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Whether Supply Side Housing Assistance Program is Efficient in Helping Overcome Spatial Mismatch
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Whether Supply Side Housing Assistance Program Is Efficient In Helping Over Come Spatial Mismatch

Comparison Of Low Income Housing Tax Credit Program With Rental Housing

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Reviewer Comments:

· **Reviewer 39: A comparative study only and tenuously related to the track theme but potentially informative even if the author seems, so far, to be adding little that is original.**

· **NOTE ALSO unintended duplication of abstract's wording in the document as circulated.**

· **Reviewer 40: Comprehensive study on an assessment method of phenomena called 'spatial mismatch'. The paper itself requires some more structuring, it is difficult to read, there seem to be too many repetitions. The posed problem is very narrow, some background would be welcome. Another solution to the problem, possible to enhance by urban planning, would be introduction of some enterprises to the downtown, without relocation of excluded groups.**

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1. Abstract

When low-income jobs move outside of the city and low-skill workers still stay in the center of the city, there is a spatial mismatch. The Spatial Mismatch Hypothesis is testing whether the low-skilled workers have access to low-income jobs as urbanization takes place. It has been tested for different dimensions for 40 years, and the U.S. government has used some policies to eliminate the separation of low-income jobs and housing. Although no housing policy was specifically aimed at eliminating the spatial mismatch, it is possible that the Low-Income Housing Tax Credit Program (LIHTC) has had some positive effect on the issue. The program gives credit to developers with the aim of providing affordable housing. This thesis is testing the effectiveness of the program in overcoming spatial mismatch, and comparing one supply side housing program - LIHTC program - with demand side housing program - rental housing. This paper aims to give suggestions and assessments on whether the LIHTC program is efficient than rental housing and whether it is worth working on with the goal of eliminating the spatial mismatch.

The hypothesis for this study is that the LIHTC program is more effective than rental housing in overcoming spatial mismatch, since the LIHTC program not only gives its recipients freedom to choose where to live and also makes it easier to approach low income jobs. The LIHTC is the only housing program with nearly100 percent occupancy, and is also the second largest supply side housing program among all HUD housing programs.

2. Introduction

This thesis examines whether LIHTC is efficient in overcoming the spatial mismatch. It reviews the study of housing assistance programs and using the Index of Dissimilarity as a metric to determine how the programs work. This paper is not trying to prove the Spatial Mismatch Hypothesis, but to assess the housing assistance programs.It is comparing people in different areas who are assisted by LIHTC and those who live in rental housing to see how they access jobs, especially low income jobs. The thesis will also give a sense of how those people have been separated from low-income jobs. Although the Spatial Mismatch Hypothesis is mainly testing how African Americans are segregated from Caucasians, this work only tests how housing units and job needs are segregated.

The methodology I used for measuring the effectiveness of eliminating spatial mismatch is the Index of Dissimilarity, which is the measurement of two groups distributed across a geographic area. The study area is the New York Metropolitan area, since this area is well known as being challenged to provide housing for its large urban population. In the text part, I will give detailed information on how the study area is defined, how the data has been collected and how the calculations have been done.

Firstly, the article gives a review of the Spatial Mismatch Hypothesis. In the past, the Hypothesis has been tested in many studies and also by different models. Those empirical studies have tested different dimensions of the Spatial Mismatch Hypothesis (Ihlandfeldt and Sjoquist, 1998). Those findings and studies have proved the spatial mismatch hypothesis. Spatial mismatch itself is an economic and sociological phenomenon associated with the segregation between low income jobs and low skilled workers, so this work is testing the employment opportunities of

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low skilled people and where they live.

Secondly, the article reviews housing programs that are implemented by United States Department of Housing and Urban Development. Among all the housing programs, the LIHTC program has been one of the most important programs providing affordable rental housing in the United States, because of its high occupancy among all housing programs since its inception (from HUD website). It was created by the Tax Reform Act of 1986 as an alternate method of funding housing for low- and moderate-income households, and has been in operation since 1987. But it has been argued that the program serves low-income households poorly. So this article tests the spatial relationship of recipients of the LIHTC program and low-income jobs and compare it with the spatial relationship of rental housing household and low-income jobs. The hypothesis here assumes that LIHTC spatially matches low-income jobs better than rental housing.

Thirdly, rental housing is the one of the major ways of providing affordable housing for low income workers and rent is an important variable when calculating the Consumer Price Index (CPI) since it includes rent of primary residence and owners' equivalent to rent in housing price. The generally accepted definition of affordability of housing is for a household to pay no more than 30 percent of its annual income on housing. So, families who pay more than 30 percent are considered cost-burdened, because they may have difficulty affording necessities, such as food, clothing, transportation and medical care. The article will examine 30%, 50% and 80% of Average Area Median Household Income (AMI) groups. In the rental housing part, the article compares the index of rental housing of each percentage group.

Finally, at the end of the article, a comparison of the three Indexes of Dissimilarity of rental housing and Index of Dissimilarity of the LIHTC program has been compiled in a table and a conclusion will be drawn on the effectiveness and efficiency in eliminating spatial mismatch of the LIHTC program as compared to those of the three rental housing percentage groups.

3. Literature Review & hypothesis
3.1. Spatial Mismatch Hypothesis

Spatial mismatch is the sociological, economic and political phenomenon associated an economic restructuring in which employment opportunities for low-income people are located far away from where they live. In the United States, this takes the form of high concentrations of poverty in central cities, with low-wage, low-skill employment opportunities concentrated in the suburbs.

John F. Kain first came up with the idea of the Spatial Mismatch Hypothesis (SMH) in 1968. The idea of SMH is that jobs are decentralized from the urban center, but urban workers, especially minorities, such as black and Latinos, are left in the centre of the city and they do not have easy access to employment. In his article 'Housing Segregation, African American Employment, and Metropolitan Decentralization', he investigated the relationship of housing market segregation and the distribution of non-white employment. He has three hypotheses, which have been proved by the method of home interviews and surveys in the Detroit and Chicago Areas. From his article, we learn that the experience of African Americans has been remarkably different

