

# Inferring Migration from Birthplace-Specific Population Stocks

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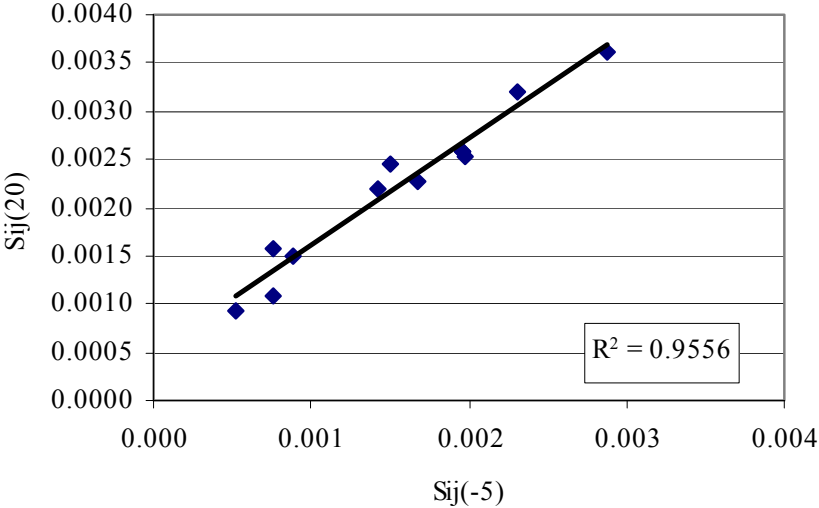
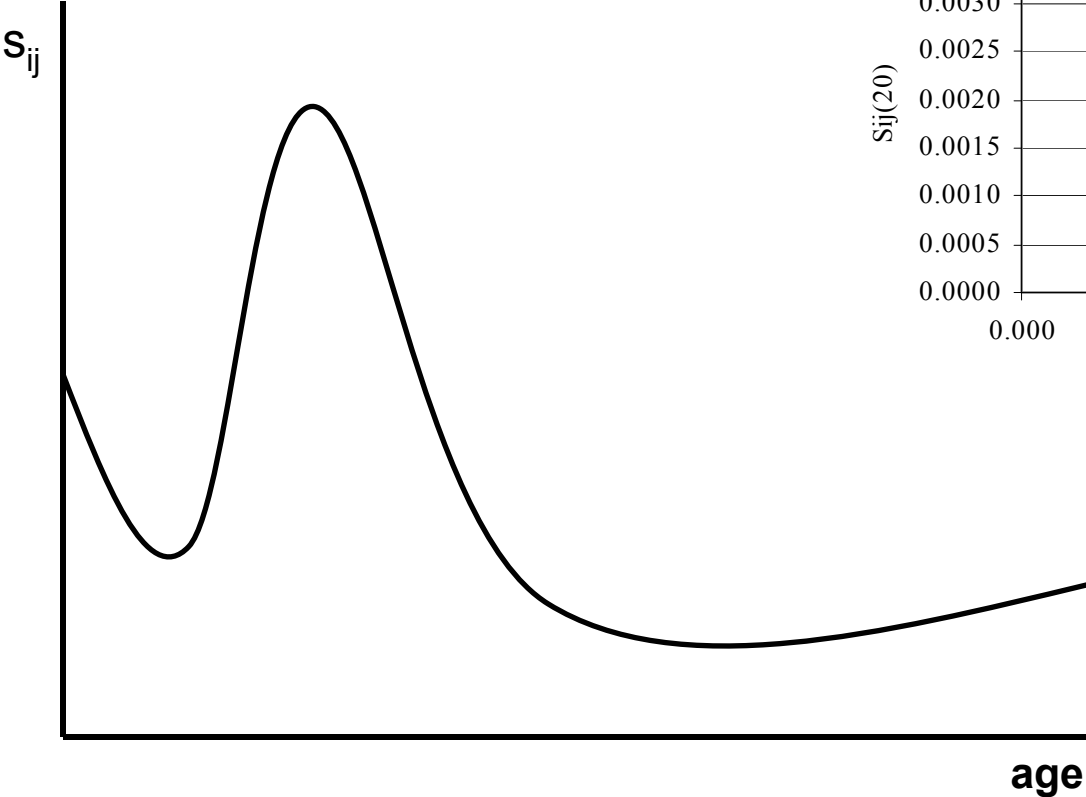
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Introduction to Method 1: Infant Population Stocks

