ACS PUMS Data and Socioeconomic Modeling

Dmitry Messen

Houston-Galveston Area Council

Outline

- Overview of the H-GAC model
- Details on the Household Evolution Model
- Details on the Economic Model
- Summary and wish list

Our Approach to Socioeconomic Forecasting

- Two-tier framework
  - Macro (regional control totals)
  - Micro (local "land use")
- Tiers are linked, but without the feedback
- Fully disaggregate models
- Microsimulation (probability-nudged stochastic process)
- Path-dependency, consistency, realism
- Transparency, modularity, expandability

Two-Tier Framework

- Macro (regional "control totals")
  - What happens with people and jobs over time
  - Aspatial process (intra-regional location has no influence on dynamics)
- Micro (parcel-level "land use")
  - What happens with parcels over time
  - Spatial process (intra-regional location has everything to do with the real estate markets)

Tiers Connected

- Macro model (population and employment dynamics) creates demand estimates for new buildings (residential housing and workplaces) by simulating a list of movers (new or relocating)

- Micro model (parcel dynamics) creates supply of new buildings by simulating a list of new buildings

- Movers (households and jobs) are "matched" with buildings via choice/assignment model

Demographic Modeling

- Population-centric Model
  - Employment/jobs are endogenous
- Level of geography modeled: Region
- Household Evolution Model
- Simulation of
  - Personal biological events
    - Aging, Surviving, Giving Birth
  - Personal social events
    - Marriage, Divorce, Child Leaving Parent's Household
  - Household social events
    - Migration, Relocation

Inputs

- Base-year people/households
  - Age, Ethnicity (Black, White Hispanic, Other), Sex, Marital Status, Household Role (Head, Child, Non-relative, etc.)

- Parameters (rates/frequencies/probabilities)
  - Survival
  - Fertility
  - Household Formation/Dissolution
  - Migration/Relocation

Household Evolution Model

- Importance of households, hence household formation/dissolution; explicit and immediate consequences for the housing market
  - 1 household = 1 housing unit
  - Vacated units due to death, marriage, out-migration
  - Demand for housing units due to marriage, divorce, in-migration, relocation, etc.
- Synthesis applies only to the base year
- Keeping full accounting of people, households, and implied housing units without linking them to specific sites

Event	Entity	Source	Derivation
Death	Person	State Demographer	Projections
Giving birth	Female (10-49)	State Demographer (but can also use ACS PUMS)	Projections
Marriage	Person	ACS PUMS	Current status and status one year ago
Divorce	Person in "Married Couple" Household	ACS PUMS	Current status and status one year ago
Adult child leaving parent's household	Household with children	ACS PUMS	Change in % of adult children living with parents (as children age)
Relocation to/from the Region	Household	ACS PUMS	Current residence and residence one year ago
Relocating inside the Region	Household	ACS PUMS	Current residence and residence one year ago

Marriage and Divorce in ACS PUMS

Status One Year Ago	Current Status	Code
Not Married	Not Married	N1
Not Married	Married	N2
Married	Married	M1
Married	Divorced	M2

- Probability of Marriage = N2 / (N1+N2)
- Probability of Divorce = M2 / (M1+M2)
- Segmented by Age/Race/Sex
  - Used PUMS for all TX residents
- For marriage, also use probabilities for spousal attributes

Household Migration in ACS PUMS

- PUMA (sub-county, county, or group of counties) identifies "current" residence
- MIGSP (state/country) and MIGPUMA (county or group of counties) identify the previous residence for households not living in the same house one year ago
- Define current residence in terms of MIGPUMAs
- Define the "region" in terms of MIGPUMAs

Current Residence	Previous Residence	Same house?	"Current Year" Category
In Region	In Region	Yes	Not moved
In Region	In Region	No	Relocated within Region
In Region	Not in Region (US)	No	Domestic In-Migration
In Region	Not in Region (not US)	No	Foreign In-Migration
Not in Region (US)	In Region	No	Domestic Out-Migration

- "Current Year" households: currently residing in the region
- "Previous Year" households: those who resided in the region one year ago

- "Previous Year" households = Not moved + Relocated within Region - Domestic In-Migration + Domestic Out-Migration - Foreign In-Migration

Count of "Current Year" Households in a Category	Divided by the Total "Previous Year" Households Results in a Probability Estimate for...
Not moved	An existing household to stay in place
Relocated within Region	An existing household to relocate within Region
Domestic In-Migration	A new household to move in from some other Region
Foreign In-Migration	A new household to move in from a Foreign Country
Domestic Out-Migration	An existing household to move out to some other Region