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from that of other ethnic and racial groups in this respect. Stanley Lieberson has shown that African Americans are far more segregated than any other ethnic or racial group in American cities and that while segregation of immigrants and other groups has generally declined; the segregation of African Americans has increased over time.[i] In his article, at first, he gave the four most obvious reasons why housing market segregation is affecting the distribution of African American employment. (1) The distance factor, which will impose costs to African Americans. (2) Lacking of employment information from the job areas. (3) Possible discrimination in the job area against job seeking African Americans. (4) Possible self segregation by ghetto area people. And then he tests the hypothesis by using Chicago and Detroit as examples. He proved that the location of African Americans'jobs strongly affects the distribution of African American residences.[ii] He also examines the occupational groups of African Americans and their work and residence locations. He found that African American ghettos are typically located in the most central part of cities and expand only at their peripheries.[iii] He came to the conclusion that housing market segregation clearly affects the distribution of African American employment.[iv] His conclusion is supported by the data obtained from the Chicago and Detroit metropolitan areas. One year later, a paper "Housing Segregation, Negro Employment and Metropolitan Decentralization: An Alternative Perspective" by Joseph D. Mooney was published in the same journal. In his article, Mooney used a different model testing the same hypothesis. He examines the 25 largest standard metropolitan Statistical areas. He used a coefficient to measure the relationship between employment and population. He came to two major conclusions. Firstly, the locations where people live and the locations of job opportunities are closely connected. Secondly, the growing employment sectors in the central cities are largely for female employees.[v] Almost thirty years later, in 1992, John F. Kain himself published a paper, "The Spatial Mismatch Hypothesis: Three Decades Later', which includes a comprehensive scholarly literature review for the spatial Mismatch Hypothesis, which deals with the effect of housing market discrimination on the employment of African Americans. In this paper he reviews the history of SMH and the arguments about his paper because of the problems that happened in ghetto areas, such as civil disorder. The government's reaction to the social disorder made this issue of spatial mismatch hypothesis widely recognized and it received extensive attention. There were several opponents and supporters during this three-decade period during which the hypothesis was hotly contested. The hypothesis was first rejected by two economists Ellwood and Leonard. Afterwards, Kain argued with them, because they rejected the spatial mismatch hypothesis on the ground of the different definition of coefficient variables in his 1974 paper, regarding the levels of racial segregation. Wilson's book, *The Truly Disadvantaged* (1987), helped to rekindle this dispute by attributing at least part of the employment problems of inner-city blacks to the suburbanization of industry and employment. (1991, p. 105). Kain analyzed the weakness of the opposition arguments about their models and coefficient of variables.

Most new employment opportunities do not occur in central cities, near all-African American neighborhoods. They are being created in suburbs and outlying areas—and this trend is likely to continue indefinitely. New office buildings have risen in the downtown of large cities, often near all-African American areas. But the outflow of manufacturing and retailing facilities normally offsets this addition significantly—and in many cases has caused a net loss of jobs in central cities. [vi]After Kain's review, there were more than two dozen new studies on the spatial mismatch issue. Keith R. Ihlanfeldt and David L. Sjoquist gave a review of these studies.

There are also some other brilliant articles after the 30-year debate. In Michael A. Stoll's article, 'Within Cities and Suburbs: Racial Residential Concentration and the Spatial Distribution of

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Employment Opportunities across Sub-Metropolitan Areas', he indicates that less-educated people, public assistance recipients and poor minorities mostly reside in areas that are heavily populated by similar people, but the less-skilled and entry level jobs are in the suburb of metropolitan areas which are not easily accessed by public transit. This is Spatial Mismatch. He tested this hypothesis by examining Atlanta, Boston, Detroit, and Los Angeles, which represent the four different regional metropolitan types, since each has its own central city/ suburban dichotomy. His gave a great example of his data gathering and analysis method of testing the connection of jobs and people. The author recommended two possible results to increase central-city minority residents access to jobs. One is to give minorities more opportunity to live in suburban housing. The other is to subsidize commuters and commuting.

Another paper in this field is "The Mechanisms of Spatial Mismatch". This article is mainly about the factors that cause the spatial mismatch. The first part of the report shows how the jobs been suburbanized. The report argues that in most U.S. cities, the proportion of jobs located in the central cities decreased largely. For example, in 1980 the proportion of jobs located in the central cities was 57%, but in 2000, the proportion decreased to 47%. A number of factors caused this steady decrease: 1.Higher growth rate of jobs in suburbs than in the central city. 2. The rapid pace of suburbanization.

The second part of the report is about the disconnection of the minorities from jobs. The author, using statistics, strongly supports his assertion about blacks remaining in the city during suburbanization. Although the causes of the segregation are diverse, the author gives a direct explanation for the reasons: sheer racial discrimination and housing-market discrimination.

Besides the tests for the spatial mismatch the author made, he also gives 7 underlying mechanisms of spatial mismatch. They are (i) Workers may refuse a job that involves commutes that are too long because commuting to that job would be too costly in view of the proposed wage. (ii) Workers' job search efficiency may decrease with distance to jobs. In other words, for a given search effort, workers who live far away from jobs have fewer chances to find a job because, for instance, they get less information on distant job opportunities. (iii) Workers residing far away from jobs may not search intensively. For instance, when housing prices decrease with distance to jobs, distant workers may feel less pressured to search for a job in order to pay their rent. (iv) Workers may incur high search costs that cause them to restrict their spatial search horizon at the vicinity of their neighborhood. (v) Employers may discriminate against residentially segregated workers because of the stigma or prejudice associated with their residential location (redlining). In particular, suburban employers may consider that, on average, inner city residents have bad work habits or are more likely to be criminals (statistical discrimination). (vi) Employers may refuse to hire or prefer to pay lower wages to distant workers because commuting long distances makes them less productive (they are more tired or more likely to be absent). (vii) Suburban employers may think that their white local customers are unwilling to have contacts with minority workers. They thus discriminate against minority workers (customer discrimination) and in particular against those located in the central city. At the end of the article, the author also gave recommendations on different policy making.

To conclude, all the previous works give a detailed analysis of mechanisms by which spatial mismatch exists and why it exists but seldom mention the relationship with housing programs.

3.2. Housing assistance programs

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Schwartz's book gave an overall view on the housing programs. In his book, he introduced key concepts and institutes and examines the most important programs, and also includes empirical data concerning program evaluations, government documents, and studies carried out by the author and other scholars. The book worked well as an introductory level text. The first chapter is mainly about the US housing policy, including the current basic trends and problems, the housing finance system, and the role of the federal tax system in subsidizing homeowner and rental housing. The middle chapters focus on subsidy programs one by one. The closing chapters discuss issues and programs that do not necessarily involve subsidies, including homeownership, mixed-income housing, and governmental efforts to improve access to housing by reducing discriminatory barriers in the housing and mortgage markets. These chapters also offer reflections on future directions of U.S. housing policy.

"The federal government provides subsidies for low-income households in three basic ways: (1) supporting the construction and operation of specific housing development; (2) helping renters pay for privately owned housing; and (3) providing states and localities with funds to develop their programs. "[vii]According to Schwartz's book, the housing programs basically can be divided into two categories in the United States; one is supply side assistance, another is demand side assistance. The project-based or supply-side housing subsidies include federal level and local level. The federal government can either give money to state and local government for them to decide what forms of subsidy they want to use, or give money to developers to construct the public housing or operate privately owned housing instead.