September 25, 2004

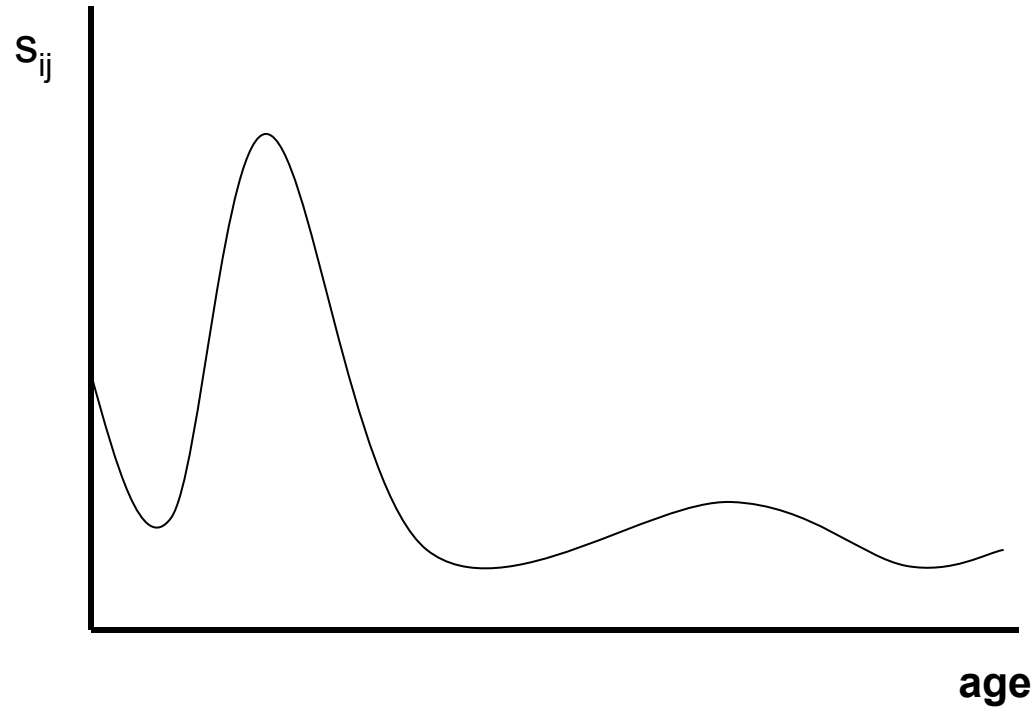
**ASSUMPTIONS:**

- Model Migration Schedule



## POSSIBLE COMPLICATIONS:

- Model Migration Schedule with Retirement Peak



- Violation of Temporal Assumptions

# Inferring Survivorship Proportions from Infant Population Stocks

For this project, the migration values being estimated are survivorship proportions, which are equal to the number of migrants moving from  $i$  to  $j$  divided by the total population in  $i$ .

$$S_{ij}(x) = \frac{\text{Migrants}_{ij}(x)}{\text{TotalPop}_i(x)}, x = \text{age}$$

Another interpretation of survivorships, a measurement taken from mortality studies, is that an individual in  $i$ , has the probability of surviving ( $S_{ij}(x)$ ) in  $j$ ,  $t$  years later.

The calculation of infant survivorship proportions only requires data on the population stocks, which makes this an attractive method.

Inferring survivorships takes place by using the age-to-infant ratio

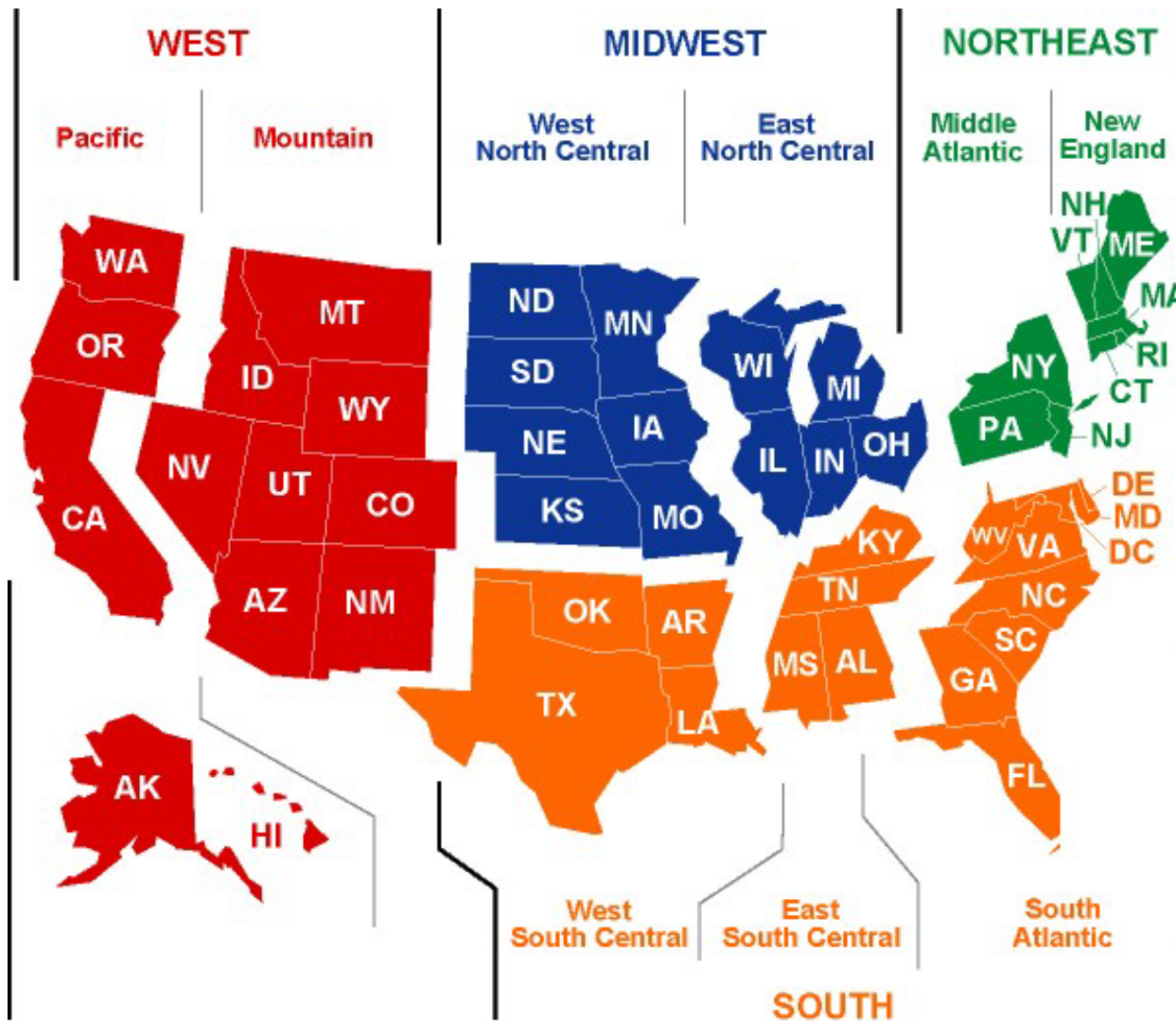
Age-to-Infant Ratio:

