4	1.5
15	3	3.7	6.5	8.8	11.3	7.6	7.6
20	2	8.4	14.9	22.0	30.2	18.9	18.5
25	1	10.8	26.5	45.7	70.3	38.3	36.1
All	15	1.4	4.3	7.2	10.6	5.9	5.8

Appendix Table 13a. MAPE by Target Year and Growth Rate, 5 Year Horizon, 10 Year Base Period

Year	Horizon	Growth Rate	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
1985	5	< -10%	26.6	29.4	48.0	19.7	23.1	12.6	19.2	20.0
1985	5	-10% to 0%	6.3	6.4	12.1	6.2	12.6	5.9	5.8	6.2
1985	5	0% to 10%	5.9	6.0	8.6	5.9	14.6	6.0	6.0	5.8
1985	5	10% to 25%	7.3	7.6	8.9	7.6	13.8	8.2	7.4	7.1
1985	5	25% to 50%	10.7	11.8	11.2	12.5	14.2	10.3	10.4	11.0
1985	5	> 50%	20.8	22.7	25.7	42.0	19.8	24.8	22.2	21.5
1990	5	< -10%	21.7	23.2	30.9	18.1	22.1	15.5	18.5	18.9
1990	5	-10% to 0%	6.3	6.3	9.5	6.2	11.7	5.9	6.0	6.1
1990	5	0% to 10%	7.3	7.4	7.6	7.3	13.8	6.7	7.5	7.2
1990	5	10% to 25%	9.0	9.2	9.0	9.3	13.0	8.8	9.0	9.0
1990	5	25% to 50%	8.2	8.7	8.7	9.3	10.2	11.9	8.1	8.3
1990	5	> 50%	10.8	10.6	11.3	18.6	12.6	23.0	10.4	10.4
1995	5	< -10%	25.8	26.7	31.9	20.8	14.4	13.6	20.1	21.0
1995	5	-10% to 0%	8.7	8.9	13.1	8.6	10.7	7.1	7.6	8.3
1995	5	0% to 10%	6.1	6.1	8.0	6.1	11.5	6.5	6.2	6.1
1995	5	10% to 25%	5.5	5.8	5.5	5.7	10.8	7.5	5.7	5.5
1995	5	25% to 50%	7.5	8.2	8.2	9.2	8.5	11.2	7.2	7.6
1995	5	> 50%	12.3	14.6	16.5	23.9	12.3	18.1	12.7	13.3
2000	5	< -10%	17.5	18.0	22.0	15.7	16.1	14.0	15.0	15.4
2000	5	-10% to 0%	6.4	6.4	9.3	6.3	12.4	5.8	5.8	6.2
2000	5	0% to 10%	7.6	7.6	8.5	7.6	11.8	8.0	7.6	7.6
2000	5	10% to 25%	5.4	5.5	6.1	5.6	6.8	7.8	5.3	5.4
2000	5	25% to 50%	7.2	7.5	7.7	8.3	8.1	13.2	7.2	7.3
2000	5	> 50%	10.8	11.8	13.4	19.9	11.5	18.3	11.0	11.1
2005	5	< -10%	26.3	27.3	33.5	21.6	12.7	12.7	20.6	21.8
2005	5	-10% to 0%	7.1	7.3	10.5	7.0	6.5	5.3	5.8	6.7
2005	5	0% to 10%	5.2	5.2	6.6	5.2	8.4	6.2	5.1	5.3
2005	5	10% to 25%	6.2	6.3	6.4	6.3	7.2	8.6	6.1	6.2
2005	5	25% to 50%	7.8	8.1	8.3	8.8	7.7	11.8	7.6	7.8
2005	5	> 50%	11.8	12.1	13.1	19.9	10.7	17.7	11.0	11.3
All	5	< -10%	23.6	24.9	33.3	19.2	17.7	13.7	18.7	19.4
All	5	-10% to 0%	6.9	7.1	10.9	6.9	10.8	6.0	6.2	6.7
All	5	0% to 10%	6.4	6.5	7.9	6.4	12.0	6.7	6.5	6.4
All	5	10% to 25%	6.7	6.9	7.2	6.9	10.3	8.2	6.7	6.6
All	5	25% to 50%	8.3	8.9	8.8	9.6	9.8	11.7	8.1	8.4
All	5	> 50%	13.3	14.4	16.0	24.9	13.4	20.4	13.5	13.5

