

**FINAL PAPER GUIDELINES – DUE Tuesday, 12/16 by 5pm – To be completed individually**

**A hardcopy should be submitted directly to your TA**

**Please note: given the deadlines for submission of grades for the semester, there will be NO extensions granted and late papers will not be accepted.**

Your first assignment asked you to make a preliminary attempt at assessing the potential and limitations of a science of cities. Since then, you were tasked with modeling and presenting possible theoretical explanations for neighborhood change, mapping the flow of information through an urban system and domain area, and exploring the application of scaling laws to urban carbon emissions.

In this final assignment, your goal is to explore the potential for a science of cities more deeply. You have two options:

- (1) An analysis of urban innovation and productivity - *respond to the three questions on the following pages using the data indicated;*  
*or*
- (2) Drawing from the literature discussed in class (and other readings), develop an argument supporting – or contradicting – the possibilities for a science of cities. Your argument will be demonstrated by an empirical analysis based on a question, hypothesis, and data of your choosing. This paper may also be a more theoretically-driven discussion of urban science, using existing research to clearly support your argument.

Regardless of which option you choose, your final paper (expected to be approximately 10-15 pages, double spaced, excluding figures, and one-inch margins) should comprise of the following, at a minimum (note – the pages indicated are only guidelines):

- a. Introduction to the urban topic/problem at-hand you are aiming to solve/answer and hypothesis to be tested (~ 1-2 pages)
- b. Literature review of previous research relating to your chosen topic (~3-4 pages)
- c. Clear description of the specific question(s) being asked, data sources, variables, unit of analysis, methods of data manipulations and analyses, results (visualized in some manner) and insights/explanations drawn from the analyses and results (total ~4-6 pages for all questions). *Please see the patent data final project for more information on how to structure this section.*
- d. Conclusion synthesizing your analysis/insights, laying out the limitations and commenting on how you could improve the analysis, etc, with additional data. (~2-3 pages)

In addition, please include and caption figures in the text and document all works cited.

This is not a group project, and each student is expected to individually complete the assignment based on their independent research. Please submit a stapled, double-sided, hardcopy of your paper by December 16, 5pm to your TA.

## Understanding Spatial Patterns of Urban Innovation and Productivity

These suggested projects will give you experience using and analyzing patent data in the context of urban economic development. Please follow the requirements/guidelines above when completing the project. The three components of the project are laid out below:

### I. Patents and Economic Development

Question: *what is the relationship between patenting performance and economic performance?*

Variables: *per capita real GDP* (as a measure of economic performance, productivity and wealth) and *patent intensity* (patents per capita) as a measure of inventive productivity.

Spatial unit of analysis: *Metropolitan Statistical Areas (MSAs)*

#### Data sources

For MSA GDP:

Bureau of Economic Analysis (BEA), U.S. Department of Commerce

<http://www.bea.gov/iTable/iTable.cfm?reqid=70&step=1&isuri=1&acrdn=2#reqid=70&step=1&isuri=1>

For MSA patents:

U.S. Patent Office

[http://www.uspto.gov/web/offices/ac/ido/oeip/taf/cls\\_cbsa/allcbsa\\_gd.htm](http://www.uspto.gov/web/offices/ac/ido/oeip/taf/cls_cbsa/allcbsa_gd.htm)

For MSA population:

Bureau of Economic Analysis (BEA), U.S. Department of Commerce

<http://www.bea.gov/iTable/iTable.cfm?reqid=70&step=1&isuri=1&acrdn=2#reqid=70&step=25&isuri=1&7023=7&7024=non-industry&7001=720&7090=70&7029=20&7022=20>

Construction of the patent intensity variable will involve matching the patent data with the population data (at the MSA level):  $(\text{MSA patents} / \text{MSA population}) \times 100,000$  (since the numbers tend to be small for some locations).

The way by which the Patent Office assigns a patent to an MSA is by the place of residence of an inventor; for patents with multiple inventors residing in different MSAs, each of the metropolitan areas represented in the authors' places of residence gets its patent count increased by one.

Suggested starting analysis: scatter plot of LN(GDP per capita, annual data averaged over 2008-2012 period) vs. LN(patent intensity, annual data averaged over 2001-2005 period). [Why average over 5 years? Why different time windows?]

## II. Technological Profiles of Metropolitan Areas

Questions: *what is the technological profile of the New York MSA? How does this profile contrast/compare with that of (choose three other metropolitan areas)?*

### Variables

Counts of *patents* by MSA by *technology class*

Spatial unit of analysis: *Metropolitan Statistical Areas (MSAs)*

### Data Sources

For patent counts by MSAs by Technology classes:

USPTO

[http://www.uspto.gov/web/offices/ac/ido/oeip/taf/cbsa\\_cls/index.html](http://www.uspto.gov/web/offices/ac/ido/oeip/taf/cbsa_cls/index.html)

For patent technology classes:

USPTO

<http://www.uspto.gov/web/patents/classification/selectnumwithtitle.htm>

Suggested starting analysis: for the period 2001 to 2011, tally the number of patents, by technology class, allocated to the New York MSA; identify the top 10 technologies based on the proportion of total NY MSA patent output they account for; do a similar exercise for three other MSAs. Compare the four lists of top areas of inventive activities --- what can you glean from such a comparison?

## III. Technological Heat Maps of Metropolitan Areas

Question: *how diverse are the metropolitan patenting portfolios?*

### Procedure:

Construct a 481 x 367 matrix (481 rows corresponding to technology classes; 367 columns corresponding to MSAs); in each cell enter a Y if at least one patent has been generated in a given MSA in a given technology class over the period 2001 – 2011; re-arrange so that columns are ordered from left to right with the one with the least Ys on the left and the one with the most Ys on the right --- this is a “heat map” displaying the diversity of patenting across metropolitan areas. *What does the resulting pattern reveal about patenting across metropolitan areas?*