$$r_{ij}(x, -5) = \frac{S_{ij}(x)}{S_{ij}(-5)}, \quad x = 0, 5, 10, \dots, 80$$

$$\widehat{S}_{ij}^t(x) = r_{ij}^{t-10} S_{ij}^t(-5), \quad x = 0, 5, 10, \dots, 80$$

# Data

- **Data:**
- U.S. Census 1985-90 data is used to predict 1995-2000, four-region, interregional migration for U.S. born migrants





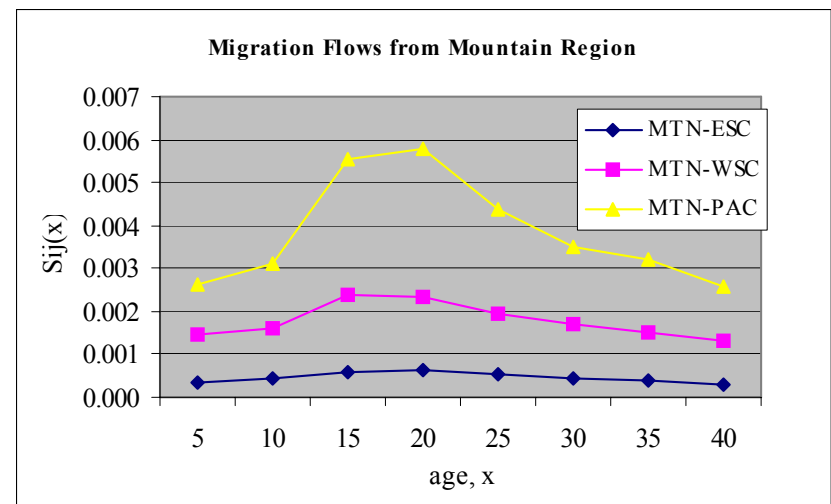


# An Illustration of Indirect Estimation

Now, given the ATI ratios, you can predict the survivorships for the age groups that you are missing. This is done by multiplying the ATI from the previous year by the survivorship for the first age group for the year with missing data.

