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Urban Governance Structure and Wage Disparities across US Metropolitan Areas

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Abstract
This paper analyses the determinants of spatial wage disparities in the US context for the period 1980-2000. Agglomeration benefits are estimated based on city productivity premia which are computed after controlling for the skills distribution among metropolitan areas as well as industry fixed effects. The drivers of productivity differentials that are taken into consideration are the size of the local economy, the spatial interactions among local autonomous economic systems and the structure of urban governance as well as the policy responses to the fragmentation issue. A metropolitan area with ten percentage more administrative units than another of the same size, experiences wages that are between 2.0% and 3.0% lower. The presence of a voluntary governance body is found to mitigate the problem of fragmentation only marginally, while the existence of special purpose districts have a negative impact on regional productivity. The implementation of a metropolitan government with a regional tax system is expected to increase productivity by around 6%.

Keywords
Governance, Productivity, Metropolitan Statistical Areas, Agglomeration Economies

JEL Codes
H70, R12, R23, J3

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1 Introduction

In the US, the huge variability of nominal wages across metropolitan statistical areas (MSA) is a well known fact. Wage disparities are extensively documented in Moretti (2011) who argues that the difference between the 10th and the 90th percentile of the wage distribution for average high school graduates account for approximately 32%. The literature has identified a number of explanations by referring to agglomeration economies (Marshall, 1890; Duranton and Puga, 2004), locational fundamentals such as amenities (Ellison and Glaeser, 1999) and workforce skill composition (Glaeser and Resseger, 2010). Despite being often assumed as an important driver of local economic performance (Storper, 2010), the role of institutions in enhancing agglomeration benefits has tended to be overlooked by the literature. In fact, metropolitan statistical areas greatly differ both in terms of population distribution between the city centre and the outlying territories as well as for the numerousness of administrative subregions. For example, the MSA of Atlanta is a distinctive case example of metropolitan fragmentation with twenty counties and a mass transit system that does not extend far enough into the suburbs where workers live. In California, Sacramento and San Jose do not have many administrative jurisdictions but in the former metropolitan area population is twice as concentrated in the city centre.

The paucity of empirical studies is in contrast with anecdotal evidences and qualitative enquires suggesting formal structure of metropolitan governance as a channel of direct intervention for spurring local productivity (Anas, 1999; Duckett, 2012). For example, difficult coordination among local governments due to a mismatch between the boundaries of the local economic system and the administratively defined ones may obstruct infrastructure investments and effective land use planning (Ahrend et al., 2014b); moreover, a multiplicity of laws and regulations increase transaction costs for businesses that operate in multiple jurisdictions (Wolman et al., 2011). Finally, localized increasing returns may accrue from sharing facilities Puga (2010) that are more likely to be created at metropolitan scale by a club of jurisdictions. The smaller the number of participating agencies, the lower the costs of formation and maintenance of the club unless there is a dominant one that can assume a leading role (Cheshire and Gordon, 1998).

Some attempts have been made in order to mitigate the problems derived from poor metropolitan governance. In the US, these issues are addressed through two mechanisms: special purpose governments and voluntary agreements, but both solutions may have limited effectiveness. The former tend to complicate the problem by adding an other layer to the existing multiplicity of local governments (Duckett, 2012; Orfield and Gumus-Dawes, 2009); the latter may not be geographically adherent to the metropolitan area and tend to under-represent central cities in voting boards, while favouring outlying counties. Portland, OR and Minneapolis - Saint Paul, MN are two exceptions to the predominant type of metropolitan governance in the US. In fact, the former has a governance body that has the status of full local government and a leadership elected by popular vote. The latter, delivers a wide range of services and have implemented a metropolitan tax-based sharing that is welcomed by some authors (see for example Orfield, 2002; Wolman et al., 2011).

Our primary objective is to quantitatively assess the impact of different dimensions of the structure of urban governance on local productivity premia. We concentrate on the distribution of population in metropolitan areas, whether more or less concentrated in the central city, as well as on the number of administrative defined jurisdictions that divide the territory of functional economic regions. Poor governance of metropolitan areas may mitigate the extent to which agglomeration enhances productivity. The analysis of the policy responses to this problem is the second objective of the paper. Governance bodies are created in order to solve coordination difficulties among local governments, but their effectiveness remains an open issue.

Empirical evidences on the role of metropolitan governance structure is rather scant. Most of the studies focus on its relationship with the rate of local economic growth (as Nelson and Foster, 1999; Paytas, 2001; Stansel, 2005; Hammond and Tosun, 2011), which is usually analysed in cross sectional growth models adopting the convergence approach pioneered by Barro (1991) and criticized as uninformative and perhaps misleading for both theoretical and empirical reasons (Cheshire and Malecki, 2004; Cheshire and Magrini, 2009). To the best of our knowledge, Ahrend et al. (2014a) is the only study that analyses the impact of fragmented governments on productivity premia in five OECD countries. Our paper follows the latter but we provide a number of original contributions to the literature. First of all, we different dimensions of metropolitan governance structure enter the analysis: the number of local governments and the degree of dominance of the central city are considered as complements rather than substitutes. Other indices introduced in the literature (Grassmueck and Shields, 2010; Hamilton et al., 2004) are excluded because of both high correlation with dominance and fragmentation measures and endogeneity problems due to their computation based on local governments expenditures. Secondly, we introduce a time variability in these dimensions by letting the boundaries of the spatial units of analysis to change over time. In this way results about the difficulties deriving from poor governance of metropolitan areas are derived robustly also to the Modifiable Areal Unit Problem (Briant et al., 2010) and remain even after accounting for a state centralization component. Thirdly, we provide an evaluation of the policy responses by distinguishing between special districts, voluntary agreements that are further divided into Council of Governments (COGs) and Metropolitan Planning Organizations (MPOs), the variety of services provided by Regional Councils as well as the geographic adherence of COGs to metropolitan area. Moreover, we test the hypothesis about the beneficial impact of general purpose governments, such as the one implemented in the Twin Cities, at the metropolitan level.