From the supply side, public housing or government-subsidized housing programs have been built either by federal government or by nonprofit and private companies which are subsidized by government or by any forms of project based subsidies. In this category, job seekers have to live in the subsidized programs when they receive the subsidies, which greatly limits their approachability to low income jobs, since most of those who have been subsidized have no personal vehicle and have to use public transit to commute. Low-income housing is a typical example of this category. From the demand side, government issues vouchers or other tax deduction methods to help recipients of demand side housing programs with their financial burden or to enable low-income households to obtain housing that already exists in the private market.

Most Low-income households receive assistance through the following methods (Table 1). It can be seen that the Rental Voucher program, Public Housing and other Project-based subsidies are three main types of assistance that the federal government uses and have been assessed many times. The LIHTC program is one of the major methods for government to assist low-income workers that have not been much assessed.

Table 1: Overview of Federally subsidized Rental Housing

Program (year)	Total Units	Percentage of Total
Rental Vouchers	1803013	26%
Public Housing	1220937	18%
Other Project-based subsidies	1999545	29%

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Deep Subsidy Programs	1709808	25%
Shallow Subsidy Programs	289737	4%
Low-income Housing tax Credits	908563	13%
Tax-Exempt Bond Financing	850000	12%
Home Funding	113553	2%
Total	6895611	100%

Data Source: Vouchers, public housing: HUD, 2004; Other Project-based Subsidies: National Housing Trust, 2004a, ICF Consulting Team, 2005, and Millennial Housing Commission, 2002; Low-income Housing tax credits: HUD, 2004; Tax-exempt bonds: National Council of State Housing Finance Agencies, 2004, HOME: National Council of State Housing Finance Agencies, 2005

Table Source: Alex F. Schwartz (2006) Housing Policy in the United States: an introduction. Routledge, Tylor & Francis Froup, LLC P. 8

3.3. LIHTC program

The LIHTC program was created as an alternate method of funding housing for low- and moderate-income households. The LIHTC system, has been operated since 1987 and is very success in that it has generated many rental-housing units which are now occupied by low- and moderate-income households. However, many argue that the program is overly complex and poorly designed to serve the needs of low-income households (Stegman 1991). There are several significant articles about LIHTC, but none of them have analyzed the program in terms of eliminating spatial mismatch. Some of the related works evaluate how the program works. One of the most cited articles is 'The LIHTC: an analysis of the first ten years' by Jean L. Cummings and Denise DiPasquale. In this article, the author analyzes the cost of the projects, who they serve, where they are built and their financial viability by analyzing the 2544 LIHTC projects, which covered the entire history of the program. Before this article, there was very little detailed historical information on the characteristics and performance of the LIHTC. Although this article provides analysis very well about the program in 5 key areas: total development cost, source of financing, operating income and expenses, returns to equity and debt investors, and total subsidies provided, it has nothing to do with the elimination of spatial mismatch.

There are several inspiring articles by Professor Freeman related to LIHTC program. One of the articles mentioned that the percentage of African American in a neighborhood was a relatively strong predictor of the siting of LIHTC developments[viii]. The article shows the relationship between concentrations of Latino and Asian residents and siting of assisted housing. At another article, 'Comment on Kirk McClure's "The Low-Income Housing Tax Credit Program Goes Mainstream and Moves to the Suburbs" , he argues that LIHTC program is well suited to

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the peculiar circumstance of U.S. in terms of unambitious nature of its objectives, although some other argues that the program is fundamentally flawed. Another article 'Subsidized Housing and Neighborhood Racial Transition: An Empirical Investigation' By Professor Freeman indicates that there is no consistent relationship between assisted housing and racial transition in surrounding neighborhoods.

Another article, which examines how the LIHTC program works, is by Kirk McClure, of University of Kansas. His article "The Low-Income Housing Tax Credit as an Aid to Housing Finance: How Well Has It Worked?" was written when the program had been operating for 10 years. The article mainly deals with the program's financing problems, and controversy about whether the program mainly helps low-income households. In the first part of the article, the author gives a detailed review of how the program works, including the selection process and implementation process of projects. Then he gives the figures showing the program's performance, which show that the program has worked really well since its inception. The article also examines the construction types and market locations of LIHTC properties. The author finds that LIHTC projects are mostly located in areas with poor households, but little is known about the households besides their income. At the end the author comes to the conclusion that the program gives developers too much benefit and that this program and its tax credit are an inefficient subsidy system.

Some other inspiring research on LIHTC program include William S. Hettinger's "Low Income Housing Tax Credits: Strategies for Year 15" and most recently "Housing Choice Vouchers, the LIHTC, and the Federal Poverty Deconcentration Goal" by Anne R. Williamson of The University of Texas at San Antonio. Some of the research mentions the spatial character or analyzes the spatial distribution in certain areas, such as 'Spatial Analysis of the LIHTC Developments in Cuyahoga County' by David M. Brown of University of Cincinnati. Some are research on the market price or evaluations of whether builders get too much benefit. None of this research is about the spatial mismatch of jobs and units located.

3.4. Rental Housing

Rental housing is the major source of housing but there is not any specific research on the relationship of rental housing and low-income jobs. One of the most significant research on rental housing is "Rethinking rental housing" by John Gilderbloom, in which the author provides an attempt to justify state intervention in rental markets, and a more technocratic list of solutions to increases in rent during the 1970s. Although the book has nothing to do with the spatial mismatch of jobs, it is an exhaustive and penetrating study on rental housing policy and history. At the end of the book, the author proposes a variety of less obviously controversial fixes.

Among the variety of studies, there is basically no study on the spatial mismatch of LIHTC program and employment, and the spatial relationship of rental housing with employment. The most related studies are abut how residence affects employment, such as Scott W. Allard and Sheldon Danziger's "How Residence and Race Affect the Employment of Welfare Recipients" published in September 2000.

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4. Methodology
4.1. Data and Definition of Variables

Index of Dissimilarity is using to measure the relationship of housing units and low-income jobs in this article. There will be four Indexes of Dissimilarity for units of rental housing and low-income jobs. The first Index of Dissimilarity will show the relationship of units of LIHTC projects and low-income jobs; the second Index of Dissimilarity will show the relationship of units of rental housing and low-income jobs. The second category includes three different household income levels. The first group is the household which earns 30% of the Average Area Household Income (AMI), and the other two groups are households which earn 50% of AMI and 80% of AMI. The Index of Dissimilarity is one of the most common measures for assessing the separation of two groups.