- Unobserved Foreign Out-Migration (adjustment)
- Segmentation by Age/Race of Householder
- Multi-year averaging

ACS PUMS-Based Migration Rates for the H-GAC Region
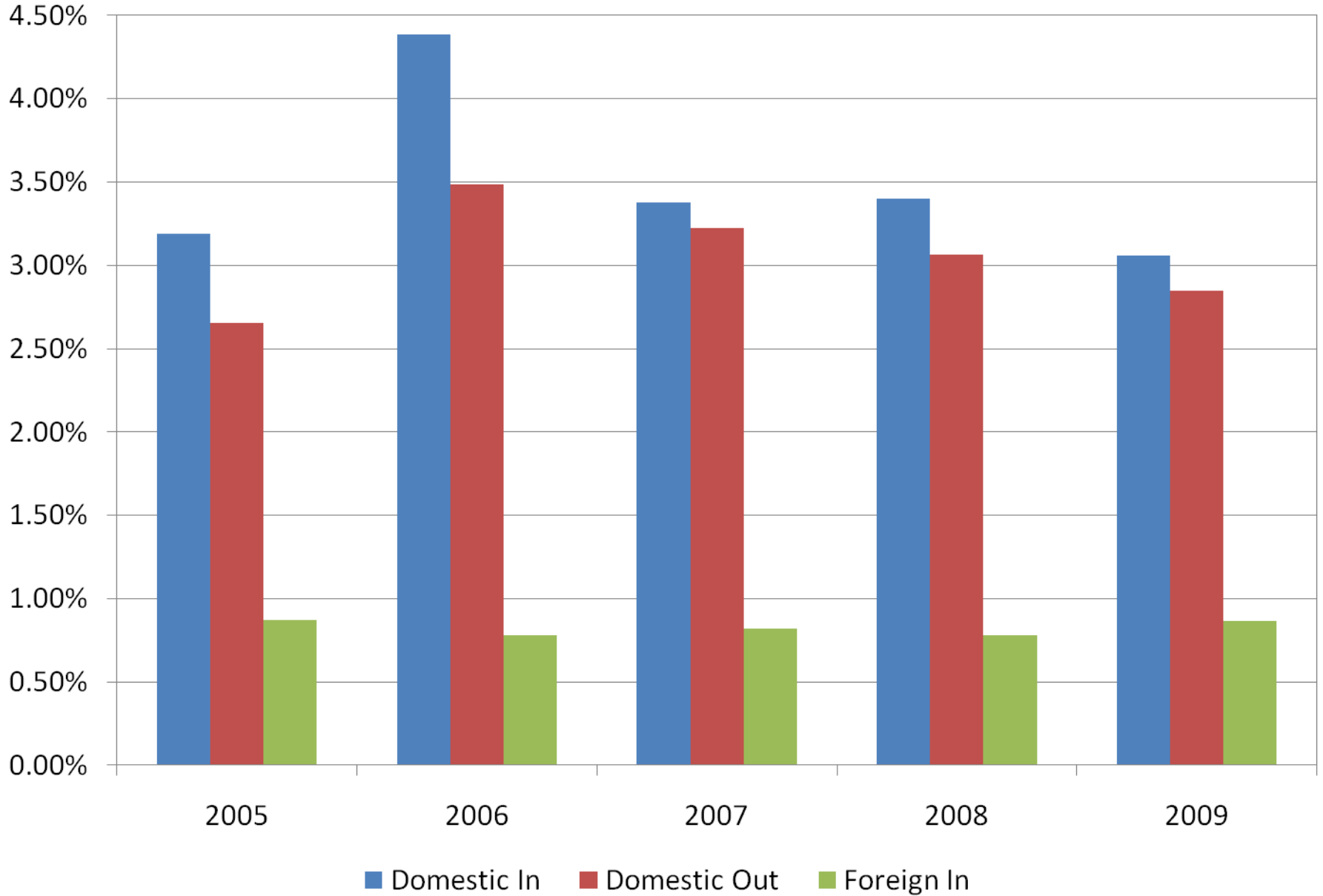
ACS PUMS-Based Domestic In-Migration Rates for the H-GAC Region
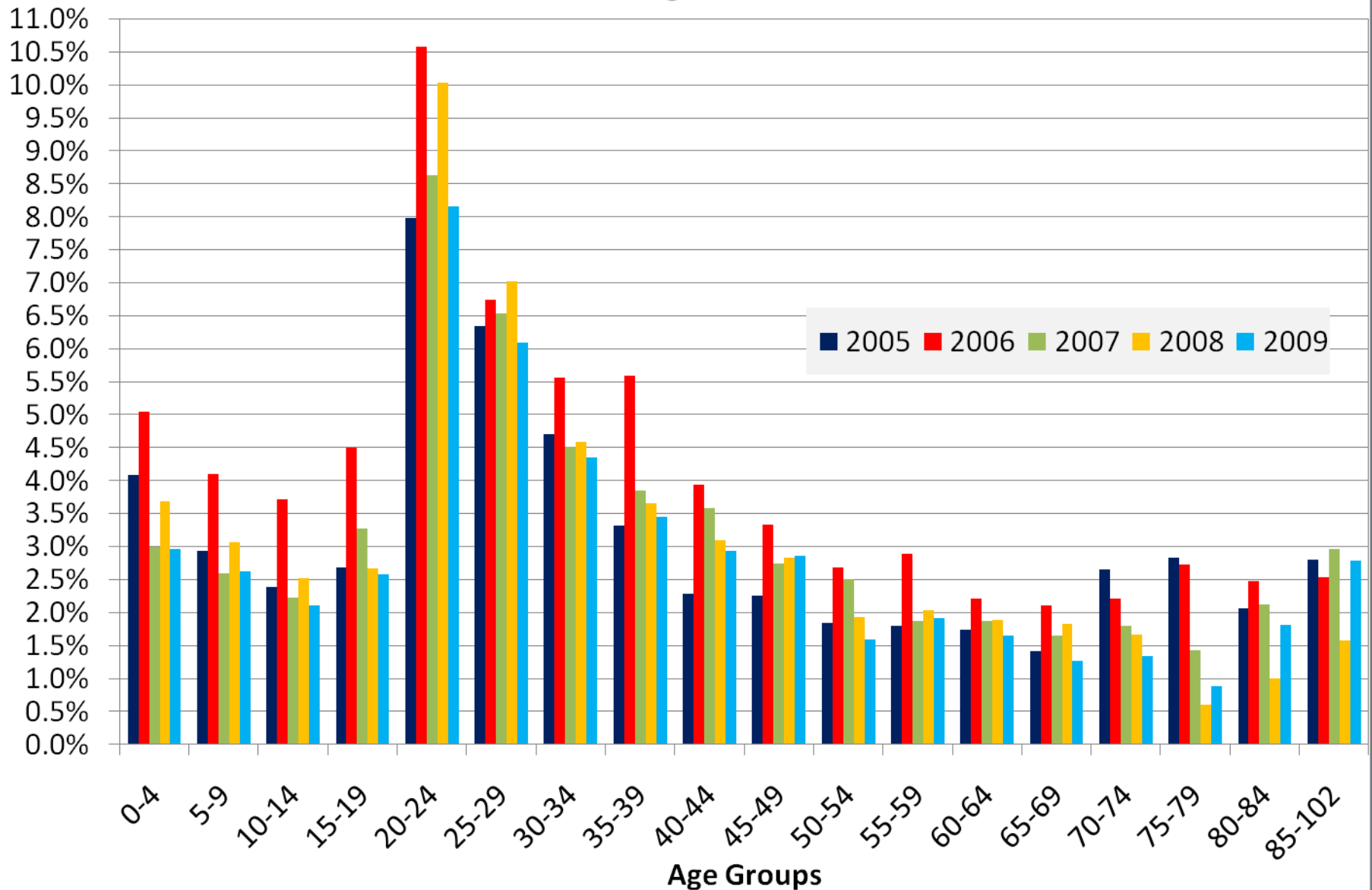
Employment Model

Population

Labor Force

Employed and Unemployed

Jobs

Jobs by Sector

Employment Parameters

Parameter	Segmented	Source
Labor Force Participation Rate	YES	ACS PUMS
Unemployment Rate	YES	ACS PUMS
System-wide (Regional) Unemployment Rate	NO	Projections
Share of Working Residents who Work in the Region	NO	ACS CTPP
Jobs Per Local Worker	NO	BEA, BLS

Model Summary

- Effective representation of biological and social dynamics for population and households

- Jobs balanced with People

- Links and constraints are more important than absolute levels

- Parameters as knobs/dials

- Ability to run scenarios (e.g., regional/national recession, closed borders, matching external employment forecast)

ACS PUMS Wish List

- Larger sample
- Year half (first/second) indicator
  - Census estimates are for mid-year
- More data on non-marriage based and non-family households
  - Particularly on change over time

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www.h-gac.com/forecast

forecast@h-gac.com

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