From a methodological point of view, we follow the approach suggested by Combes and Gobillon (2015) consisting in a two-stages procedure where productivity premia are estimated in the first stage by using micro data and then used as dependent variable. Hypothesis about the structure of urban governance and the policy responses to the fragmentation problem are tested in the second stage where a specification including a spatial lag of the independent variable is adopted in order to take into account spatial dependence between metropolitan areas. Moreover, we propose a floating approach for the identification of metropolitan areas that takes into consideration their territorial evolution over time. By letting the spatial units of analysis free to modify the boundaries in accordance to the correspondent local autonomous economic system, it is possible to avoid biases related to the structure of urban governance. Secondly, the analysis considers the reverse causation problem deriving from the fact that not only city productivity is affected by the density of the metropolitan area, but also the viceversa holds. In order to tackle the endogenous quantity of labour, an instrumental approach is suggested and the counter-factual for the local evolution of the population is computed from the average of national employment changes in the industrial sectors, weighted by the initial shares of local sectoral structure. Finally, the study considers the possibility that the rate of decline of agglomeration benefits is sharper than the one determined by the inverse of the distance. In order to test the hypothesis, the distance decay parameter is estimated by using a nonlinear estimation technique based on Vega and Elhorst (2015).

The analysis in this article focuses on US metropolitan areas and the period of analysis runs from 1980 to 2000. We employed microdata (IPUMS, Ruggles et al. (2015)) as well as macrodata series from the Bureau of Economic Analysis. We assess the impact of the structure of urban governance and we find that both the level of fragmentation and the degree of dominance of the central city have an effect on the rise of agglomeration externalities that is significant. In particular, a metropolitan area with ten percentage more administrative units than another of the same size, experiences wages that are between 2.0% and 3.0% lower. Moreover, a ten percentage point decrease in the share of population living in the central city is estimated to reduce productivity by a small on average but highly significant amount, that is between 0.7% and 0.8%. By nonlinearly estimating the distance decay parameter, rather than imposing it beforehand, it turns out that the rate of decline of agglomeration benefits is sharper than the one determined by the inverse of the distance. Finally, the presence of a voluntary governance body or a high number of special districts determine a lower level of productivity, meaning that they do not solve the coordination problems at the regional level. The result remains as it is even after looking in details at the services provided by the Regional Councils. Instead, the presence of a general purpose metropolitan government is expected to increase local productivity by about 6%.

The rest of the paper is structured as follows. Section 2 describes the issues at stake about wage disparities, metropolitan governance structure and policy responses to the fragmentation problem, Section 3 explains the methodology adopted, Section 4 presents the empirical analysis and the results, Section 5 concludes.

2 Spatial Disparities and Urban Governance Structure

2.1 Productivity differences across US MSAs

The issue of spatial disparities in wages and productivity levels is a source of considerable policy concern. In many countries, individual wages exhibit strong and persistent differences not only between rural and urban regions, but also across metropolitan areas. The US territory is no exception: the average high school graduate living in the median metropolitan area earns $14.1 for each hour worked; the 10th and 90th percentile of the wages distribution for average high school graduates across metropolitan areas are $12.5 and $16.5, respectively (Moretti, 2011), which accounts for a 32% difference. On average, a full-time worker between the age of 25 and 60 may experience an increase in the earned nominal wage of about 40% by moving from Abilene, TX to San Jose, CA. The figure applies to high school graduates and it is not the most extreme case: if this worker had a college degree, the increase in nominal wage rise to about 50%. Clearly, land prices vary as well across locations; therefore, variations in real wages are significantly smaller than in nominal terms. Still, differences in nominal wages are not without meaning as they say something about local productivity premia (Combes and Gobillon, 2015; Gibbons et al., 2014). The idea is that a firm set in San Jose, CA would had preferred paying lower wages and land rents by relocating in Abilene, TX if it had had no significant productive advantages in the West Coast. Hence, even though labour markets are not perfectly competitive and labour is barely paid at the value of its marginal product, higher wages can be seen as evidence of higher productivity.

Urban productivity premia are strictly related to the size of the cities: it is well known that large cities produce more output per capita than small cities do. The literature has identified one of the causal factors in the economies that accrue from agglomeration, as introduced by Marshall (1890). A high density of firms and workers generates increasing returns to scale at the local level because of the emergence of a number of positive externalities. For example, Duranton and Puga (2004) cited the matching between employers and employee, the learning spillovers and the sharing of infrastructures as well as of facilities. On the latter, Burchfield et al. (2006) found that cities with shared public facilities for the provision of water are more populous than those in which cities aquifers make individual household wells viable. While part of the literature has tried to disentangle the magnitude of the mechanisms at play (Puga, 2010), some scholars proposed other factors explaining urban productivity premia. For instance, a *locus ameneus* may have locational fundamentals that are able to attract people and economic activity *per se*. On the other hand, high-skilled individuals usually prefer to live in denser cities (Bacolod et al., 2009; Glaeser and Resseger, 2010) causing output per worker to increase because of workers sorting. Behrens and Robert-Nicoud (2015) propose a unique theoretical framework supported by the empirical literature that shows a reduction in agglomeration benefits once productivity endogeneity is taken into account (Melo et al., 2009). Finally, spatial relationships among metropolitan areas matter as well. The literature on agglomeration economies agrees in arguing that wage differences across metropolitan areas may also be determined by proximity to markets for intermediate and final goods (Combes and Gobillon, 2015). In this regard, urban economists usually adopt the concept of market potential: cities should be larger and pay higher wages if they have better access to markets, i.e. if their location has higher market potential (Harris, 1954). The idea has been introduced in the theoretical literature by New Economic Geography scholars (Krugman, 1991; Fujita et al., 2001; Redding and Venables, 2004; Hanson, 2005), according to whom city incomes, distance between cities and the city price indices for manufactured goods are the main ingredients of market potential. Some of these models cast doubt on the unambiguous positive effect of a high market potential; Ioannides and Overman (2004) find that spatial interactions contribute to create city's ability to generate high wages only from the end of the Twentieth century.

2.2 Metropolitan governance structure and wage premia

2.2.1 Descriptive evidences

In the present paper, we want to direct the attention towards other factors that we think are able to explain some part of the variability in productivity across metropolitan areas. Our focus is the structure of metropolitan governance, which represents the spatial organisation of formal institutions of local government as well as informal networks in a core-based city region. To clarify the issue, a Metropolitan Statistical Area (MSA) may be conceived as a statistical unit of analysis composed by one or more administratively defined jurisdictions on which population is not uniformly distributed. Usually, metropolitan areas include one central municipality surrounded by a number of outlying jurisdictions that are linked to the former through commuting patterns of people living in the suburbs but working in the city centre as well as by input-output relations among local firms. We define the level of urban *fragmentation* as the number of administratively defined jurisdictions (local governments) that insists on a metropolitan area and the degree of *dominance* of the central jurisdiction as the share of population living in the major municipality. We make an argument to support the thesis that the dispersion of political power, both in terms of numerousness of administratively defined jurisdictions and as distribution of population in a local autonomous economic system, limits the extent to which agglomeration benefits foster local economic productivity. We support the need for a policy response to the issue of poor metropolitan governance but we raise concerns about the effectiveness of existing solutions. Our belief is that only a governance body that resembles a full-fledged regional system can have the capabilities to mitigate the problem.