The Index of Dissimilarity has been used to measure evenness largely. The Index is an indicator of just how much one group is spatially separated from another group. It has been frequently used by population geographers and demographers. One of the usages is in the book *Racism in Contemporary America* by Meyer Weinberg. The Index of Dissimilarity measures the evenness of housing units and low-income/ entry-level jobs in this thesis. The result will show these two groups' distribution across the census tracts within the New York metropolitan statistical area. I set up the formula by using spreadsheet software.

To access the efficiency of the LIHTC subsidy housing policy in eliminating spatial match is to measure the people's accessibility to jobs. In Spatial Mismatch Hypothesis, the mismatch is mainly the mismatch of low-income/ entry-level jobs and of workers. The measurement process in this thesis is calculating the Index of Dissimilarity of housing units provided by the LIHTC program and low-income/ entry-level jobs, since most people who live in subsidized housing programs are usually low-income workers. The variables include low-income/ entry-level jobs and housing units. The variable will be changed into low-income jobs and housing units. The measurements range from 0 to 1, where the higher the number, the more separated the two groups are. The formula is listed as follows:

Figure 1: The Index of Dissimilarity

$$\frac{1}{2}\sum_{i=1}^{N}\left|\frac{b_i}{B}-\frac{w_i}{W}\right|$$

For the Index of Dissimilarity of units by Low Income tax credit program and low-income/ entry-level jobs, where:

b_i = the units by LIHTC program of the ith area, e.g. census tract, in this study i is zip code level area

B = the total the units for the large geographic entity for which the Index of Dissimilarity is being

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calculated.

wi = the low-income/ entry-level jobs of the ith area

W = the total low-income/ entry-level jobs of the large geographic entity for which the Index of Dissimilarity is being calculated.

For the Index of Dissimilarity of residents lives in rental housing and low-income/ entry-level jobs (residents, who lives in rental housing, include rent account for 30% of 30%, 50%, 80% of AMI), where:

bi = the residents lives in rental housing area of the ith area, e.g. census tract, in this study i is zip code level area

B = the total residents lives in rental housing for the large geographic entity for which the Index of Dissimilarity is being calculated.

wi = the low-income/ entry-level jobs of the ith area

W = the total low-income/ entry-level jobs of the large geographic entity for which the Index of Dissimilarity is being calculated.

4.2. Study Area

The i areas are 347 zip code areas in the study area. Detailed zip code numbers can be found in the appendix. I chose the New York Metropolitan Area, also known as Metropolitan New York or Greater New York or Tri state Region, as my study area. It is the most populous metropolitan area in the United States and is also one of the most populous in the world. The metropolitan area is defined by the U.S. Office of Management and Budget. There are several definitions for New York Metropolitan area based on commuting pattern, which is the wider region consisting of New York Metropolitan area plus five adjacent metropolitan areas, or a smaller region based on the center of New York and its adjacent zone of influence. I chose the smaller region of New York Metropolitan area as my study area, which makes sense for low income housing assistance programs. The official definition of New York metropolitan statistic area is from the article from Executive Office of the President, Office of Management and Budget in Dec 2006. There are two Major Metropolitan areas for New York:

One is 35620: New York-Northern New Jersey-Long Island, NY-NJ-PA Metropolitan Statistical Area: including New York, NY; Newark, NJ; Edison, NJ; White Plains, NY; Union, NJ; Wayne, NJ.

The other one is 35644: New York-White Plains-Wayne, NY-NJ Metropolitan Division: including Bergen County, NJ; Hudson County, NJ; Passaic County, NJ; Bronx County, NY; Kings County, NY; New York County, NY; Putnam County, NY; Queens County, NY; Richmond County, NY; Rockland County, NY; Westchester County, NY.
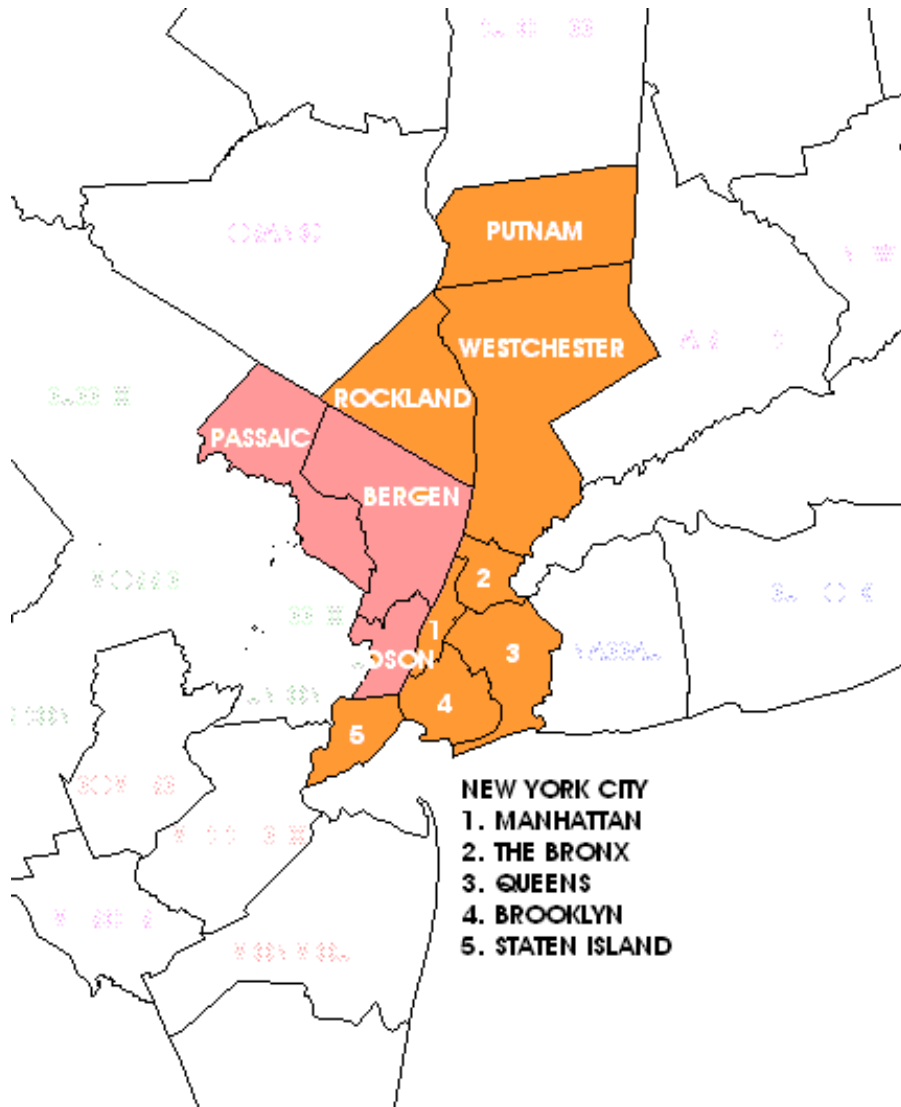
The first one is more focused on New Jersey. So I chose the second one to give a broader view of how the LIHTC works. Another reason for choosing 35644 area is as follows: I can get New Jersey employment data either for 35620 employment data by industry or for the whole state,

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but not in the form of zip code levels. After I consulted the staff in State of New Jersey Office of Labor Planning and Analysis, I found that they do not have zip code level employment data available, but only data at the municipal level.