Appendix Table 13b. Average Rank by Growth Rate, 5 Year Horizon, 10 Year Base Period

Year	Horizon	Growth Rate	LIN	SHR	SFT	EXP	COS	CON
All	5	< -10%	3.8	5.0	6.0	2.4	2.6	1.2
All	5	-10% to 0%	3.2	4.2	5.4	2.2	5.0	1.0
All	5	0% to 10%	1.8	3.0	5.0	2.0	6.0	3.2
All	5	10% to 25%	1.4	3.0	3.4	3.2	5.6	4.4
All	5	25% to 50%	1.4	2.8	3.0	4.8	4.0	5.0
All	5	> 50%	1.8	2.6	4.0	5.8	1.8	5.0

Appendix Table 14a. MAPE by Target Year and Growth Rate, 10 Year Horizon, 10 Year Base Period

Year	Horizon	Growth Rate	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
1990	10	< -10%	45.2	51.2	74.5	34.0	39.4	17.6	30.9	34.6
1990	10	-10% to 0%	10.5	10.8	29.4	10.3	28.7	9.3	9.2	10.0
1990	10	0% to 10%	10.6	11.1	20.5	10.8	31.7	9.5	10.9	10.4
1990	10	10% to 25%	15.9	17.7	19.9	17.4	32.9	13.7	15.9	15.6
1990	10	25% to 50%	23.4	27.0	25.9	29.0	33.1	19.4	23.4	24.5
1990	10	> 50%	32.9	39.2	47.1	116.1	32.1	36.3	42.6	35.9
1995	10	< -10%	32.9	35.3	52.1	26.5	32.6	17.9	24.7	26.5
1995	10	-10% to 0%	10.5	10.9	22.5	10.3	23.2	9.3	9.5	9.9
1995	10	0% to 10%	9.3	9.4	13.7	9.3	22.5	9.7	9.5	9.3
1995	10	10% to 25%	12.3	13.0	12.9	12.9	20.8	14.6	12.6	12.4
1995	10	25% to 50%	12.2	13.5	14.2	16.0	16.5	18.8	12.0	12.5
1995	10	> 50%	16.2	17.5	21.7	50.6	17.7	34.3	17.0	16.2
2000	10	< -10%	38.5	40.4	51.0	31.3	23.1	20.0	28.8	30.8
2000	10	-10% to 0%	17.7	18.0	29.9	17.5	24.2	14.8	15.9	17.0
2000	10	0% to 10%	11.5	11.6	17.3	11.5	23.8	12.0	11.6	11.5
2000	10	10% to 25%	10.6	11.3	11.6	11.1	22.1	13.9	10.9	10.4
2000	10	25% to 50%	12.7	14.9	15.4	17.8	16.7	20.1	12.5	13.4
2000	10	> 50%	23.8	31.0	36.5	63.0	25.8	31.4	28.0	27.8
2005	10	< -10%	28.8	30.6	41.9	23.3	15.7	12.5	20.5	22.4
2005	10	-10% to 0%	12.0	12.5	23.1	11.8	19.5	9.4	10.0	11.2
2005	10	0% to 10%	11.1	11.2	15.0	11.2	19.5	12.0	11.0	11.2
2005	10	10% to 25%	9.2	9.2	11.6	9.4	12.1	14.9	9.1	9.3
2005	10	25% to 50%	12.9	14.0	14.2	15.7	14.6	22.3	12.8	13.3
2005	10	> 50%	15.5	17.1	20.1	42.2	17.1	29.7	17.0	15.8
All	10	< -10%	36.3	39.4	54.8	28.8	27.7	17.0	26.2	28.6
All	10	-10% to 0%	12.7	13.0	26.2	12.5	23.9	10.7	11.1	12.0
All	10	0% to 10%	10.6	10.8	16.6	10.7	24.4	10.8	10.7	10.6
All	10	10% to 25%	12.0	12.8	14.0	12.7	22.0	14.2	12.1	11.9
All	10	25% to 50%	15.3	17.3	17.4	19.6	20.2	20.2	15.2	15.9
All	10	> 50%	22.1	26.2	31.3	68.0	23.2	32.9	26.1	23.9