We collect (and report in Table A3 of the Appendix) a number of descriptive evidences to corroborate our conjectures and to give a flavour of the real dimensions of the question. Let's start by comparing the economic performance in terms of wage premia[1] of two metropolitan areas with a similar level of population such as San Francisco, CA and Atlanta, GA. Wage premium in the former is about 25% higher than in the latter where we observe both a higher number of municipalities (*Fragmentation*) and a more dispersed population (*Dominance*). We notice the same pattern when we look at the figures for New York, NY and Los Angeles, CA with a discrepancy in wage premia favouring the East Cost city. In this case, much of the variation in the structure of urban governance comes from differences in the concentration of population as in Los Angeles, CA, it is 2.2 times more dispersed than in New York, NY. On the opposite, the stark difference in the way urban governance

[1] Data refer to the year 2000. Reported wage premia correspond to those estimated in the first-stage of the empirical analysis; therefore, they measure local productivity net of local industrial composition and skill effects.

is structured between St. Louis, MO and Seattle, WA, is in the number of municipalities that insist on the metropolitan area, being more than four times higher in the former with respect to the other city. At the same time, workers in Seattle benefit from a wage premium that is almost 37% higher than in St. Louis. The descriptive evidences suggest the existence of a relationship between structure of urban governance and wage premia disparities across metropolitan areas, according to which the more concentrated the political power, the higher the returns to labour. By no means the two dimensions that we identify can be considered as substitutes: San Jose, CA and Sacramento, CA, show similar levels of *fragmentation* but in the more productive city (San Jose, CA) population is far more concentrated in the city centre. Moreover, Sacramento, CA does not feature any governance body at the metropolitan level; a reasonable concern may be whether it is the lack to drive its poor economic performance. The hypothesis seems to be invalidated by the presence of a governance body in all the other metropolitan areas that we have just mentioned.

2.2.2 The economic debate

The presence of multiple governments of the same type (either townships, municipalities or counties) within a metropolitan area may create obstacles to the enhancement of metropolitan productivity (Wolman et al., 2011). In the first instance, local governments are governed by officials who are elected by the voters residing within the local jurisdiction. Often, elected local officials tend not to take decisions in a broader, metropolitan perspective, as acting in region's interest is perceived to be counter local interests. Secondly, each local government tries to attract local development within its jurisdictional boundaries in order to receive the revenues from property tax. Hence, the local tax structure within metropolitan areas encourages inter-jurisdictional competition rather than cooperation to enhance productivity within the entire area. Finally, businesses that operate in multiple jurisdictions within a metropolitan area bear higher administrative and regulatory costs imposed by the multiplicity of laws and regulations.

A bunch of OECD studies (see, for example, Ahrend et al., 2014b; Kim et al., 2014) argues that municipal fragmentation increases cities' congestion costs because a high number of local governments is more likely to encounter difficulties when it is necessary to coordinate decisions about transport infrastructure investments or effective land use planning. As a consequence, businesses and individuals are less encouraged to locate in a metropolitan area of this type. Furthermore, Storper (2010) argues that formal structure of political institutions determines their efficiency in facilitating economic activity by shaping both the effectiveness of problem-solving as well as the capacity of adjusting to change and capturing new opportunities. In particular, initiatives that require areas are difficult to implement in regions with many small jurisdictions because they can see the light of the day only if a cross-jurisdictional coalition-building is formed.

Finally, Cheshire and Gordon (1998) investigate more deeply which are the factors favouring the formation of cross-jurisdictional clubs. In their original view, agreements between administrative regions belonging to the same local economic system are desirable in order to implement growth promotion policies, such as the construction of relevant infrastructures. The reason relies on the presence of inter jurisdictional spillovers among administrative units of the same metropolitan area: in the case in which the central jurisdiction of a metropolitan area implements a project for the realization of a facility, it will benefit also the other regions belonging to the local economic system. A small number of public agencies belonging to the club and/or the existence of a dominant jurisdiction with the role of leading agency are the two elements that increase the probability that a club will actually be created and maintained at low costs. The argument on governance they make is about its impact on the rate of local economic growth but it can be easily sustained also when talking of local productivity. As a matter of fact, the implementation of growth promotion policies for the creation of quasi-public goods (such as local public infrastructures) is the prerequisite for the activation of the mechanism of sharing facilities that creates localized increasing returns (Puga, 2010).

Opposite to the previous contributions which support centric government structures in metropolitan areas, proponents of public choice theory defend poly-centric or fragmented governance arrangements (Tiebout, 1956; Ostrom et al., 1961; Parks and Oakerson, 1989). In particular, Ostrom (2010) identify three mechanisms that increase productivity in the presence of multiple governmental units. In the first instance, smaller jurisdictions are more effective than larger ones in monitoring the performance of their citizens and the costs of service provisions; secondly, a multiplicity of local governments makes it possible for individuals to choose the jurisdiction in which the mix and costs of public services is closer to their preferences; thirdly, the smaller the administrative units, the better individuals preferences are likely to be represented and citizens may have more say in the decision process.

In general, advocates of fragmented metropolitan governance argue that the higher the number of jurisdictions, the lower the transaction costs for households and firms because of reduced heterogeneity of public policy preferences. The statement draws back to Tiebout (1956) public choice theory, who contends that people, by "voting with their feet", decide to live in the communities that better satisfy their preferences; therefore, the higher the number of jurisdictions among which people can choose, the higher the probability that public services are provided more efficiently because of the high degree of homogeneity of preferences within jurisdictions. On the other hand, centric governance defenders point out how transaction costs are instead reduced when the metropolitan area is little fragmented because it is possible to avoid bureaucratic overlap and law inconsistency; moreover, the region may benefit from economies of scale and scope in providing public goods and services. In this paper, we support the second argument: the absence of inter-jurisdictional spillovers which is taken as given in the public choice literature cannot be assumed in the metropolitan context. Administratively defined regions in a autonomous local economic system are not isolated islands; input-output relationships among local firms as well as commuting patterns create economic linkages across space.