So I chose the New York State part of the 35644 New York Metropolitan statistical area as my study area, which includes Bronx County, NY; Kings County, NY; New York County, NY; Putnam County, NY; Queens County, NY; Richmond County, NY; Rockland County, NY; Westchester County, NY, 8 Counties in total. The study area map follows (the orange area is the study area, the pink area is the three New Jersey counties within New York Metropolitan Statistical area):

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4.3.   Data Collection and Comparison

4.3.1   Employment data:

The zip code level employment data by zip code level in 2000, 2006, and 2008 for all these 8 counties were gathered from New York State Department of Labor Division of Research & Statistics via the help of James Brown, Principal Economist from New York State Department of Labor Division of Research and Statistics, and Elena Volovesky, from the same department. The zip code employment data of three New Jersey countries (Bergen County, Hudson Country, Passaic County) are gathered from dataset online from Office of Labor Planning and Analysis State of New Jersey with the help of Mary Jane Carnevale, Cathy Mycoff and Chester Chinsky. Unfortunately, they do not have zip code level data available but only municipal level data. Because the zip code area does not correspond to the municipal area, the difference in units makes index calculation difficulty. I tried to match each municipal areas with zip codes as follows: The NY metropolitan area 35644 contains three NJ counties, which are Bergen, Hudson and Passaic. These counties correspondence in zip code is hugely different. For Bergen County, there are 78 zip code areas containing 70 municipal areas. For Hudson County, there are 30 zip code areas containing 12 municipal areas. For Passaic County, there are 48 zip code areas containing 16 municipal areas, but the Municipal boundary is not exactly the same as the zip code boundary, and the New Jersey employment data is only available from 2003 to 2008, or before 1999. Because New Jersey employment data are not available for year 2000, but rental housing data are available for 2000 from census, municipalities are too big to really give a sense of the Mismatch.

 I therefore dropped the three New Jersey counties from the New York Metropolitan area. The employment data I got is categorized by industries. There are 17 industries in total in each zip code area, including: agriculture & mining, Utilities, Construction, Manufacturing, Wholesale trade, Retail trade, Transportation & warehousing, Information, finance & insurance, Real estate & Retail & Leasing, Professional Scientific & Tech, Management of companies, Administrative & support, Educational Services, Social Assistance, Art & Entertainment & Recreation, Accomodation & Food service and Other services.

4.3.2   Low-income housing tax credit program data

The LIHTC Program data was gathered from HIHTC database online with the help of Michael Hollar, senior Economist from Policy Development and Research. I downloaded the whole dataset of the all LIHTC projects in U.S. since the program's inception and then selected the zip code areas within the study area. For the LIHTC Program, the most updated date they have available to the public is 2006, so I collected all the programs that were implemented after 1990, given that 30 year rule takes effect after 1990. When the LIHTC program began in 1987, properties receiving tax credits were required to stay eligible for 15 years. However, owners were able to opt out of the program after 15 years if they or the state housing agency were unable to find a buyer who is willing to maintain the affordability restrictions. The 30-year extended use agreement was instituted for properties placed in service in 1990 and later. So the data I collected is from 1990 and after since there is no data available on LIHTC program tenants, so I assume after 1990, the tenants are still in the apartments.

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There are 3 tax credit agencies in New York state: New York State Division of Housing and Community Renewal; New York State Housing Finance Agency; and City of New York, Dept. of Housing Preservation and Development. Usually the federal government will allocate the credit for affordable housing projects every year. The tax credits are allocated prior to construction or development of the projects. There is typically a1-3 year period between when the credits are allocated and when the project is placed into service, so in this thesis, the data I selected is from 1990 to 2006, since the most updated data available is stops at 2006. For example, a project that was allocated credits in 2005 might not be ready for occupancy until 2007. So for the year 2006, there are only two projects being allocated credits, but much more being placed into service that year. The web query sorts the projects first by agency, then by year. When the LIHTC program began in 1987, properties receiving tax credits were required to stay eligible for 15 years. This eligibility time period has since been increased to 30 years in 1990. The LIHTC database contains a variable (NONPROG) that indicates whether a project is no longer monitored for compliance due to expired use agreement or some other reason. The 30-year extended use agreement was instituted for properties placed in service in 1990 and later. However, owners are able to opt of the program after 15 years if they or the state housing agency is unable to find a buyer who is willing to maintain the affordability restrictions. There is currently no comprehensive data on tenants living in LIHTC units. So I am using the data after 1990 assuming that people living in LIHTC units are not moving anywhere.

4.3.3 The rental housing data

The rental housing data is acquired from 2000 Decennial Census data portal for Census 2000 data at American Fact Finder website and with the help of Jane, EDS consultant from Columbia University. The most updated data for rental housing is from the year 2000. From the Summary File 3, I customized my table by choosing H62 Gross Rent of Specified renter-occupied housing units instead of choosing H54 Contract Rent of Specified renter-occupied housing units, because the definition of H54 contract rent is the monthly rent agreed to or contracted for, regardless of any furnishings, utilities, fees, meals, or services that may be included. For vacant units, it is the monthly rent asked for the rental unit at the time of enumeration. We need to exclude the vacant units from the total rental housing. So we choose H62 as variable. After selection of geographic type, the last choice is 5-digit zip code areas. The reason for choosing Summary File 3 is that it presents in-depth population and housing data collected on a sample basis. Summary Files 1 and 2 in Census 2000 do not have detailed housing information we need.