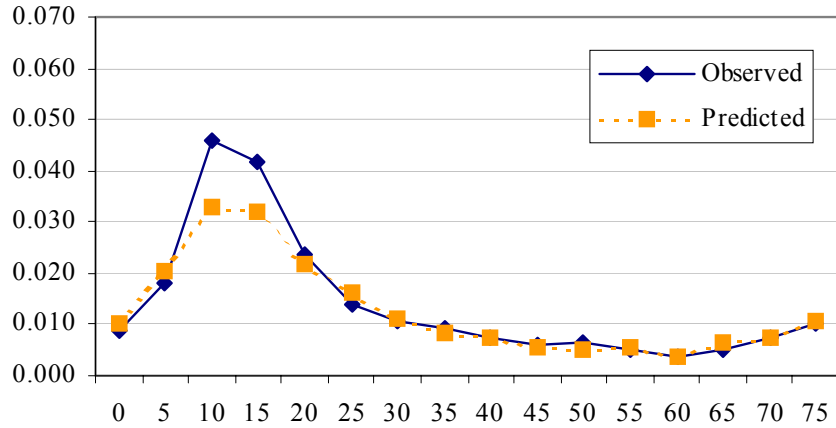
Year	Origin	Dest	rij0	rij5	rij10	rij15	rij20	rij25	rij30	rij35	rij40
1985-1990	MTN	ESC	1	0.651734	0.88036	1.162131	1.266626	1.047959	0.874122	0.780798	0.601832
	MTN	WSC	1	0.846652	0.938476	1.389141	1.361065	1.11516	0.974468	0.862636	0.766981
	MTN	PAC	1	0.807377	0.955683	1.704708	1.779431	1.352726	1.077414	0.988336	0.796877
Year	Origin	Dest	sij0	sij5	sij10	sij15	sij20	sij25	sij30	sij35	sij40
1995-2000	MTN	ESC	0.000502	0.000327	0.000442	0.000583	0.000635	0.000526	0.000439	0.000392	0.000302
	MTN	WSC	0.001729	0.001464	0.001623	0.002402	0.002353	0.001928	0.001685	0.001492	0.001326
	MTN	PAC	0.003245	0.002620	0.003101	0.005532	0.005774	0.004390	0.003496	0.003207	0.002586

You can then plot the data you have created. In this study, we have done the following for all 9 regions and destinations. Since we have data for 1995-2000, we can assess the quality of the estimates.