Empirical evidence on the role of governance structure is, in general, rather scant. To our knowledge the only study that analyses the impact of fragmentation on productivity is Ahrend et al. (2014a). Studying Functional Urban Areas in five OECD countries the authors find that cities with more fragmented structures have significantly lower productivity premia. Other studies instead focus on the relationship between governance structure and local growth with conflicting results[2]. Stansel

[2] The impact of governance structure has been analysed also within the literature dealing with urban sprawl (Carruthers and Ulfarsson, 2002) and fiscal decentralization (Zhang and Zou, 1998).

(2005) examines the relationship between local growth and local decentralization in the US metropolitan context and finds that metropolitan economic performance appears to be favoured by the presence of a multiplicity of local governments. Similarly, Hammond and Tosun (2011) find that single-purpose governments per square mile have a positive impact on metropolitan population and employment growth, but they conduct the analysis at the county level and distinguish between metropolitan and non-metropolitan counties. Grassmueck and Shields (2010) argue that results are sensitive to the way fragmentation is measured and, resorting to both an Hirshman-Herfindal-Index and a Metropolitan Power Diffusion Index based on government expenditures, find that fragmentation is associated with increased employment and per capita income growth. In contrast, Paytas (2001) and Hamilton et al. (2004) find evidence in support of the advantages stemming from consolidation by reporting that the level of fragmentation and state centralization are negatively related to metropolitan economic competitiveness. Finally, building on the idea developed by Cheshire and Gordon (1998) that local growth promotion policies are more likely to be implemented the higher the degree of dominance of the central administrative unit within a metropolitan region, Cheshire and Magrini (2009) report a positive impact of dominance on local growth for major European metropolitan areas.

2.3 Policy responses to poor metropolitan governance

In the US, there have been some policy responses to tackle the lack of coordination among local governments. In general, metropolitan problems are addressed through two mechanisms: special purpose governments or voluntary agreements. The former, special districts, are meant to provide a specific single public service like, for example, fire, police, water and sewer. Even though the number of local governments, such as municipalities and counties, have remained stable over the decades, the quantity of special purpose governments have increasingly grown. Duckett (2012) and Orfield and Gumus-Dawes (2009) agree in arguing that special districts might not be considered as a solution to the issue of poor metropolitan governance. As a matter of fact, they tend to complicate the problem by adding an other layer to the existing multiplicity of local governments; moreover, they usually lack accountability. Even worse, being special districts the instrument to provide services in unincorporated places outside municipal boundaries, they sustain growth occurring in suburban counties, thus fostering further decentralization and fragmentation (Carruthers and Ulfarsson, 2002).

The second mechanism to deal with coordination issues at metropolitan scale, voluntary agreements, have been implemented in a variety of forms which may be reduced to two broad categories: Council of Governments and Metropolitan Planning Organizations. Council of Governments (COGs) are associations consisting of public officials elected in the major local governments of metropolitan areas. Regional Councils, or COGs, may provide a variety of services ranging from public safety to community development (including both workforce and economic development) and covering also environmental and transportation issues. Their purpose is to establish a consensus about the needs of an area and to provide widely acceptable solutions. Voluntary governance body may assume the form of Metropolitan Planning Organization (MPOs), which are federally mandated and funded transportation policy making organizations made up of representatives from local governments and governmental transportation authorities. Nationwide, substantial differences among MPOs remain, even though recent decades have witnessed a devolution of greater responsibilities for planning and implementations to MPOs. As a matter of fact, states maintain significant discretion over delegating authorities and continue to play a primary role in determining most transportation decisions in metropolitan areas (McDowell and Edner, 2002). These kind of governance body share a twofold problem of under-representation. On the one hand, being conceived in the 1960s, they may not cover completely the current geographic extension of metropolitan areas. On the other, as Sanchez (2006) points outs, central cities are under-represented on governance body voting boards. Governing boards for MPOs and COGs are appointed by local officials, or they may delegated from local jurisdictions. Usually, each participating local government sends a representative to the governance body board regardless of the size of the jurisdiction represented; therefore, the voting mechanism is often non proportional or not weighted by population. As Lewis and Sprague (1997) argue, COGs and MPOs have been structured “towards consensus, with more concern toward representing all local governments on regional boards than on establishing equitable criteria for the representation of the region's population".

Some authors indicate multi-purpose regional governance structures with strong powers as the more efficient alternative to deal with the issue of poor metropolitan governance (Orfield and Gumus-Dawes, 2009; Wolman et al., 2011). Few metropolitan areas in the US present these kind of governance bodies that resemble the full-fledged regional system needed to integrate land use, transportation and housing at the metropolitan scale. Orfield and Luce (2009) analyse the cases of the Twin Cities' Metropolitan Council and Portland's Metro which are MPOs regional governing bodies not duplicating functions performed by local governments in the same metropolitan area. In particular, the Minneapolis - St. Paul region have implemented a metropolitan tax-base sharing which requires localities to contribute 40% of their growth in property tax capacity to a regional pool. The collected funds in the pool are then redistributed to local governments within the metropolitan area and municipalities with a lower-than-average tax capacity receive a higher per capita share (Orfield, 2002).

3 The Methodology

The methodological framework adopted in the paper follows from recent advancements in the empirics of agglomeration economies (Combes and Gobillon, 2015). Nominal wages are likely to be different across metropolitan areas because of a variety of reasons. In the first instance, industrial composition of the local economy demand higher or lower average wages, depending on which industry, if any, is prevalent in the economic system. Secondly, the average composition of the workforce plays a role as well: for example, we expect highly educated or more talented individuals to receive higher wages. Finally, cities may have specific characteristics that are beneficial to the local economy up to the point of translating into a wage premium. We hypothesise that the structure of urban governance, together with the size of the local economy and the agglomeration spillovers among core-based city regions, play a fundamental role in determining metropolitan areas productivity.