Appendix Table 14b. Average Rank by Growth Rate, 10 Year Horizon, 10 Year Base Period

Year	Horizon	Growth Rate	LIN	SHR	SFT	EXP	COS	CON
All	10	< -10%	4.0	5.0	6.0	2.5	2.5	1.0
All	10	-10% to 0%	3.0	4.0	5.8	2.0	5.3	1.0
All	10	0% to 10%	1.3	3.3	5.0	2.3	6.0	3.3
All	10	10% to 25%	1.3	3.3	3.8	2.8	5.8	4.3
All	10	25% to 50%	1.3	2.5	3.0	4.8	4.8	4.8
All	10	> 50%	1.3	3.0	4.5	6.0	2.0	4.3

Appendix Table 15a. MAPE by Target Year and Growth Rate, 15 Year Horizon, 10 Year Base Period

Year	Horizon	Growth Rate	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
1995	15	< -10%	57.3	66.0	86.6	43.3	64.8	23.6	36.3	44.6
1995	15	-10% to 0%	13.3	13.8	49.6	13.1	47.1	11.8	11.8	12.8
1995	15	0% to 10%	12.4	13.2	34.1	12.6	44.7	11.9	12.6	12.2
1995	15	10% to 25%	17.5	21.4	26.7	20.3	47.8	15.5	18.1	17.4
1995	15	25% to 50%	27.1	34.4	31.9	38.0	44.8	24.7	27.9	29.5
1995	15	> 50%	41.6	56.4	73.4	322.8	42.8	42.8	84.4	50.6
2000	15	< -10%	42.8	47.7	68.7	34.4	48.2	22.1	30.5	34.3
2000	15	-10% to 0%	16.0	16.9	39.9	15.6	38.2	14.3	14.4	15.1
2000	15	0% to 10%	13.2	13.5	23.4	13.3	32.7	13.8	13.4	13.2
2000	15	10% to 25%	17.0	18.3	19.9	18.0	30.0	21.3	17.4	17.1
2000	15	25% to 50%	18.3	22.9	22.3	27.2	28.6	25.6	18.7	19.6
2000	15	> 50%	22.3	27.1	36.2	105.5	24.0	43.9	29.5	24.3
2005	15	< -10%	51.2	53.9	69.2	41.7	28.1	20.9	37.5	40.8
2005	15	-10% to 0%	20.3	21.3	44.0	19.9	30.8	15.2	17.6	19.1
2005	15	0% to 10%	14.8	14.8	28.6	14.8	32.2	16.4	14.4	15.0
2005	15	10% to 25%	13.1	14.5	18.5	14.2	29.8	19.2	13.4	13.3
2005	15	25% to 50%	16.9	21.6	22.0	26.6	25.4	27.7	17.1	18.4
2005	15	> 50%	26.6	37.9	47.7	108.5	30.5	39.8	36.5	33.2
All	15	< -10%	50.4	55.9	74.8	39.8	47.0	22.2	34.7	39.9
All	15	-10% to 0%	16.5	17.3	44.5	16.2	38.7	13.8	14.6	15.7
All	15	0% to 10%	13.5	13.8	28.7	13.6	36.6	14.0	13.5	13.5
All	15	10% to 25%	15.9	18.1	21.7	17.5	35.9	18.7	16.3	15.9
All	15	25% to 50%	20.8	26.3	25.4	30.6	32.9	26.0	21.2	22.5
All	15	> 50%	30.2	40.5	52.5	178.9	32.4	42.2	50.1	36.0

Appendix Table 15b. Average Rank by Growth Rate, 15 Year Horizon,
10 Year Base Period

Year	Horizon	Growth Rate	LIN	SHR	SFT	EXP	COS	CON
All	15	< -10%	3.3	4.7	6.0	2.3	3.7	1.0
All	15	-10% to 0%	3.0	4.0	6.0	2.0	5.0	1.0
All	15	0% to 10%	1.3	3.0	5.0	2.7	6.0	3.0
All	15	10% to 25%	1.3	3.3	4.3	2.3	6.0	3.7
All	15	25% to 50%	1.3	3.0	2.7	5.0	5.3	3.7
All	15	> 50%	1.0	3.3	4.7	6.0	2.0	4.0