This variable has been divided into 24 subcategories, include Total, With cash rent total, With cash rent: less than $ 100, With cash rent: $100 to $149, With cash rent: $150 to $199, With cash rent: $200 to $249, With cash rent: $250 to $299, With cash rent: $300 to $349, With cash rent: $350 to $399, With cash rent: $400 to $449, With cash rent: $450 to $499, With cash rent: $500 to $549,With cash rent: $550 to $599, With cash rent: $600 to $649, With cash rent: $650 to $699, With cash rent: $700 to $749, With cash rent: $750 to $799, With cash rent: $800 to $849, With cash rent: $850 to $899, With cash rent: $900 to $949, With cash rent: $950 to $999, With cash rent: $1,000 to $1,249, With cash rent: $1,000 to $1,249, With cash rent: $1,250 to $1,499, With cash rent: $1,500 to $1,999, With cash rent: $2,000 or more, no cash rent. I did not count the no-cash rent. Part of the table is as follows:

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Table 2: Rental housing data in study area by zip code level

Geography Identifier (part of zip code areas, 347 in total)	Geography	Specified renter-occupied housing units: Total	Specified renter-occupied housing units: With cash rent	Specified renter-occupied housing units: With cash rent; Less than $100	Specified renter-occupied housing units: With cash rent; $100 to $149
10001	10001 5-Digit ZCTA, 100 3-Digit ZCTA	6890	6843	21	132
10002	10002 5-Digit ZCTA, 100 3-Digit ZCTA	27326	27225	294	1144
10003	10003 5-Digit ZCTA, 100 3-Digit ZCTA	21803	21333	83	127
10004	10004 5-Digit ZCTA, 100 3-Digit ZCTA	492	484	0	0
10005	10005 5-Digit ZCTA, 100 3-Digit ZCTA	452	452	0	0
10006	10006 5-Digit ZCTA, 100 3-Digit ZCTA	737	730	5	0

Source: U.S. Census Bureau data SF3

5. Text

5.1 How does LIHTC work

The tax credits are determined by the development costs, and are used by the owner. However, because of Internal Revenue Service regulations and program restrictions, the owners of the property are usually not allowed to use all of the tax credits. Therefore, many LIHTC properties are owned by limited partnership groups, which are put together by syndicators. Under this situation, a lot of companies and private investors who participate within the LIHTC program aim at receiving credits against their federal tax liability in return when investing in housing projects. Tax Credits must be used for new construction, rehabilitation, or acquisition and rehabilitation, and projects must also meet the following requirements:

- At least 20 percent of the units are occupied by households whose income is less than 50

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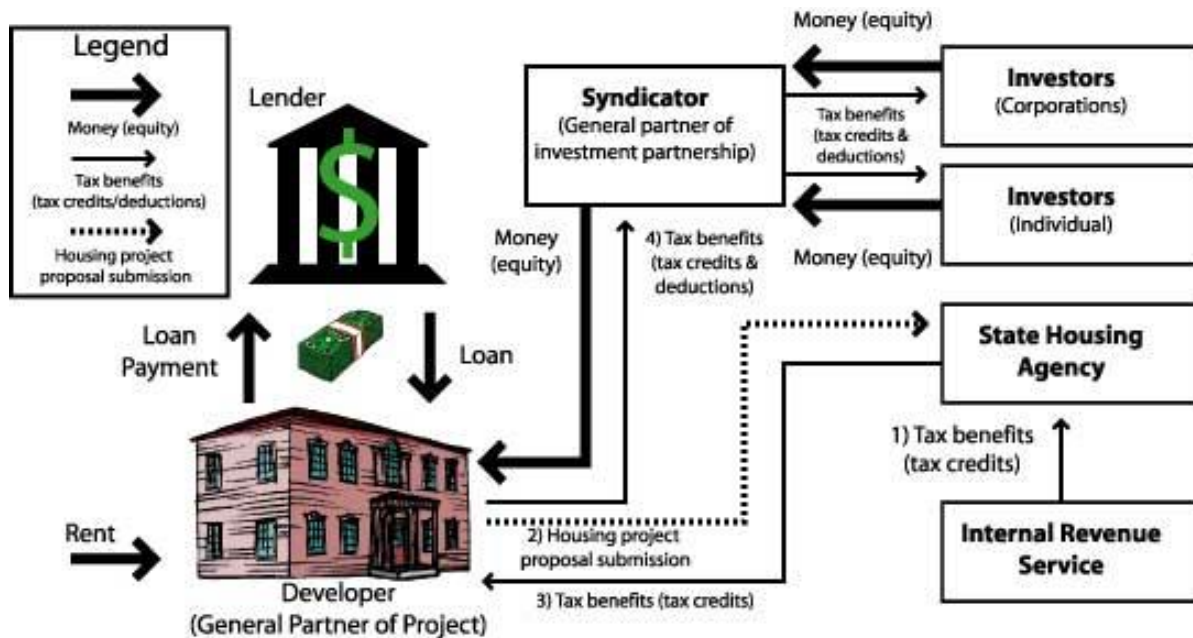49th ISOCARP Congress 2013

percent of the metropolitan area's median family income, or

- At least 40 percent of the units are occupied by households whose income is less than 60 percent of the metropolitan area's median family income [ix]

- When the LIHTC program began in 1987, properties receiving tax credits were required to stay eligible for 15 years. This eligibility time period has been increased to 30 years since 1990. [x]

Most states determine the amount of tax credit an individual project receives based on its qualified basis. The qualified basis is determined by following standards. Firstly, the total cost of a project has been calculated. Secondly, the non-depreciable costs need to be deducted from the total project cost to determine the eligible basis, such as land, permanent financing costs, rent reserves and marketing costs, etc. Thirdly, as an option, the project developer may also voluntarily reduce the requested eligible basis in order to gain a competitive advantage. Finally, to determine the qualified basis, the eligible basis is multiplied by the applicable fraction, which is the smaller of the following criteria to arrive at the qualified basis: 1. The percentage of low-income units to total units. Or, 2. The percentage of square footage of the low-income units to the square footage of the total units.

The qualified basis is then multiplied by the federal tax credit rate, published monthly by the Internal Revenue Service, to determine the maximum allowable tax credit allocation. For projects that are new construction or rehabilitation, which are not financed with a federal subsidy, the rate is approximately 9%. For projects involving a federal subsidy (including projects financed more than 50% with tax exempt bonds), the rate is approximately 4%. The 9% and 4% rates are used to determine a project's initial tax credit reservation. A project's final (placed-in-service) tax credit allocation is based on actual project sources and uses of funds, the financing shortfall and the actual applicable federal rate.

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Source: U.S. Department of Housing and Urban Development online

The chart illustrates the process of how the Low-income housing credit system works. The Internal Revenue Service issues the Tax Credits to the state housing agencies. The state housing agencies examine and investigate housing projects' proposal submissions and award the Tax Credits to the developer of the project. In the meantime, the developer could receive money from individual investors or institutional investors or other forms of lenders. In return for additional equity financing, the Tax Credits pass to the syndicator, who gets this equity financing from investors, to whom the syndicator passes the Tax Credits. So the investors get the tax credit advantage of investing in such affordable programs and tax credits can have a much larger impact than tax deductions. For example, Tax credits are subtracted directly from one's tax liability. Credits reduce tax liability dollar-for-dollar, but Tax deductions are subtracted from a taxpayer's total income to compute his or her tax base. Deductions reduce tax liability by the amount of the deduction times the tax rate. For example, for tax credit, a $1,000 credit in a 15% tax bracket reduces tax liability by $1,000. But for tax deduction, A $1,000 deduction in 15% tax bracket reduces taxable income by $1,000, thereby reducing tax liability by $150.