Combes et al. (2008) present a simple model of agglomeration economies on which we rely to provide a clear explanation of our methodological strategy. Let's consider a representative firm in MSA a, industry k at time t which maximizes profits $\pi_{a,k,t}$ with a Cobb-Douglas production function $y_{a,k,t}$ expressed in effective labour and other factors of production. In a competitive equilibrium, first order conditions for the optimal allocation of inputs lead to a (log-linearised) individual wage which is a function of a worker effect ($X_{i,t}$), an industry effect ($i_{k,t}$), a core-based city region effect ($\gamma_{a,t}$), and a shock specific to worker i at time t:

$$log\ w_{i,t} = \beta\ X_{i,t} + i_{k,t} + \gamma_{a,t} + \varepsilon_{i,t} \tag{1}$$

The worker effect includes *observable* individual characteristics, such as age and its square value, education, gender, ethnicity and occupation of the respondents. Actually, *unobserved* characteristics, such as skills and abilities, play a role in determining nominal wages as well but measurement difficulties prevent them to be included in a simple repeated cross-section regression, which is in fact our case [3]. Hence, in the absence of a panel structure, the only possibility is to confine time-invariant workers fixed effects in the error term. Nevertheless, we believe that the highly detailed set of *observable* characteristics that we include may reduce the loss of information.

The coefficient $\gamma_{a,t}$ in Equation (1) is our parameter of interest as it indicates the wage premium associated to the metropolitan area a at time t net of local industrial mix and local workforce characteristics. Which factors determine such measure of local productivity is the central question of our work; therefore, the identification of the coefficient $\gamma_{a,t}$ deserves special attention. In this context, Combes et al. (2011) discuss the main sources of bias in the identification of agglomeration effects. One of the main empirical issue derives from the fact that the quality of labour is endogenous to the productivity of the metropolitan area: some cities more than others are known to attract younger and highly educated workers or just more talented individuals, who expect to gain more by moving to more productive cities. In particular, the composition of the workforce is strictly connected to the size of the city. The complementarity between cities and skills has been documented by a number of studies

[3] The IPUMS sample that we use does not allow us to adopt a panel specification because individual identifiers have not been provided due to confidentiality restrictions.

(see, for example, Glaeser and Resseger, 2010) and may occur for two reasons. On the one hand, the initial distribution of workers' skills may vary according to the size of the city with larger urban agglomeration having, on average, higher skill level. In fact, better schools and universities in denser cities may increase the productivity of natives; moreover, learning at the workplace may be faster in denser cities (Glaeser et al., 2001; De la Roca and Puga, 2012). On the other hand, workers may sort by skills and more talented individuals tend to co-locate in larger cities (Bacolod et al., 2009): for instance, workers with a better learning potential may choose to go to denser cities where more learning takes place. In econometric terms, the problem translates into a positive covariance between the coefficient representing the local wage premium and the *observable* and *unobservable* characteristics of the workforce.

Ideally, the problem of endogenous labour quality could be solved by adopting a two-stages procedure and relying on a panel data structure in the first stage where it would be possible to control for both *observable* (skills distribution among metropolitan areas) and *unobservable* workers' characteristics (non random sorting of skills) (see, for example, Combes et al., 2008; Mion and Naticchioni, 2009). In particular, it would be possible to estimate wage premia by means of a metropolitan dummy variable having some workers that remain in each of the metropolitan areas between any two consecutive periods of time and a flow of workers from each of the metropolitan areas. Differences between areas over time are identified by workers that move across areas; workers that remain in the same metropolitan area provide the identification for changes over time for their area. Hence, in a panel specification, area fixed effect may be estimated separately from individual effect through movers' choice of location.

Here, we adopt a different identification strategy in order to overcome the limitations due to the structure of our dataset, which is a simple cross-section repeated over three decades. The general framework follows Combes et al. (2008) and we maintain the two-stages procedure where the first stage is implemented on individual data while metropolitan statistical areas become the unit of observation of the second stage. The aim of the first stage is that of estimating a measure of metropolitan wage premium, that is the part of nominal wages that remains to be explained after having considered the effect of the local industrial composition, the average workers characteristics and the non-random skill sorting across cities. The likely sources of variation of wage premia are then tested in the second stage of the empirical model and include the size of the local autonomous economic system, the spatial spillovers among cities, the structure of the metropolitan governance as well as the effectiveness of the policy solutions implemented in response to the problem of poor governance.

Our main concern in the first stage is to distinguish the contribution of the "place" from that of the "people" in the formation of individual wages. We believe that the identification can be achieved by introducing an instrument for the metropolitan area dummy variable. In particular, the *current* metropolitan area of residence is instrumented with the corresponding five-years lagged. In this way, the metropolitan area of *previous* residence is used as an instrument for the *current* one. For the whole dataset, about 77% of respondents have not moved from one metropolitan area to another in the 5 years interval. The high correlation assures us that the relevance condition for the validity of the instrument is satisfied, and we can move to the discussion about the exogeneity condition. In particular, we want the instrument to be uncorrelated with the error term; in our specific case, with the *unobserved* workers characteristics contained in the error term. Our identification strategy relies on the non-random sorting of skills: if the individuals that moved in the previous period are the more talented looking for better opportunities in more productive cities, then using the *previous* metropolitan area of residence rather than the *current* one avoids the over-estimation of the "place" contribution. Let's consider, for example, an individual that earns a nominal wage higher than a colleague working in the same industry but in a different place. The wage premium may be due to the fact that in his metropolitan area agglomeration benefits foster local productivity and nominal wages or that the individual is simply more talented than the colleague. If we try to identify the contribution of the location characteristics by imputing the *current* MSA of residence, we over-estimate it. Instead, if we use the *previous* residence (and it is different from the current one), he will be excluded from the estimation of the "place" effect of the *current* MSA of residence. The area fixed effect is correctly identified if he is a high-skilled individual who has moved to a city that is more productive than the previous one. This is the pattern described by Glaeser and Resseger (2010) and Bacolod et al. (2009). On the contrary, if skills sorting is random, the problem of endogenous quality of labour ceases to exists and the use of the instrument cannot be harmful for the estimation purposes because it captures a random process.

To sum up, the first-stage equation that we estimate is:

$$log\ w_{i,at} = \beta X_{i,at} + \gamma_{at} d_{i,at-5} + \mu_t i_{i,t} + \varepsilon_{i,at} \tag{2}$$

where $w_{i,at}$ is the nominal wage of individual i at time t who works in Metropolitan Area a at time t, X is a vector of individual characteristics, $d_{i,at-5}$ is a vector of dummy variables that take value 1 if the individual used to live in Metropolitan Area a five years before and $i_{i,t}$ is the vector of industry dummies. The estimated coefficients γ_{at} represent that part of wages variability that is not explained by workforce or industrial composition [4]. Details on the Census data used and on the construction of the set of variables are available in the Appendix.

