

Appendix. Selection correction for neighborhood effects regressions based on the multinomial logit model

This appendix is designed to illustrate how one can employ the Heckman-type selection corrections to account for endogeneity of neighborhood choice. The analysis is taken from Brock and Durlauf (2003). Under the assumptions that 1) $v_{i,n}$ is double exponentially distributed, i.e. $\mu(v_{i,l} \leq \zeta) = \exp(-\exp(-\beta\zeta + \gamma))$ (so that neighborhood choice obeys a multinomial logit model) and 2) ε_i is normally distributed, arguments in Lee (1983) may be used to show that

$$\omega_i = k + cX_i + dY_{n(i)} + Jm_{n(i)} - \rho\sigma_\varepsilon\varphi_{n(i)}(\gamma Z_{i,n(i)}) + \xi_{i,n(i)} \quad (32)$$

where

$$\varphi_{n(i)}(v) = \phi\left(\frac{\Phi^{-1}(\Lambda_{n(i)}(v))}{\Lambda_{n(i)}(v)}\right) \quad (33)$$

with $\phi(\cdot)$ and $\Phi(\cdot)$ denoting the density and distribution function of a normal (0,1) random variable and

$$\Lambda_{n(i)}(v) = \frac{\exp(v)}{\exp(v) + \sum_{n \neq n(i)} \exp(\gamma Z_{i,n})} \quad (34)$$

The correction described by (33) and (34) allows for consistent estimation of the behavioral parameters in (32). The parameters γ are estimated in a first stage multinomial logit analysis and used to form $\varphi_{n(i)}(\gamma Z_{i,n(i)})$; $\rho\sigma_\varepsilon$ is simply a regression parameter in (32).

Table 1: Models of Neighborhood Formation

Model	Neighborhood Structure	Sorting mechanism	Neighborhood Effects	Equilibrium Allocations
Bénabou (1993)	2 equal sized neighborhoods for ex ante identical individuals	Rental price differences between neighborhoods	Peer effect via lower human capital investment costs when others have invested	Stable stratified equilibria exist
Bénabou (1996a)	2 equal sized neighborhoods for individuals of two types for characteristic that is valued in peers	Rental price differences between neighborhoods	Mean characteristic in neighborhood is valued	Stable stratified equilibria exist and are linked to several aspects of the microstructure
de Bartolome (1990)	2 neighborhoods of fixed size	Rental prices and education/tax packages.	Ability level of peers affects value of educational expenditure	Stratified versus integrated equilibria depend on strength of peer effects; integration requires “intermediate” degree of interactions
Durlauf (1996a)	Number and size of neighborhoods are endogenous	Neighborhoods may erect income barriers	Local public finance; distribution of incomes in neighborhood also increases productivity of educational expenditure	All equilibria are stratified
Durlauf (1996b)	Number and size of neighborhoods are endogenous	Housing prices	Local public finance; distribution of incomes in neighborhood also increases productivity of educational expenditure	All equilibria are stratified
Epple and Platt (1998)	J neighborhoods of arbitrary size	Differences in property tax, lump sum subsidies	Local public finance	Partial stratification

Model	Neighborhood Structure	Sorting mechanism	Neighborhood Effects	Equilibrium Allocations
Epple, Filimon and Romer (1984)	J neighborhoods of arbitrary size	Differences in property tax rates and public good provision	Local public finance; no spillover effects	Stable stratified equilibria exist under assumptions ensuring willingness to pay for public goods is increasing in income
Fernandez and Rogerson (1997)	2 neighborhoods	Tax and education expenditure differences; zoning is modeled as minimum housing consumption level	Local public finance; no spillover effects	All stable equilibria are stratified; zoning increases ability of richer families to isolate themselves from others
Fernandez and Rogerson (1996)	J neighborhoods for $I > J$ income classes	Differences in income taxes and public education provision	Local public finance; no spillover effects	All stable equilibria are stratified
Hoff and Sen (2000)	J neighborhoods of equal size	Differences in rental and house prices	Value of home is affected by expenditures of neighbors	Stable stratified equilibria exist
Nechyba (1997)	J neighborhoods of fixed size	Housing prices	Local public finance	Under plausible assumptions, agents stratify by preferences and income