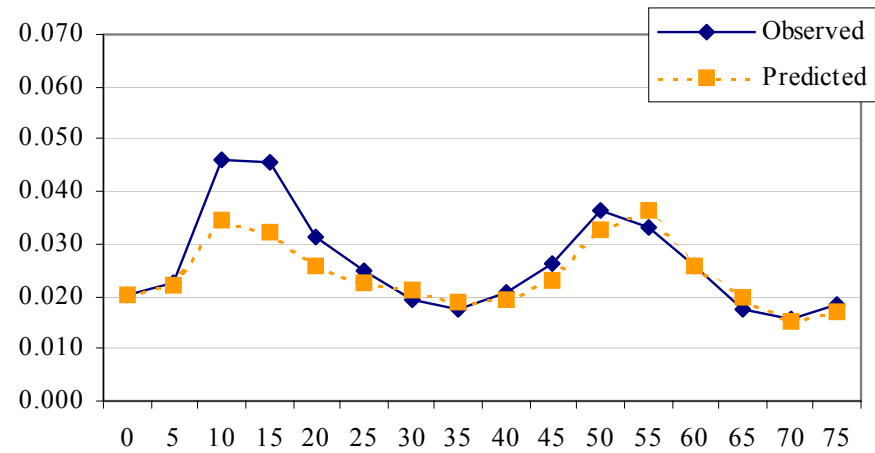
# Migration from the Northeast

NE-MA



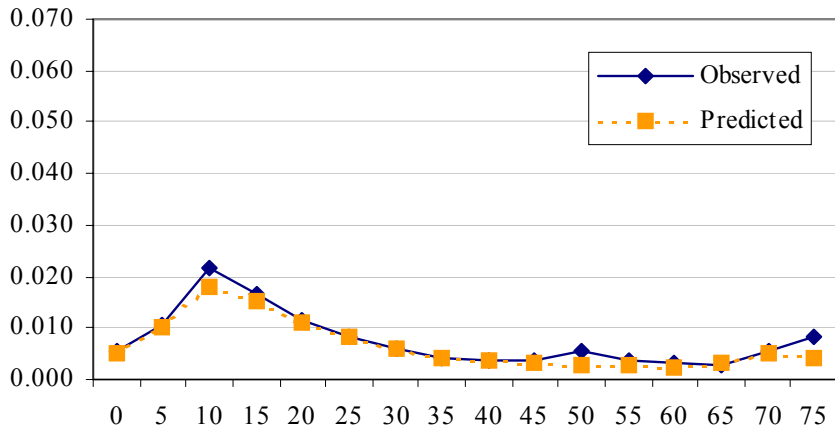
$R^2 = 0.949$

NE-SA



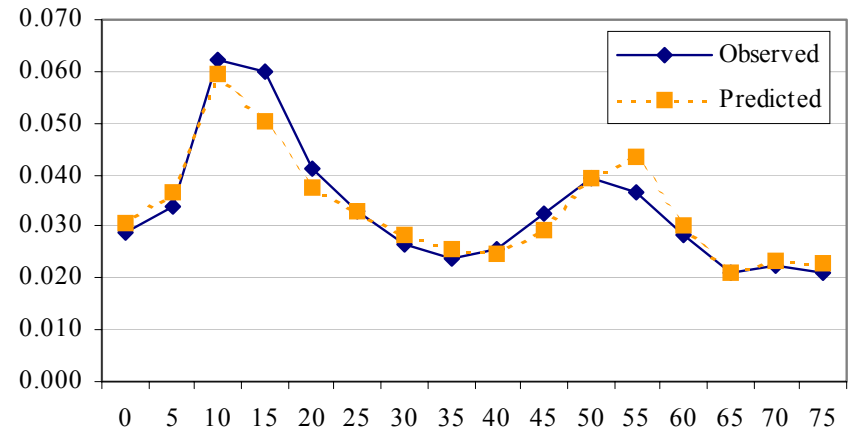
$R^2 = 0.830$

MA-NE



$R^2 = 0.937$

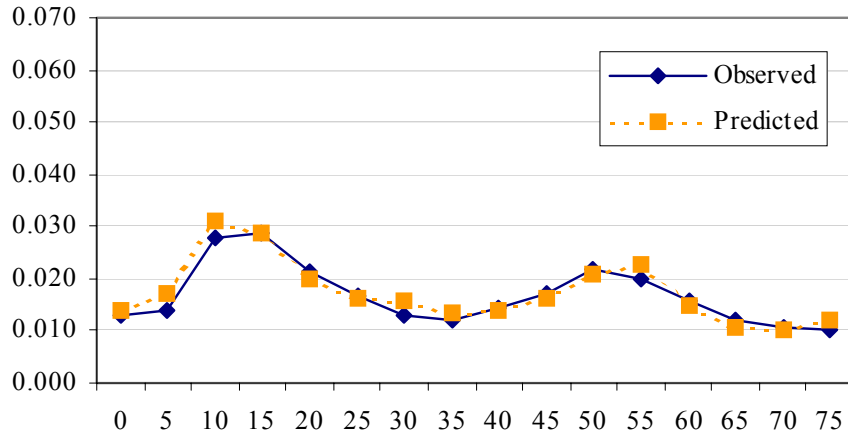
MA-SA



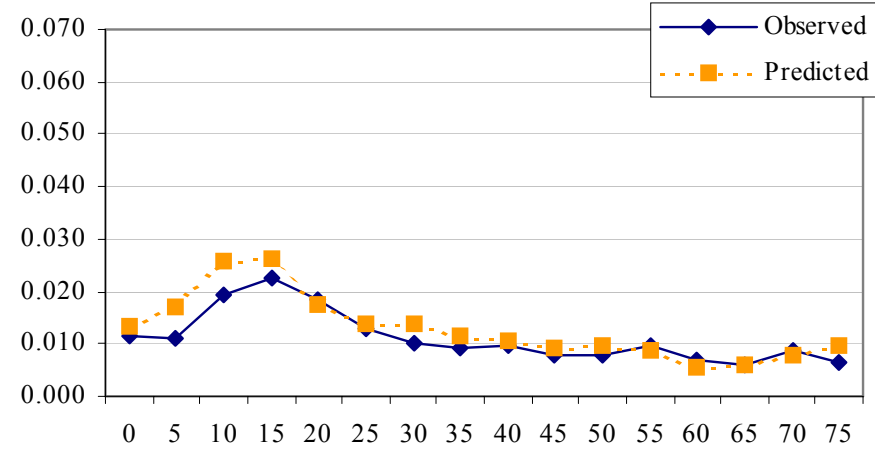
$R^2 = 0.927$

# Migration from the Midwest

ENC-SA

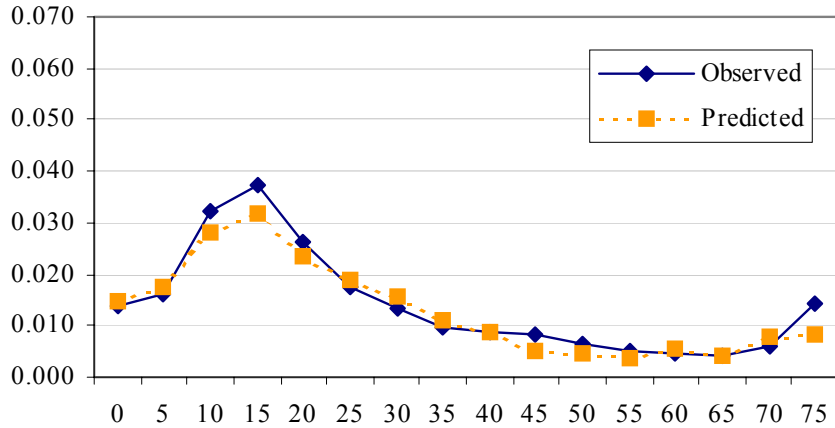