Subsequently, the second stage of the estimation procedure entails the use of location fixed-effect as dependent variable, which is regressed on the set of explanatory variables of interest:

$$\hat{\gamma}_{a,t} = \theta T_t + \delta Z_{a,t} + u_{a,t} \tag{3}$$

where $\hat{\gamma}_{a,t}$ are the estimated coefficients of the metropolitan areas a dummy variables obtained from the first stage regression, T_t are additional year fixed effects, $Z_{a,t}$ is a matrix containing the explanatory variables and $u_{a,t}$ is the error term. The objective of the second stage is the assessment of the relative importance of the size of the local economy, the structure of urban governance and the spatial extent of agglomeration effects in explaining the area-year fixed effects estimated in the first stage.

The *size of the economy* may be measured in terms of employment, population or production. Ciccone and Hall (1996) suggested to use the number of individuals per unit of land and Briant et al. (2010) argued that the adoption of density measures, instead of population level, should reduce the Modifiable Areal Unit Problem

[4] In order to catch the location specific effect, we hypothesize that the respondents used to live and work in the same place. While the assumption would be barely defensible in many other contexts, it turns out to be quite reasonable when the unit of analysis is the metropolitan area that represents a local economic system as self contained as possible in terms of commuting patterns.

even though shape distortions remain a second order concern with respect to correct model specification. In general, both density and the size of the location should have a positive impact on local productivity if agglomeration gains outweigh agglomeration costs; therefore, it would be worthwhile to consider both effects in a logarithmic specification (Combes and Gobillon, 2015). In particular, by introducing *density* and *land area* among the explicative variables of Equation (3), it is possible to derive conclusions about the gains from increasing the number of people while maintaining land fixed (or viceversa) and the effect of land area for a given population level which is equal to the difference between the effect of land area (with constant population) and the effect of density (with constant land). It should be noted that the conclusion about the presence of agglomeration benefits are not invalidated even though the last effect turns out to be negative. As a matter of fact, when using density and land area, agglomeration gains exist when any of the estimated coefficients is significantly positive.

The second set of explanatory variables aim at assessing whether productivity benefits associated to agglomeration economies may be enhanced by the presence of a small number of local governments within the same metropolitan statistical area or by the presence of a dominant municipality. In particular, the two dimensions of the structure of urban governance that will be taken into account are the *level of fragmentation* and the *degree of dominance*. The former is computed as the number of municipalities in metropolitan areas in 1980, 1990 and 2000 as defined by the Office of Management and Budget. The latter is the ratio of the population living in the largest city of each metropolitan area to that of the metropolitan area in contemporaneous configurations for the three decades. Note that the *degree of dominance* needs to control for territorial extension of the central city in order to take into account, for example, the case in which the central city is consolidated with the county[5]. On the other hand, the *level of fragmentation* does not need to control for the Metropolitan Area size[6], since this dimension has already been taken

[5] The consolidated city-county included in the analysis are Augusta-Richmond County, GA; Indianapolis-Marion County, IN; Jacksonville-Duval County, FL; Louisville-Jefferson County, KY; Nashville-Davidson County, TN; Macon-Bibb County, GA.

[6] Usually the literature adopts the number of municipalities per 100,000 inhabitants (Stansel, 2005).

into account by including *density* and *land area*. A final set of explanatory variables include the policy responses to the issue of fragmented metropolitan governance. In particular, we consider: presence of Council of Governments (*COGs*) and Metropolitan Planning Organizations (*MPOs*), variety of services provided by the governance bodies (Transport, Environment, Community Development, Public Safety, Economic Development and Workforce Development), *Geographic Adherence* of Regional Councils to metropolitan areas, number of *special purpose governments* and existence of a metropolitan *general purpose government*. Table A2 in the Appendix presents the complete list of explanatory variables with a synthetic description and the sources of the data. An exhaustive explanation of the way in which the measure of *Geographic Adherence* has been computed is in the Appendix as well.

Substantive spatial dependence A simple way to assess the spatial extent of agglomeration effect is that of relying on the concept of market potential, which is a proxy of the goodness in the access to the market. Once the specified equation to be estimated contains on the RHS both density and market potential as measured in terms of density, it resembles the generic formulation of a ''Spatial Lag of X" (SLX) model (LeSage and Page, 2009), in which the independent variable is included with a spatial lag. As argued by Gibbons and Overman (2012), the use of a SLX specification helps to overcome the identification problems that are typical in spatial econometrics, i.e. a) the impossibility to distinguish different econometric specifications without assuming hypothetical prior knowledge of the data generating process and b) the ''reflection problem" according to which it is not possible to recover the unknown parameters of a model from their reduced form specification if it includes both exogenous and endogenous characteristics of the neighbours.

There exists a number of variants for computing market potential; in fact, it is possible to consider either population, employment or production in levels or density forms. As shown by Combes and Lafourcade (2005), all the different formulations measuring market potential are highly correlated but if density is used to measure the size of the local economy, computing market potential using densities is more consistent. In what follows, the market access variable used is the (log) of market potential computed from the density of neighbouring areas:

$$MP_{a,t} = \sum_{a \neq l=1}^{n} w_{a,l}\ den_{l,t} \tag{4}$$

where $w_{a,l}$ are the elements of a spatial weighting matrix, W, providing a description of the interactions between spatial units.