Table 2: Regression Studies of Neighborhood Effects

Study	Agents	Outcomes	Neighborhood Characteristics	Findings
Aaronson (1998)	Adults with siblings at least 3 years apart	High school graduation, grade completion, college attendance	High school drop out and poverty rate for neighborhood, averaged over ages 10-18; geocode or equivalent data used when available, Zip Code otherwise	Neighborhood effects are present and generally robust
Ainsworth (2002)	8 th Grade Students	Composite Math/Reading Test Score; time spent on homework	Composite measures of proportions of high status adults, neighborhood stability, degree of economic deprivation, and ethnic diversity at Zip Code level	Proportion of high status adults positively influences educational outcomes
Aizer and Currie (2002)	Mothers in California with less than 4 years of college	Utilization of publicly available prenatal care	Utilization rate among other women of similar ethnicity at 5 digit Zip Code	Peer effects matter even after controlling for spatial fixed effects; however these also matter for repeat users, thus peer effect does not seem due to information transmission
Anseshensel and Sucoff (1996)	Adolescents in Los Angeles County	Measures of mental health	Socioeconomic and ethnic characteristics of neighbors that are formed by applying cluster analysis to characteristics of 49 census tracts based on 1990 data	Neighborhood characteristics are associated with perception of danger from crime, etc., which in turn are associated with depression, anxiety, etc.

Study	Agents	Outcomes	Neighborhood Characteristics	Findings
Bertrand, Mullainathan, and Luttmer (2000)	Adult women	Welfare use	Network measure equal to product of percentage of neighborhood members in same language group multiplied by welfare usage rate of group; data measured at Public Use Microdata Areas and Metropolitan statistical areas of PUMS	Network measure helps predict welfare use; results robust to a range of specifications
Borjas (1995)	Adults	Educational attainment, wage rates	Percentage of neighborhood that has graduated from high school, percentage that has graduated from college, labor force participation, and additional measures	Neighborhood characteristics explain some, but not all, of persistent ethnic differences in outcomes
Brewster (1994)	Adolescent women	Nonmarital sexual activity	Income, labor market, education, and racial heterogeneity measures taken at census tract level	Premarital sexual activity associated with lower median income, higher female unemployment and higher percentage of women employed full time outside the home
Brooks-Gunn et al (1993)	Infants age 3 and adolescents age 14-19	IQ and measure of behavioral problems at 36 months; dropping out of high school and nonmarital fertility	Percentage of families in neighborhood with income below \$10,000; percentage with incomes above \$30,000; various additional measures	White teenagers benefit from affluent neighbors; strength of effect appears greater for more affluent families
Case and Katz (1991)	Young men in low income Boston neighborhoods	Criminal behavior, drug and alcohol use, church attendance, labor market activity	Mean behavior of neighbors	Peer effects are statistically significant and qualitatively large

Study	Agents	Outcomes	Neighborhood Characteristics	Findings
Corcoran et al (1992)	Males age 25-32	Hourly wages, hours of work, family income, family income relative to needs	Median family income, male unemployment rate, percentage of female-headed families, percentage of families on welfare in Zip Code for residence in 1968	Some evidence of effects related to welfare participation rate; other variables statistically insignificant
Crane (1991)	Young women age 16-19	Dropping out of high school and teenage fertility	Percentage of workers with professional or managerial job in PUMS neighborhoods (similar to census tracts)	Job composition generally predicts both outcomes; effect is nonlinear, stronger for worst neighborhoods
Crowder and South (2003)	Teenagers	Dropping out of high school	Index of neighborhood disadvantage based on poverty and joblessness rates, occupational structure, and additional measures.	Neighborhood effects present for a range of demographic groups, particularly strong for black teenagers in single parent households and low income whites
Datcher (1982)	Males 23-32	Years of schooling, hourly wages, annual earnings	Average income and racial composition of Zip Codes	Intra and inter-racial education and wage differences associated with each measure
Drewianka (2003)	Men and women 16-44	Marriage rates	Percentage of unmarried adults in age group and various demographic characteristics of counties of residence	Larger pools of unmarried persons reduce marriage probabilities
Evans, Oates, and Schwab (1990)	Teenagers	Dropping out of high school, teen fertility	Percentage of students in school attended who are classified as economically disadvantaged under Elementary and Secondary Education Act	No evidence of neighborhood effects once endogeneity of neighborhood is controlled for by instrumental variables