5.2   Why testing the spatial mismatch on LIHTC and rental housing is important

LIHTC program is a very effective in housing subsidy used to finance the development of affordable housing and is one of the most important supply side housing assistance programs. According to U.S. Department of Housing and Urban Development staff, there were 4.9 million

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households living in HUD-subsidized housing in the United States in the year 2000, and the units of LIHTC program have high occupancy, and it is the second biggest supply side housing program among all HUD housing programs. The LIHTC program seems complicated, but many local housing and community development agencies are effectively using its tax credits to increase the supply of affordable housing in their communities.

LIHTC program is definitely a great method for promoting the construction of affordable housing projects, but how the program works in helping those low-income workers is unclear. Although it has high occupancy, we still cannot get a direct sense of how it serves the low-income worker. Whether the LIHTC spatially matches the need of all those low-income workers is the major question we would like to answer through a comparison to the rental-housing match with low-income jobs. We assume that LIHTC program spatially matches low-income jobs better than others since it has the highest occupancy.

To understand how the LIHTC works in eliminating spatial mismatch is important in assessing the supply side housing programs. As I mentioned in Spatial mismatch hypothesis, since the test of the relationship of housing units and low-income jobs has not been done yet, this thesis can be considered as a hope that my observations may lead to other studies.

5.3   Calculation

The calculation of Index of Dissimilarity of rental housing & low income jobs is as follows:

1. Figure out the median income of each county for the NYC metropolitan area in 2000. The data is in Table 3. To figure out the Area Median Income (AMI) in 2000, I got the area median income from HUD of those 8 counties.

Table 3: The area median family income in 2000 in study area

Bronx County	56200
Kings County	56200
New York County	56200
Putnam county	56200
Queens County	56200
Richmond County	56200
Westchester County	83100
Rockland County	82400

Source: U.S. Department of Housing and Urban Development

2. Based on that median income, calculate households with 80% of AMI, 50% of AMI and 30% of

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AMI. Calculate 1/3 household income level to create the following table:

Table 4: Study Area average household income group

County	30% of Area Median Family income	50% of Area Median Family income	80% of Area Median Family income
Bronx County	16860	28100	44960
Kings County	16860	28100	44960
New York County	16860	28100	44960
Putnam county	16860	28100	44960
Queens County	16860	28100	44960
Richmond County	16860	28100	44960
Westchester County	24930	41500	66480
Rockland County	24720	41200	65920

3. Figure out the amount of rent a household in each county would pay based on the percentage of AMI (80% of AMI, 50% of AMI, and 30% of AMI).

Table 5: Monthly rent of each income group

County	30% of 30% of AMI	30% of 50% of AMI	30% of 80% of AMI
Bronx County	421 (400)	702 (700)	1124 (1000)
Kings County	421 (400)	702 (700)	1124 (1000)
New York County	421 (400)	702 (700)	1124 (1000)
Putnam county	421 (400)	702 (700)	1124 (1000)
Queens County	421 (400)	702 (700)	1124 (1000)
Richmond County	421 (400)	702 (700)	1124 (1000)
Westchester County	623 (600)	1038 (1000)	1662 (1500)

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| Rockland County | 618 (600) | 1030 (1000) | 1648 (1500) |

4. Using the H62 variable in 2000 census zip code level rental housing data, determine how many units are rented for each of these 3 levels, in each zip code in the New York metropolitan area. Since the units are divided by rent range, I selected units according to number in the brackets in table 5.

5. Then compile them with low-income jobs by zip code. The selection process for low-income jobs is as follows: total wage divided by total employment, and then calculate the half of the total average wage per person, which is 9952 USD. Those who earn below 9952 in each industry have been selected in each zip code area. Use the values obtained in #4 to calculate the dissimilarity index with the zip code level employment data.

5.4   Result Comparison

When calculating the index for LIHTC recipients and low-income jobs, the process is the same. So the Dissimilarity indexes of LIHTC & Low income job and rental housing & low-income jobs are as follows:

Table 6: Index of Dissimilarity of Housing Assistance programs and Low income jobs

Index of Dissimilarity variables	Index variable: Rental housing that is affordable to those with incomes that are 30% of AMI	Index variable: Rental housing that is affordable to those with incomes that are 50% of AMI	Index variable: Rental Housing that is affordable to those with incomes that are 80% of AMI	Index variable: all LIHTC projects
Index variable: low-income/ entry-level jobs	0.496	0.430	0.405	0.687

Study area: New York Metropolitan area: Bronx county, Kings County, New York County, Putnam County, Queens County, Richmond County, Westchester County, Rockland County

Typically the Index of Dissimilarity is between 0 to1, with 0 meaning no segregation or spatial disparity, and 1 being complete segregation between the two groups with no spatial intermingling. In this result, we know from the table, that for those people who live in rental housing, 30% of household income is paid for the rental housing, the least segregation occurs between affordable rental housing and low-income jobs. The index is 0.496, which means 49.6% of the households who earn 30% of area median income would have to move in order for the rental housing and low-income job to be spatially integrated. Those who live in rental housing who earn 80% of area median income are segregated from low-income jobs at 0.430,

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which means 43% of low-income jobs need to be moved into those rental-housing areas to achieve a job housing integration. For households that earn 80% of area median income, 40.5% of the low-income jobs need to be moved into those rental-housing areas to achieve job housing integration. This group of people is segregated the least from jobs. The results of Index of Dissimilarity of the LIHTC program and low income jobs are the highest, with the number 0.687, which means that 68.7% of the LIHTC units would have to move into other areas in order for the LIHTC units and low-income jobs to be spatially integrated.

5.5   Explanation & Recommendation

The LIHTC program as a supply-side method works well to provide affordable housing. But the LIHTC program is not efficient enough in eliminating the spatial mismatch. One of the reasons is developers of LIHTC properties receive an additional 30% in tax credits if the property is located in a Qualified Census Tract (QCT). To be eligible for designation as a QCT, a census tract must have at least 50% of its households earning less than 60% of area median income or a poverty rate of at least 25%. Thus, developers have an incentive to locate in relatively poor areas, where there are presumably fewer jobs. The aim of the program is to increase affordable rental housing. However, unlike public housing, the goal is to have private developers build and manage the properties. Thus, developers receive tax credits in exchange for building low-income units and maintaining rent and income restrictions for at least 15 years. The 30% incentive is for developers to locate the property in areas where, probably, Congress feels affordable housing is under-supplied or needed. So, In this case, the LIHTC program works well in providing affordable housing, but needs to consider the work opportunities for people who live there before issuing the credits to developers. For example, gather information on low-income jobs and roughly calculate how many units might be needed for the area and then make a restriction on how many units should be built to minimize the overbuilt and supply-deficient.