In order to deal with the uncertain functional form of spatial agglomeration effects, we introduce a parameterized distance based weights matrix where the distance decay parameter is estimated by using a nonlinear estimation technique, as suggested by Vega and Elhorst (2015) and recently applied to the local multipliers analysis by Gerolimetto and Magrini (2015). By adopting this approach, it is possible to capture more information on the way in which inter-dependencies between spatial units are structured. Hence, the analysis consider the possibility that the rate of decline of agglomeration benefits is sharper than the one determined simply by the inverse of the distance. In particular, we employ a simple inverse distance matrix with a threshold:

$$w_{a,l} = \begin{cases} 1/d_{al}^{\alpha}, & \text{if } 0 \leq d_{al} \leq d \\ 0, & \text{if } d_{al} > d \end{cases} \tag{5}$$

where α is the distance decay parameter, d is a distance threshold and d_{al} represents the distances between location a and l. Vega and Elhorst (2015) provide the details about the nonlinear estimation technique of the distance decay parameter. Row-normalization of W based on inverse distance make the economic interpretation of the weights to be no longer valid in terms of distance decay. Hence, we apply a min-max normalized matrix Kelejian and Prucha (2010) obtained by dividing each element w_{al} by

$$\tau = min\left\{ max_a \sum_{l=1}^{n} w_{al},\ max_l \sum_{a=1}^{n} w_{al} \right\} \tag{6}$$

Endogenous quantity of labour A further empirical concern that arises involves the possibility that some local characteristics are endogenous to local wages: a metropolitan area that experiences a positive shock may increase its size because of migrations. In this case, there may be a reverse causality problem that is going to bias the estimates. In order to deal with the endogeneity issue, we adopt an instrumental variable approach and we assume that endogeneity may be caused by *contemporaneous local shocks*, as in Ciccone and Hall (1996). So far, the literature have adopted a number of instruments for solving the problem of endogenous quantity of labour. For example, Ciccone and Hall (1996) use long lags of population, Combes et al. (2010) opt for the geological characteristics of regions and Combes et al. (2008) choose some measures of geographical periphery.

The strategy that we adopt here involves the use of a Bartik instrument (Bartik, 1991) for density. For each metropolitan area, we calculate the number of workers in each sector with respect to total employment in 1970[7]. Each metropolitan area has an *imputed rate of growth* which is the sectoral nationwide rate of growth that would have been if its contribution was set to zero. The sum of the *imputed rate of growth* weighted by the initial shares of employment constitutes the metropolitan *counter-factual rate of growth*. The *counter-factual level* of employment is then determined by applying the *counter-factual rate of growth* to the actual level of local employment at the beginning of the period and it is used as instrument for density. The use of the Bartik instrument helps to get rid of city-specific shocks and to isolate exogenous shifts in the demand for labour. The counter-factual rate of growth of employment in Metropolitan Area a ($\Delta B_{a,t-k\ to\ t}$) is computed as:

$$\Delta B_{a,t-k\ to\ t} = \left[\sum_{I \in Ind} \frac{empl^{I}_{a,t-k}}{\sum_{I \in Ind} empl^{I}_{a,t-k}} * \Delta\ ln \left(\sum_{l \in Reg \neq a} empl^{I}_{l,t-k\ to\ t} \right) \right] \quad (7)$$

where $empl^{I}_{a,t-k}$ is employment in industry I, region a, time t and $\delta_{t-k\ to\ t}$ indicates the differences between years $t-k\ to\ t$. The first term on the RHS represents the share of employment in region a that is employed in industry I, while the second term is the change in employment, in industry I, for all other regions. From the above computation derives the *counter-factual level* of employment which we use as

[7] The industries that have been considered using the SIC classification are: Construction, Manufacturing, Transport and Public Utilities, Wholesale Trade, Retail Trade, Finance Insurance and Real Estate, Services; the source of the data for local industrial employment is the Bureau of Economic Analysis, which provides information at the metropolitan level.

instrument for the level of population density.

The *floating area approach* The geographic definition of the area that corresponds to a local and autonomous economic system is not constant over time, as the pattern of centralization and decentralization evolves, so the metropolitan area changes its boundaries and internal composition. Hence, metropolitan areas are different both in static as well as dynamic terms. The former source of variation deals both with the number of administratively defined jurisdictions that shape the statistical unit of analysis as well as with the concentration of population in the central municipality; the latter derives from the evolution of the original configuration over time. Usually, the literature considers the metropolitan areas' delineation that is in effect at a precise moment in time, but does not consider the evolution of MAs boundaries even though the time frame of the analysis covers various modifications in the delineations. Hence, in the case of a city that has expanded over time, either the definition is the initial one and the level of fragmentation is underestimated, or the definition is the latter one, and it is overestimated. Let's think, for example, to the spatial variation of Atlanta, GA. In 1960, the city consisted of five counties, by 1990 it had expanded to encompass twenty counties. Figure A1 in the Appendix shows the spatial evolution of the metropolitan area of Atlanta, GA, as defined by the Office of Management and Budget for the years 1970, 1980, 1990, 2000. If we adopt the initial definition, Atlanta will show a low number of local governments for the whole time series; on the other way round, by accepting the final delineation and fitting it backwards, Atlanta will be characterized by a high level of horizontal dispersion of power among individual lower-level governments.

Few authors have tackled the change in the boundaries issue (see, for example, Gottlieb, 2006; Nucci and Long, 1995). Recently, Ferranna et al. (2016) analyse how the spatial evolution of core-based city regions affects the dynamics of the cross-sectional distribution of US MSAs per capita average incomes. The authors compare the convergence results deriving from the application of different approaches to define MSAs over time: the *fixed area* and the *floating area*. The former uses the same designation of counties over a series of decades, which may be beginning, ending or some intervening date; the latter uses the universe of metropolitan counties at the beginning of each decade. Table A1 in the Appendix reports the mean values for density, land, fragmentation and dominance based on the *floating area* and on the *fixed area* approaches. Fragmentation is here defined as the number of administrative units (counties) that compose the metropolitan area per 100,000 inhabitants; dominance is the percentage of population living in the central city. By reading across rows, one can compare the average values over the three decades (1970, 1980, 1990) using the same universe of counties (i.e. *fixed area approach*). By reading down the principal diagonal of each panel, one can compare average values using the *floating area approach*. Percentage change with respect to the latter method are reported in the last three columns. Data in Table A1 indicate that average values for land and fragmentation (density and dominance) are, in general, lower (higher) if we use the fixed area approach based on earlier years. In order to obtain more reliable estimates, we suggest to evaluate the impact of the local government structure by adopting the *floating area approach*. In particular, following Ferranna et al. (2016), the evaluation is conducted in accordance with the time-frames defined by the Office of Management and Budget's (OMB) official updates of the boundaries delineations [8].

[8] The adopted methodology is consistent with the Integrated Public Use Microdata Series's definition of the geographical unit of analysis (Ruggles et al., 2015). In IPUMS samples, the variable that identify the Metropolitan Area in which the respondent works generally correspond to contemporary OMB delineations.