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Foster and McLanahan (1996)	Young Adults	Dropping out of high school	Drop out rate in census tract	OLS estimates find neighborhood effects; these largely disappear if neighborhood variable is instrumented with city-level socioeconomic characteristics, although test of null hypothesis of equivalence of OLS and IV estimates fails to reject
Ginther, Haveman, and Wolfe (2000)	Young Adults	High school graduation, years of schooling, teen nonmarital fertility	Percentage of households with low income, percentage with high incomes, percentage white, percentage of drop outs among young adults, percentage female headed families, adult unemployment rate	Evidence of neighborhood effects is not robust to different choices of individual family background controls; richer control sets typically reduce magnitudes and statistical significance
Hogan and Kitagawa (1985)	Black female teenagers in Chicago	Nonmarital fertility	3 category ranking of neighborhood quality based on principal components analysis of a range of census tract socioeconomic characteristics	Little evidence of neighborhood effects once parenting practices are controlled for
Ioannides (2002)	Residences	Value of improvements made to home	Endogenous effects (home improvements by neighbors) and contextual effects (socioeconomic characteristics of neighbors)	Endogenous effects strongly statistically significant; contextual effects generally not statistically significant once endogenous effects are included

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Ioannides and Zabel (2002a,b)	Residences	Market value of a residence; interpreted as level of housing consumption of homeowner	Endogenous effects (housing consumption level of neighbors) and contextual effects (socioeconomic characteristics of neighbors)	Both endogenous and contextual effects are present, even after self selection and neighborhood fixed effects are accounted for
Plotnick and Hoffman (1999)	Female sibling pairs (or large sibling groups if available)	Nonmarital fertility, postsecondary education, income	Percentage of families in census tract headed by females, percentage receiving public assistance, percentage with low incomes, percentage with high incomes	Little evidence of neighborhood effects once fixed family effects are allowed
Rivkin (2001)	Young female adults	Test scores in 12 th grade, teen fertility, post high school education/labor force participation	Average education of schoolmates' mothers	Neighborhood effect estimates are larger when instrumental variables used to account for self-selection
Sirakaya (2003)	Ex-felons on probation	Recidivism for felony crimes	Recidivism rate, time to recidivism among recidivists, range of socioeconomic and demographic characteristics of legal jurisdictions (cities or counties)	Both measures of neighborhood recidivism affect individual recidivism probabilities; results are robust to controls for unobserved heterogeneity and model uncertainty

Study	Agents	Outcomes	Neighborhood Characteristics	Findings
Turley (2003)	Children under age 13	Indices of educational achievement, self esteem, and undesirable behavior	Median income of census tract or closest equivalent in PSID geocode data, measures of social connection to neighborhood (number of years child has lived in neighborhood, number of neighborhood children known by name), racial heterogeneity (measured proportion of blacks)	Effect of median income much stronger for whites than blacks; effect of median income on blacks requires certain percentage of blacks in neighborhood; effects of median income strong only when connections to neighborhood are above certain thresholds
Weinberg, Reagan, and Yankow (2002)	Adult Men	Annual hours worked	Employment rate of adult men and job density in census tract and block group, 5 additional measures used to check for robustness	Neighborhood effects matter with stronger effect in worst neighborhoods