An Expanded Look into the Role of Economic Diversity on Unemployment

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Introduction

- By "economic diversity", we mean diversity among industries

- We measure diversity with a normalized Shannon-Weaver index (S-W Index)

  - Measurement of entropy divided by maximum possible entropy: $$\frac{\sum_i^N(\frac{E_i}{E}*\log_2\frac{E_i}{E})}{\log_2\frac{1}{N}}$$

  - E_i denotes employment in industry i, E denotes total employment, N is maximum number of industries

  - Range from 0 to 1, 0 being least diverse, 1 being most diverse

  - Common measurement, reported in IMPLAN software

Motivation

- Policy motivation:
  - Classic case is regional economic policy, industry targeting, etc. (for example, does an area want to spend resources recruiting new types of businesses, or compounding specialization?)
  - People could just move, but generally have an interest in promoting a strong (smoothly growing) economy where they are.
- Research motivation:
  - The question of the effects of economic diversity has been around for a while
  - Perhaps we can motivate renewed interest and rigor with different data and methods
    - Taking up old questions with new data, new(er) statistical methods
    - In favor of asking newer questions, using newer theories, but wanted to start with the basic questions
  - Eventually, inform policy

Short Literature Review

- Diversity often theorized to affect a region's stability and prospects for growth

- Empirical results mixed
  - Either no results, or somewhat beneficial for stability and unemployment (Malizia & Ke, 1993)

- Theoretical concerns (Wagner & Deller, 1998; Wagner, 2000)
  - Is the effect of diversity, per se, really what we are trying to measure?
    - Maybe it's actually import rates, economic integration
  - Why the norm of equally distributed employment?
  - Specialization seems to benefit some regions, e.g., Silicon Valley, but not others, e.g., Detroit

- Our goal: revisit empirical results with more (better?) data, different (better?) statistical methods

Data

- Dependent variable: Annual changes in county-level unemployment rates from LAUS
- Independent variables: New set of IMPLAN data from 2001-2014
  - Based on consistent time-series source data from NIPA, BEA REA
  - Consistent estimation methods
  - Higher sector detail (536)
  - County level, only counties with consistent borders over time
- Good, but...
  - Synthetic: synthetic raw data and estimations to fill missing values from non-disclosures
  - LAUS data on place-of-residence basis, most employment data on place-of-work basis

Methods

- Common panel data methods:
  - Fixed Effects (FE) – time and entity
  - Random Effects (RE) – we settled in favor of FE over this
  - Lagged Dependent Variable (LDV) – results generally consistent with FE models
- Models estimated generally look like:
  - $URC_i = \beta_n SW_{i(t-n)} + \gamma \mathbf{x}_{i(t-1)} + \mu_t + (\alpha_i \text{ } or \text{ } \alpha URC_{i(t-1)})$
    - URC: unemployment rate change from t-1 to t
    - t is time, i is county, n is for various lags & leads
    - $\mathbf{x}$ is vector of covariates including unstable sector shares, logs of population density, average pay, and total employment
    - μ are fixed time effects
    - α are fixed entity effects or LDV effects
  - Always estimated robust SEs clustered around i

Results 1

- Sorting out causality
    - Lagged values of S-W Index generally had a negative, and significant, coefficient of about 3, but...
    - Contemporaneous values of S-W Index generally were positive, and significant
    - In an LDV model, we interacted lagged S-W, contemporaneous S-W, and the LDV, and achieved more consistent and significant results that corroborate the significantly negative coefficient, and are consistent with a causal relationship
   - Consistent with results from other research

Results 2

- Diversity and Responding to Employment Shocks
  - Interact positive and negative employment shock variables with S-W Index reveals a pattern: economic diversity has a destabilizing effect in either direction
    - in cases of negative employment changes, a larger S-W index exacerbated the increase in unemployment rate
    - in cases of positive employment changes, a larger S-W index boosted the decline in unemployment rate.
  - This was the case when we used continuous variables for employment shock as percentage of total employment or categorical variables for different levels of shocks
 - Employment shock variables behaved as expected