WNC-WSC



WNC-ENC

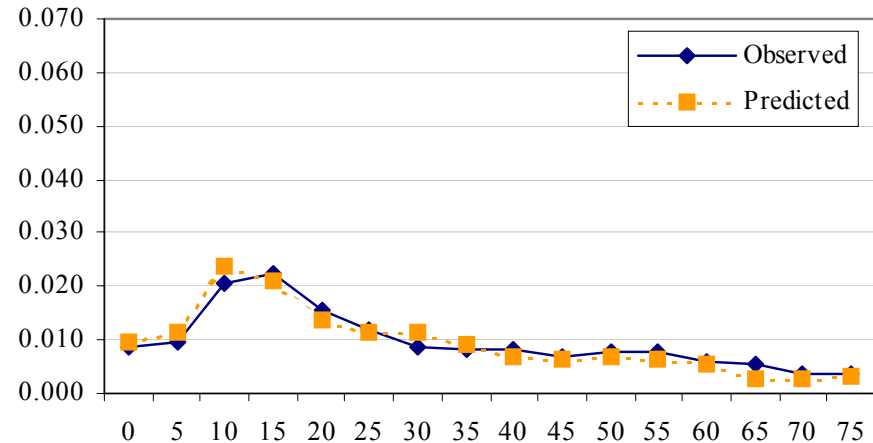
$R^2 = 0.923$



$R^2 = 0.935$

WNC-SA

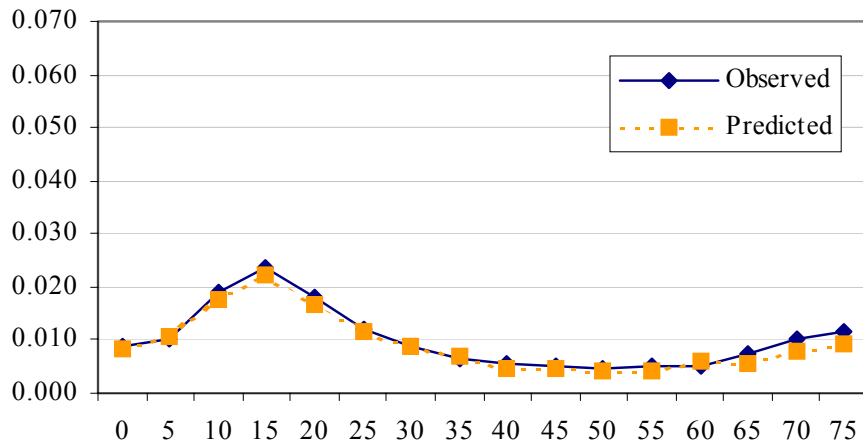
$R^2 = 0.870$



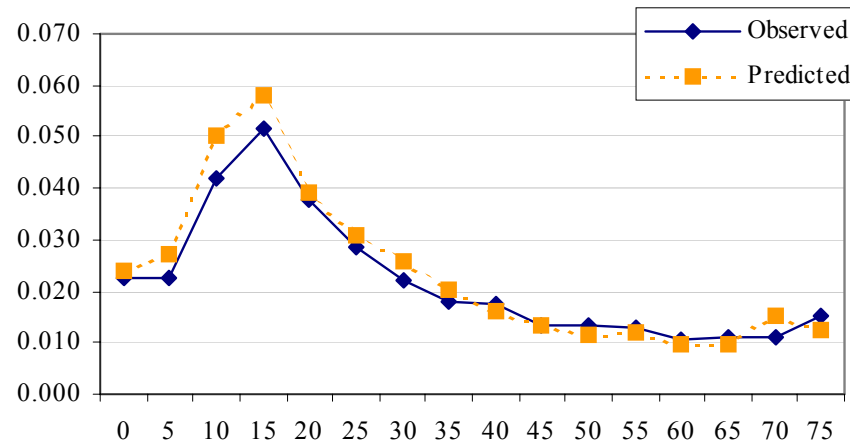
$R^2 = 0.932$

# Migration from the South

SA-MA

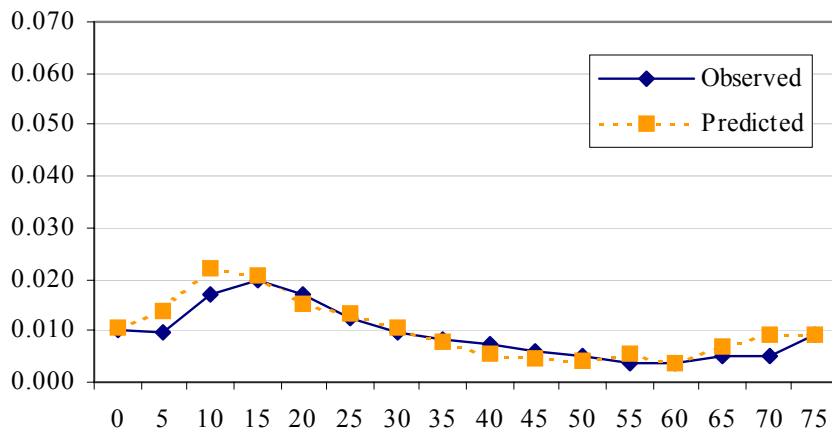


ESC-SA



$R^2 = 0.974$

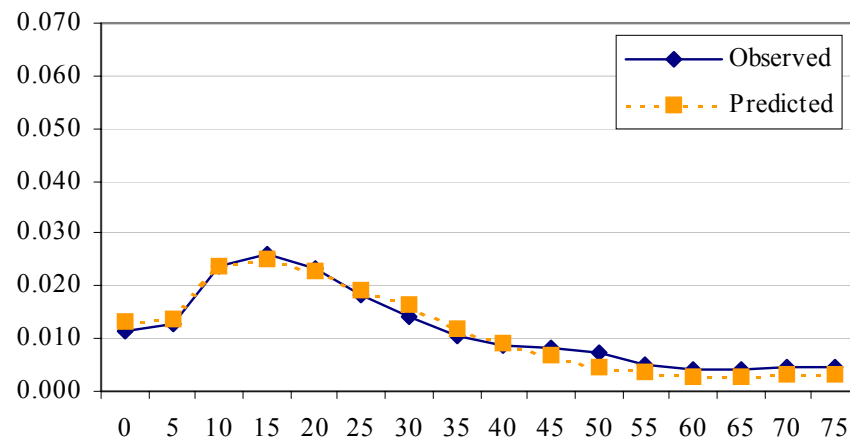
ESC-WSC



$R^2 = 0.855$

$R^2 = 0.977$