Another reason that the LIHTC program does not efficiently eliminate spatial mismatch is the low-quality jobs are mostly offered by large representative firms, which need to choose the location by themselves. Their location decisions are affected by land rents as the dispersion forces firms to locate in suburbs and firm agglomeration forces them to locate in city center, so usually the dispersion force is stronger than the agglomeration force for the firms which have mostly entry-level jobs. Empirically, the entry-level jobs are mostly manual and service jobs. According to SMH, jobs are decreasing in the central city and there is mainly entry-level job growth rather than more skilled jobs in the suburbs, which cause the problem of spatial mismatch. The LIHTC projects are mostly located in poor neighborhoods, which are in cities. The low-skilled workers mostly are minorities who remained located in the city center where they lived before suburbanization. So to minimize the effect of dispersion force, the local government also needs to give different credits to developers according to the land values and related working opportunities.

Another reason for the inefficiency of LIHTC is rental housing gives tenants much more flexibility to live where they want to live, which gives them mobility in finding a job. The LIHTC program as a supply side housing program does not have the flexibility advantage of finding a job.

But at the end, more studies need to be done in this area. But at least two methods need to be

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taken into consideration both different tax credits for developer and different tax credits for area. To summarize: 1. The division for different tax credits for developers should be set. For example, in areas that have more low-income jobs, say set a portal of giving 30% additional tax credit for the projects built in the areas which have more low-income jobs or in the areas where 50 % of the household earning is lower than area average median income. 2. The government should allocate tax credits according to land value, which means to match the low-income jobs firms' need. Other methods could be taken into consideration is from the urban planning prespect is some incentive policice could be set as to encourage some enterprise to downtown. At last, I hope my observations could bring more good works in this field.

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Appendix:

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Cathy Mycoff, Office of Labor Planning and Analysis, State of New Jersey

Chester Chinsky, Office of Planning and analysis, State of New Jersey

Qianqi, Shen, Rutgers University

There are 347 zip code areas within the study area.

Bronx Bronx:

10451 10452 10453 10454 10455 10456 10457 10458 10459 10460 10461 10462 10463 10464 10465 10466 10467 10468 10469 10470 10471 10472 10473 10474 10475

Brooklyn Kings

11201 11203 11204 11205 11206 11207 11208 11209 11210 11211 11212 11213 11214 11215 11216 11217 11218 11219 11220 11221 11222 11223 11224 11225 11226 11228 11229 11230 11231 11232 11233 11234 11235 11236 11237 11238 11239 11241 11242 11243 11249 11252 11256

Manhattan New York

10001 10002 10003 10004 10005 10006 10007 10009 10010 10011 10012 10013 10014 10015 10016 10017 10018 10019 10020 10021 10022 10023 10024 10025 10026 10027 10028 10029 10030 10031 10032 10033 10034 10035 10036 10037 10038 10039 10040 10041 10044 10045 10048 10055 10060 10069 10090 10095 10098 10099 10103 10104 10105 10106 10107 10110 10111 10112 10115 10118 10119 10120 10121 10122 10123 10128 10151 10152 10153 10154 10155 10158 10161 10162 10165 10166 10167 10168 10169 10170 10171 10172 10173 10174 10175 10176 10177 10178 10199 10270 10271 10278 10279 10280 10281 10282

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Queens

11101 11102 11103 11004 11104 11105 11106 11109 11351 11354 11355 11356
11357 11358 11359 11360 11361 11362 11363 11364 11365 11366 11367 11368
11369 11370 11371 11372 11373 11374 11375 11377 11378 11379 11385 11411
11412 11413 11414 11415 11416 11417 11418 11419 11420 11421 11422 11423
11426 11427 11428 11429 11430 11432 11433 11434 11435 11436 11691 11692
11693 11694 11697

Staten Island Richmond

10301 10302 10303 10304 10305 10306 10307 10308 10309 10310 10311 10312
10314

Westchester County

10501 Amawalk 10502 Ardsley 10504 Armonk 10505 Baldwin Place 10506
Bedford 10507 Bedford Hills 10510 Briarcliff Manor 10511 Buchanan 10514
Chappaqua 10518 Cross River 10520 Croton on Hudson 10522 Dobbs Ferry 10523
Elmsford 10526 Goldens Bridge 10527 Granite Springs 10528 Harrison 1053
Hartsdale 10532 Hawthorne 10533 Irvington 10535 Jefferson Valley 10536 Katonah
10538 Larchmont 10543 Mamaroneck 10546 Millwood 10547 Mohegan Lake 10548
Montrose 10549 Mount Kisco 10550 Mount Vernon 10552 Mount Vernon 10553 Mount
Vernon 10560 North Salem 10562 Ossining 10566 Peekskill 10567 Cortlandt Manor
10570 Pleasantville 10573 Port Chester 10576 Pound Ridge 10577 Purchase 10578
Purdys 10580 Rye 10583 Scarsdale 10588 Shrub Oak 10589 Somers 10590 South
Salem 10591 Tarrytown 10594 Thornwood 10595 Valhalla 10597 Waccabuc 10598
Yorktown Heights 10601 White Plains 10603 White Plains 10604 West Harrison 10605
White Plains 10606 White Plains 10607 White Plains 10701 Yonkers 10703 Yonkers
10704 Yonkers 10705 Yonkers 10706 Hastings on Hudson 10707 Tuckahoe 10708
Bronxville 10709 Eastchester 10710 Yonkers 10801 New Rochelle 10803 Pelham 10804
New Rochelle 10805 New Rochelle

Rockland County zip codes

Suffern 10901 Bear Mountain 10911 Blauvelt 10913 Congers 10920 Garnerville 10923
Haverstraw 10927 Hillburn 10931 Rockland M P C 10951 Monsey 10952 Nanuet
10954 New City 10956 Nyack 10960 Orangeburg 10962 Palisades 10964 Pearl River
10965 Piermont 10968 Pomona 10970 Sloatsburg 10974 Sparkill 10976 Spring
Valley 10977 Stony Point 10980 Tallman 10982 Tappan 10983 Thiells 10984
Tomkins Cove 10986 Valley Cottage 10989 West Haverstraw 10993 West Nyack
10994 West Nyack 10995

ZIP Code(s) in Putnam county, NY

10509 10512 10516 10524 10537 10541 10579 12563

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