Categorical Employment Shock Effects

| Average Marginal Effects				
	dy/dx	Std. Error	z	P>|z|
1.NegGrowth01to025	0.050693	0.014491	3.5	0.000
1.NegGrowth025to05	0.242605	0.017543	13.83	0.000
1.NegGrowth05to1	0.734524	0.032274	22.76	0.000
1.NegGrowth1to2	1.193585	0.128333	9.3	0.000
1.NegGrowth2Plus	0.319163	0.465125	0.69	0.493
1.PosGrowth01to025	-0.08966	0.012599	-7.12	0.000
1.PosGrowth025to05	-0.18031	0.013329	-13.53	0.000
1.PosGrowth05to1	-0.23097	0.017934	-12.88	0.000
1.PosGrowth1to2	-0.25481	0.042968	-5.93	0.000
1.PosGrowth2Plus	-0.40558	0.168179	-2.41	0.016

Negative Employment Shock Effects At Different Values of S-W Index

Average Marginal Effects

Positive Employment Shock Effects At Different Values of S-W Index

Average Marginal Effects
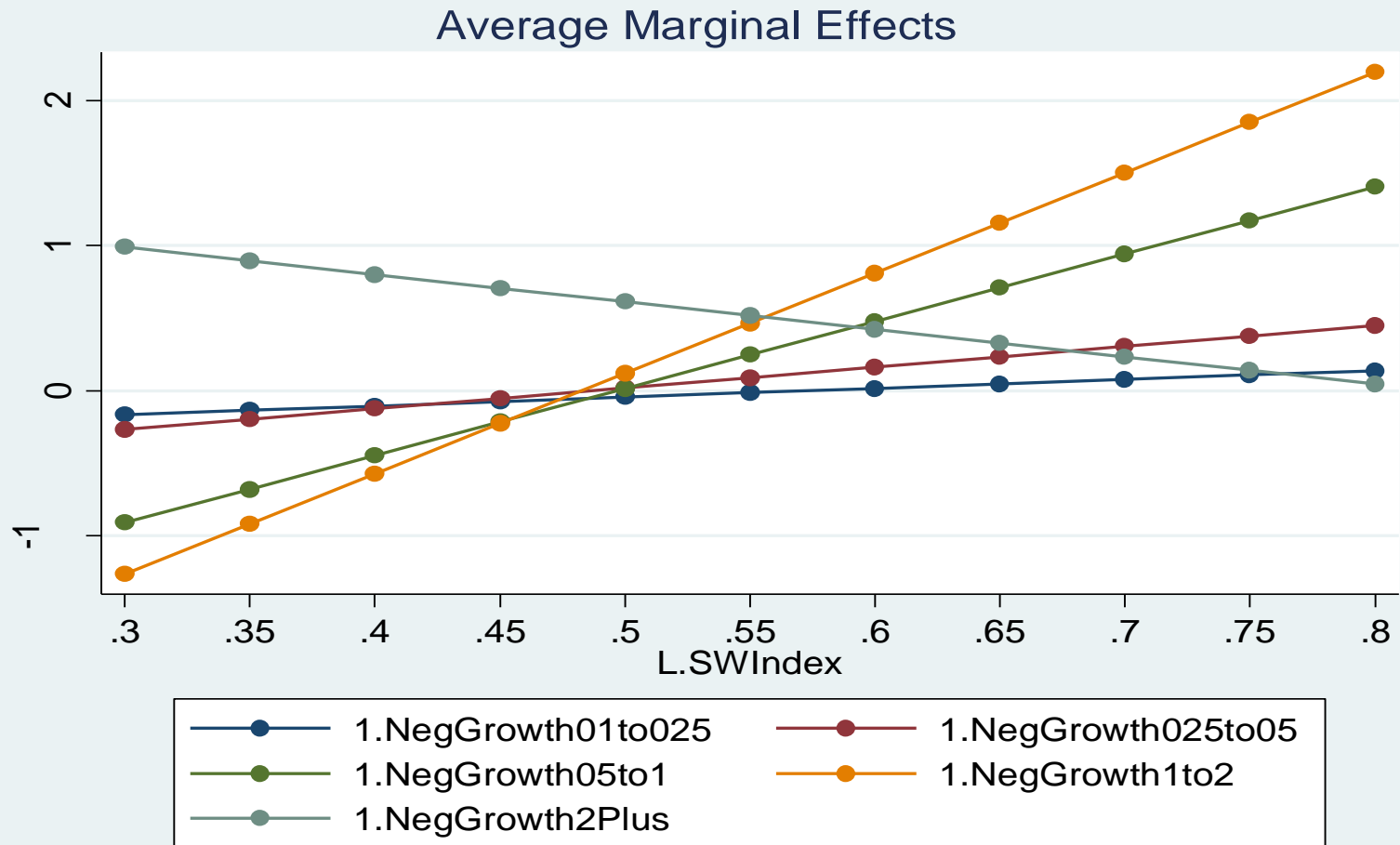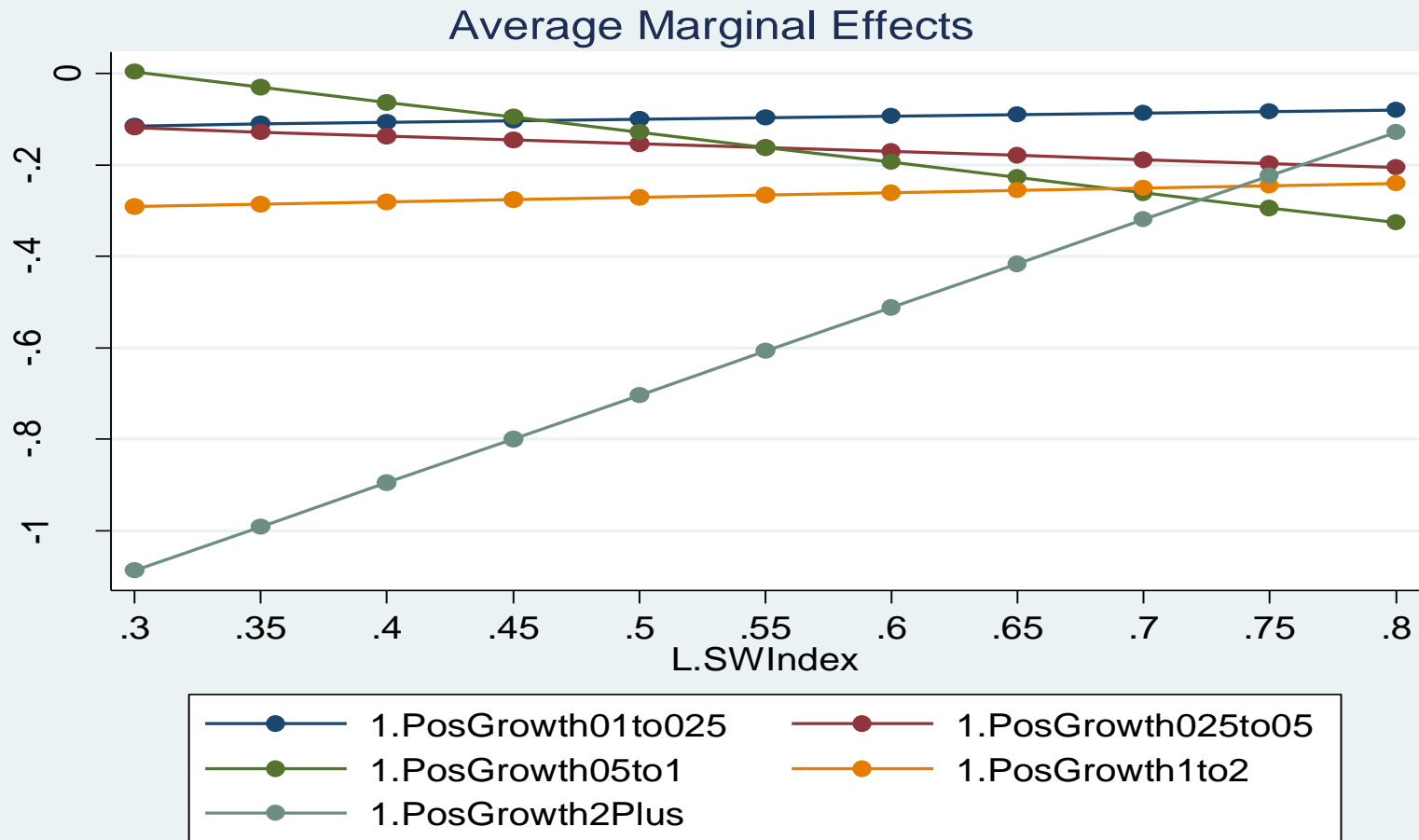
# Continuous Employment Shock Effects At Different Values of S-W Index
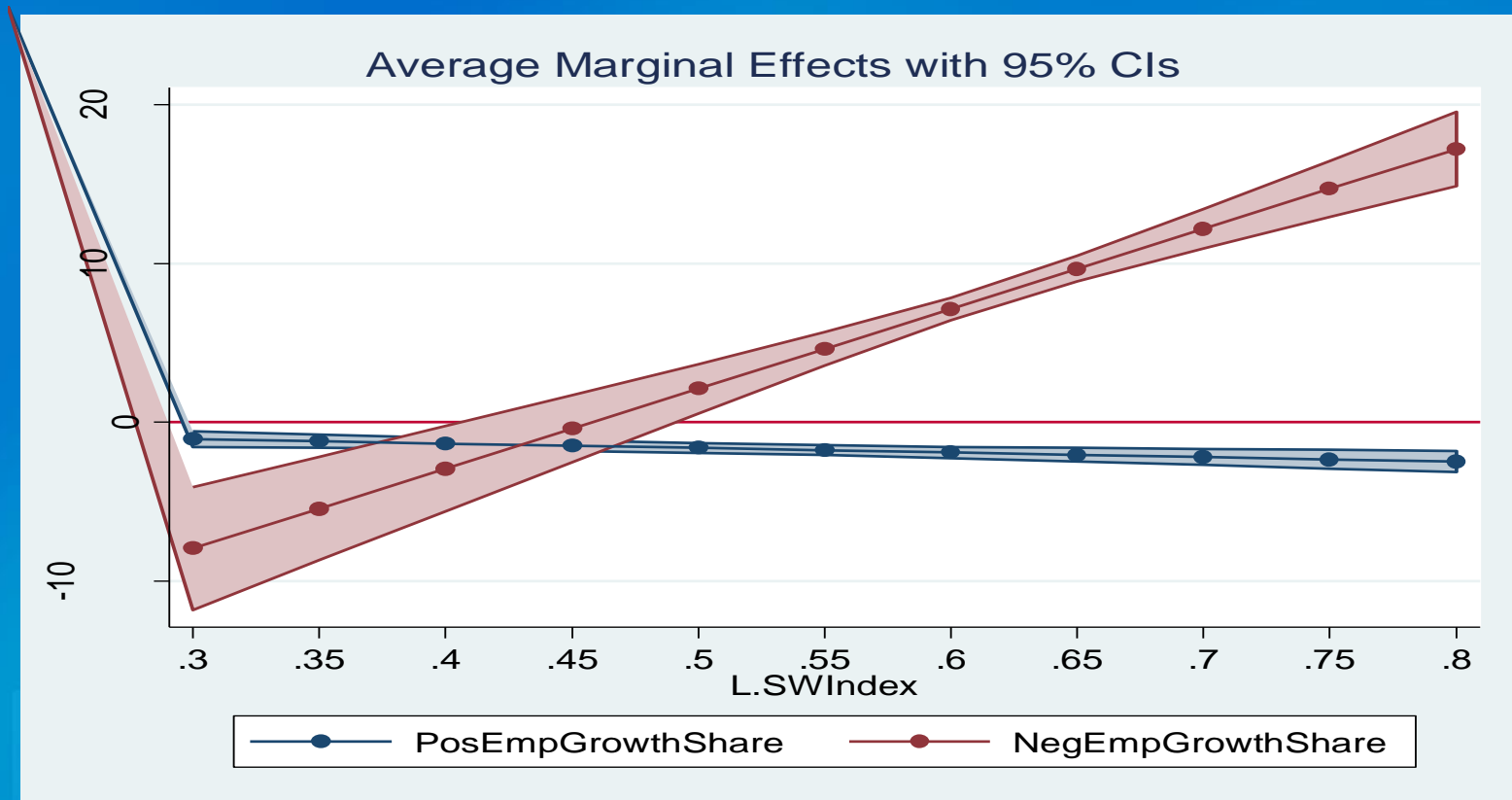
Interpretation