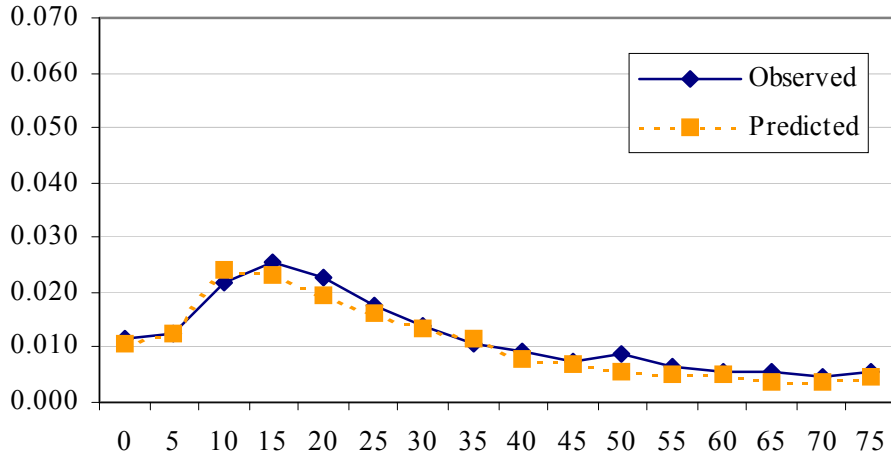
WSC-SA



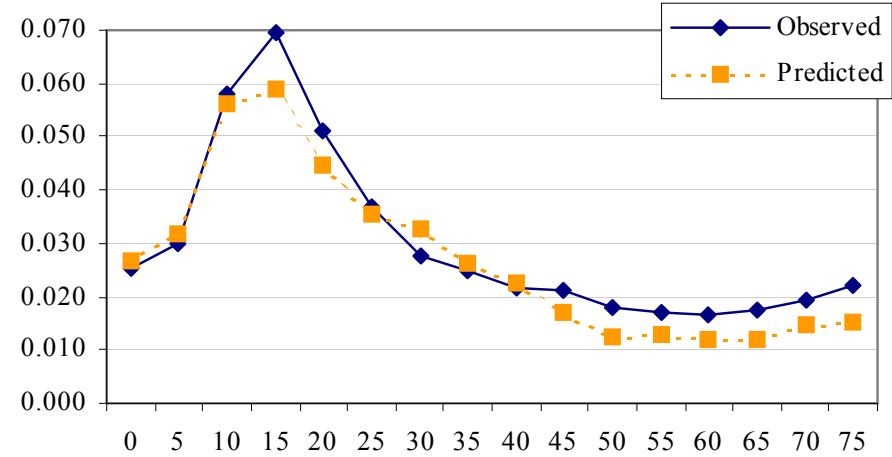
$R^2 = 0.973$

# Migration from the West

MTN-SA

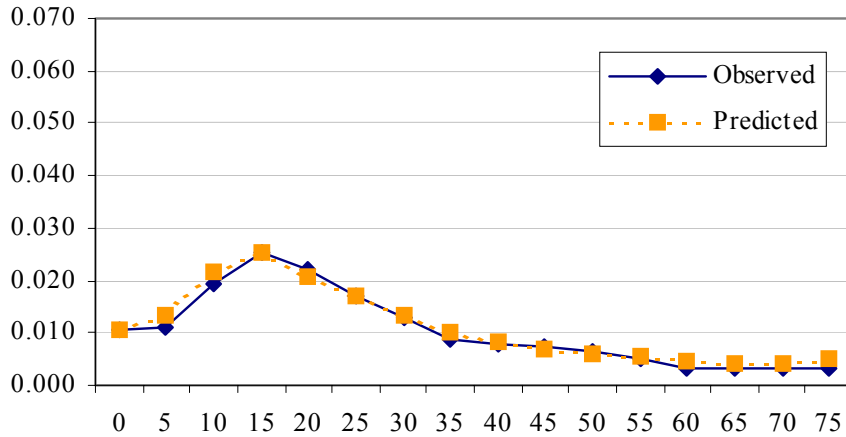


MTN-PAC



PAC-SA

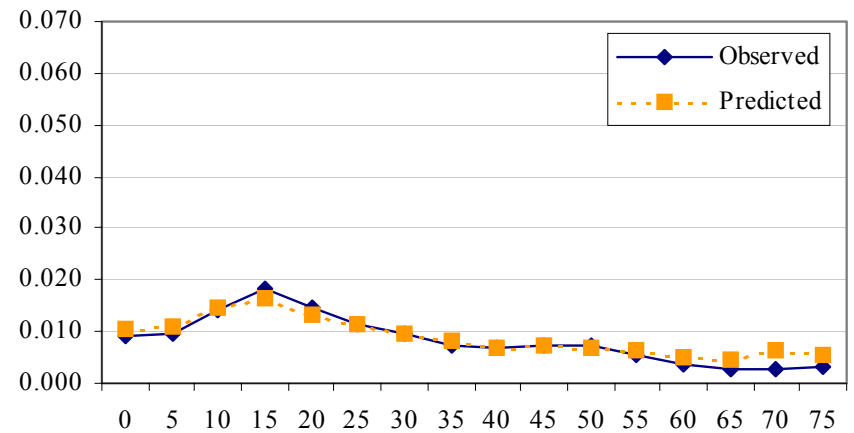
$R^2 = 0.960$



$R^2 = 0.980$

PAC-WSC

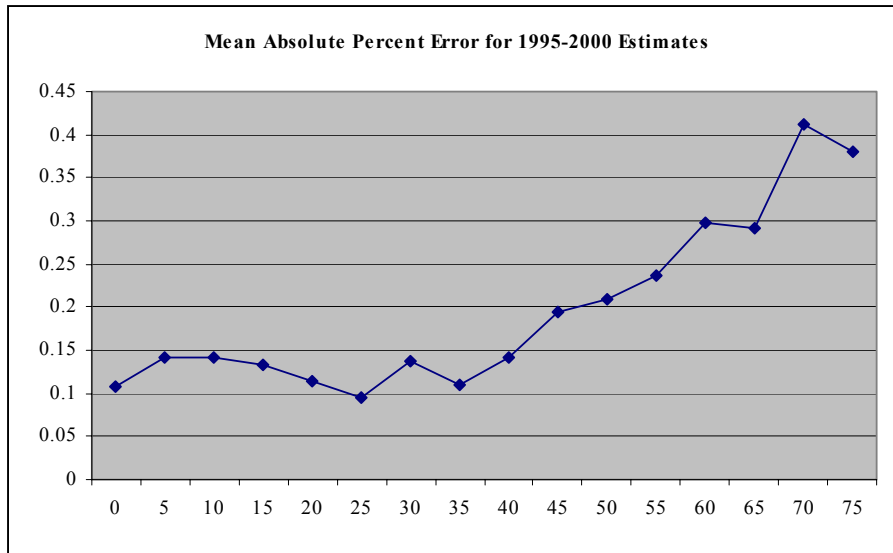
$R^2 = 0.935$



$R^2 = 0.951$

# Assessment of Predicted Values, 1995-2000

Mean Absolute Percent Error = 20%