Appendix Table 16a. MAPE by Target Year and Growth Rate, 20 Year Horizon, 10 Year Base Period

Year	Horizon	Growth Rate	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
2000	20	< -10%	72.1	81.4	93.2	55.0	109.6	33.6	47.7	57.1
2000	20	-10% to 0%	16.1	17.2	64.3	15.7	65.4	15.3	14.4	15.5
2000	20	0% to 10%	13.4	15.0	46.0	13.9	63.2	13.3	14.2	13.0
2000	20	10% to 25%	20.5	27.2	37.1	24.6	66.3	19.3	22.2	20.9
2000	20	25% to 50%	32.4	45.1	39.5	50.7	59.9	29.9	35.1	36.7
2000	20	> 50%	54.6	82.2	111.5	1014.2	60.7	50.8	213.1	72.8
2005	20	< -10%	52.6	58.8	83.5	42.7	58.2	19.7	35.1	42.1
2005	20	-10% to 0%	18.9	20.5	51.2	18.2	41.5	14.1	15.9	17.4
2005	20	0% to 10%	16.7	17.0	34.9	16.8	41.2	17.8	16.9	16.8
2005	20	10% to 25%	19.6	21.4	26.8	20.8	36.5	26.4	20.0	19.7
2005	20	25% to 50%	22.0	30.1	29.1	36.3	38.1	32.0	23.4	24.3
2005	20	> 50%	28.2	36.3	50.2	195.1	30.2	50.7	48.4	32.1
All	20	< -10%	62.3	70.1	88.4	48.9	83.9	26.7	41.4	49.6
All	20	-10% to 0%	17.5	18.9	57.8	16.9	53.5	14.7	15.1	16.5
All	20	0% to 10%	15.1	16.0	40.4	15.4	52.2	15.5	15.5	14.9
All	20	10% to 25%	20.1	24.3	32.0	22.7	51.4	22.9	21.1	20.3
All	20	25% to 50%	27.2	37.6	34.3	43.5	49.0	30.9	29.2	30.5
All	20	> 50%	41.4	59.2	80.8	604.6	45.5	50.8	130.7	52.5

Appendix Table 16b. Average Rank by Growth Rate, 20 Year Horizon, 10 Year Base Period

Year	Horizon	Growth Rate	LIN	SHR	SFT	EXP	COS	CON
All	20	< -10%	3.0	4.5	5.5	2.0	5.0	1.0
All	20	-10% to 0%	3.0	4.0	5.5	2.0	5.5	1.0
All	20	0% to 10%	1.5	3.5	5.0	2.5	6.0	2.5
All	20	10% to 25%	1.5	3.5	5.0	2.5	6.0	2.5
All	20	25% to 50%	1.5	3.5	2.5	5.0	6.0	2.5
All	20	> 50%	1.5	3.5	4.5	6.0	2.5	3.0

Appendix Table 17a. MAPE by Target Year and Growth Rate, 25 Year Horizon, 10 Year Base Period

Year	Horizon	Growth Rate	LIN	SHR	SFT	EXP	COS	CON	AV	TAV
2005	25	< -10%	76.1	84.1	98.0	59.8	130.4	25.6	43.8	59.8
2005	25	-10% to 0%	21.7	23.5	75.4	21.3	80.6	20.4	20.1	21.0
2005	25	0% to 10%	16.1	18.0	56.2	16.9	75.5	17.3	16.8	15.8
2005	25	10% to 25%	22.4	32.6	46.6	28.3	84.6	22.6	25.3	23.3
2005	25	25% to 50%	38.0	56.2	46.9	63.2	76.2	34.1	43.0	44.1
2005	25	> 50%	59.6	103.5	145.3	3167.8	76.2	54.0	582.2	90.4

Appendix Table 17b. Average Rank by Growth Rate, 25 Year Horizon, 10 Year Base Period

Year	Horizon	Growth Rate	LIN	SHR	SFT	EXP	COS	CON
All	25	< -10%	3	4	5	2	6	1
All	25	-10% to 0%	3	4	5	2	6	1
All	25	0% to 10%	1	4	5	2	6	3
All	25	10% to 25%	1	4	5	3	6	2
All	25	25% to 50%	2	4	3	5	6	1
All	25	> 50%	2	4	5	6	3	1