- We suspect that the destabilizing effect of S-W-based diversity may be due to the higher level of interdependence between sectors in regions with higher economic diversity.

- If so, this should be thought of as a re-characterization of the "shielding" or "insulating" theory; more than just protecting an economy from negative external shocks, higher levels of diversity shield an economy from external shocks in either direction (i.e., whether positive or negative), while magnifying the effects of internal shocks due to the more self-contained nature of the economy.

- Full disclosure: we're not theoreticians and these are preliminary thoughts

Economic Significance

- We found, consistent with much of the literature, a significant relationship between an entropy-based measurement of economic diversity and unemployment

- That said, the coefficient on S-W Index (or its marginal effect) tends to be around -3 (or closer to 0)

- Consider a coefficient of -3 and a change in S-W Index of 0.05. In a county that will move from 6% to 5% unemployment rate (URC of -1), the 0.05 increase in S-W Index will increase the magnitude of the change, a 6% to 4.85% decline (URC of -1.15)

  - To argue for policy significance might be a stretch based on this evidence, and in light of remaining uncertainties about the effects of economic diversity and opportunity costs of public resources devoted to economic development
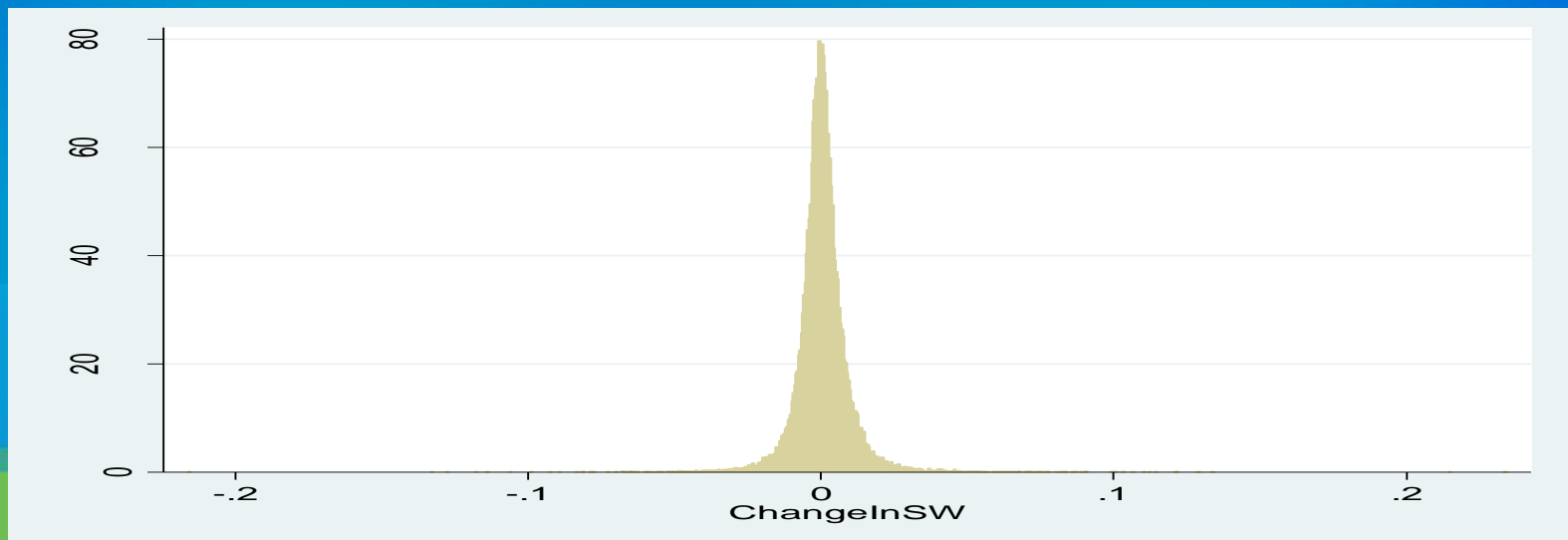
Conclusion

- Would like to do this over longer time periods, more business cycles

- Would like to try alternatives to S-W Index (e.g., other entropy metrics, Input-Output metrics), different areas (e.g., MSAs), different model specifications with the same data

- Comments or questions?