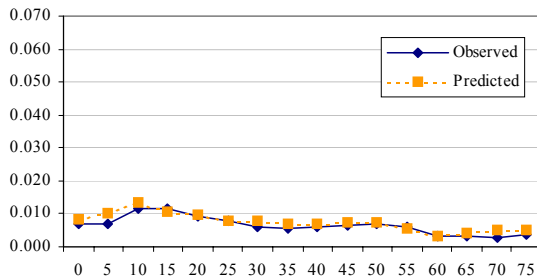
Most Effective:	Least Effective:
Predicting younger age categories, 5-10 and 25-29	Predicting older age categories, 70+

This technique estimates some ages better than others, it also estimates some regions better than others.

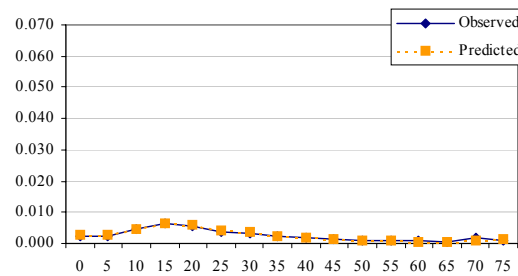
Best Fits, MAPE < 1%

Worst Fit, MAPE > 50%

ENC-ESC



WSC-MA



NE-SA