4 Empirical Analysis

The importance of metropolitan governance structure in determining wage premia has been tested for a sample of 182 metropolitan areas in the US, over a time period ranging from 1980 to 2000. A map of the metropolitan areas included in the analysis is reported in Figure A2 in the Appendix. The main source of the data for the first-stage of the regression is the Integrated Public Use Microdata Series (IPUMS) (Ruggles et al., 2015) and the samples used are 1% samples for the years 1980, 1990 and 2000. The second stage of the regression uses data from the Bureau of Economic Analysis at the county level, then aggregated at the metropolitan level according to the official delineations provided by the Office of Management and Budget for the three decades. Table A2 in the Appendix provides a list of all the variables included in the Second Stage of the estimation procedure, as well as a brief description and the specific sources of the data. Corresponding descriptive statistics are reported in the subsequent Table A4. Finally, a list of metropolitan governance bodies is available in Table A5.

First Stage Estimation Results The following Table 1 presents the results in a compact form for the set of workers observable characteristics, industry dummies as well as Metropolitan Area fixed effects interacted with time dummies[9].

In order to evaluate the relative importance of area fixed-effect with respect to either worker characteristics, industry or time fixed effect, Table 2 summarizes the explanatory power of the variables on the RHS of Equation 2 as in Abowd et al. (1999). In particular, the table reports the standard deviation of the effect of the (group of) explanatory variables and their correlation with (natural logarithm of) wages, industry fixed effects and de-trended area fixed effects. The *effect of each variable* has been constructed by multiplying its coefficient by its value for each observation; for a group of variables the sum of the effects is computed. The total number of observations is 540,740 and all correlation between coefficients that are not orthogonal by definition are significant at 1% level. Subsequently, we derive the variability of the effect of each variable across workers. The table should be inter-

[9] Table A6 in the Appendix reports the results in more details

Table 1: First Stage Specifications Results

	(I)	(II)	(III)	(IV)
Age	0.0614***	0.0564***	0.0561***	0.0536***
	(85.47)	(84.27)	(84.08)	(81.57)
Experience	-0.0006***	-0.0006***	-0.0006***	-0.0005***
	(-74.63)	(-69.71)	(-69.48)	(-67.22)
Ethnicity	0.232***	0.159***	0.158***	0.156***
	(119.78)	(88.46)	(87.47)	(87.66)
Gender	0.242***	0.246***	0.239***	0.221***
	(160.16)	(176.81)	(170.43)	(148.82)
Very High Education		0.672***	0.674***	0.664***
		(242.70)	(238.20)	(231.14)
High Education		0.382***	0.386***	0.373***
		(140.65)	(141.05)	(136.97)
Medium Education		0.227***	0.232***	0.220***
		(85.10)	(86.76)	(83.22)
N	540740	540740	540740	540740
R^2	0.9626	0.9682	0.9684	0.9693
MSA X Year Dummies	Yes	Yes	Yes	Yes
Occupation Dummies	No	No	Yes	Yes
Industry Dummies	No	No	No	Yes

MSA clustered t statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Reference categories for OCCUPATION: Occupation=Service Occupations; for EDUCATION: Education=Low; for GENDER: Gender=Female; for ETHNICITY: Ethnicity=Not White; for INDUSTRY: Industry=Personal Services.

preted as follows: when the effect of a variable has a large standard deviation and it is highly correlated with wages, then the variable of interest has a large explanatory power. On the opposite, the variations of wages could be explained only marginally if the effect of a variable has a small standard deviation and a small correlation with wages.

Table 2 indicates the *effect of*:

- *workers' observable characteristics*, which has the largest explanatory power. The standard deviation (0.296) is quite large with respect to (log of) wages' variability (0.590). Moreover, the correlation between workers' characteristics and wages is large (0.511). All of the others variables, or group of, show lower standard deviations and correlation with wages than the set of workers' char-

Table 2: Variance Decomposition

Effect of	Std.Dev.	Simple correlation with:		
		ln w	μ	$\gamma - \theta$
log of wages (ln w)	0.590	1.000	0.181	0.139
worker's characteristics (βX)	0.296	0.511	0.049	0.012
industry fixed effects (μ)	0.098	0.181	1.000	0.023
area fixed effects ($\gamma - \theta$)	0.153	0.139	0.023	1.000

Notes: Area fixed effects are de-trended using the time fixed effects θ estimated in the second stage.

acteristics. This set includes: age and its square, gender, ethnicity, education and occupation.

- *industry fixed effects*, which has a quite small explanatory power. In particular, even though the correlation with wages (0.181) is quite high, the standard deviation (0.098) is less than one sixth of that of worker characteristics.

- *area fixed effects*, which has a substantial power in explaining wages' variability, still lower than that of worker fixed effects. In fact, the correlation with (ln of) wages is 0.139 while the standard deviation is 0.153, one fourth that of wages. In order to distinguish its explanatory power from that of time fixed effect, area fixed effects have been de-trended using the time fixed effects (θ) estimated in the second stage.

In sum, the results of the First Stage estimation are in line with previous studies. For example, Combes et al. (2008) estimate a model of wage determination across local labour markets using a very large panel of French workers and find that the set of variables with the strongest power in explaining wages' variability is worker fixed effects, followed by area-year fixed effects. Differently from the present analysis, they include also within-industry interactions (number of establishments and industry share in employment) among the explanatory variables, but these turn out to be of modest interest in explaining wages' differences across locations.

Second Stage Estimation Results The coefficients for the area fixed effects estimated in the First Stage are then used as dependent variable in the Second Stage of the regression (Equation 3) which is estimated by using a SLX-IV method. Table 3 reports the main results. The model has been estimated by using several specifications in order to: firstly, assess the negative impact of poor metropolitan governance, i.e. highly fragmented metropolitan areas without a dominant jurisdiction; secondly, evaluate the various policy responses to the coordination difficulties and, finally, to test the hypothesis about the benefit deriving from having a general-purpose regional structure with extensive powers.

In all the specifications, the explanatory variables introduced are density, land area, market potential and the dimensions of urban governance structure, i.e. the *degree of dominance* and the *level of fragmentation*. The coefficient of density is around 8% , is quite large with respect to the literature: Melo et al. (2009) show that there is a great deal of variability in the magnitude of the estimates, although they are usually found to be positive. The coefficient on land area is smaller than that on density: an increase in population through higher density has a much larger effect on wages than the one that we would have obtained if the same increase in population had left density constant by increasing land area. The estimated coefficients of the variables that proxy the structure of urban governance are both significant and indicate how agglomeration benefits are penalized in the case of less consolidated metropolitan areas. As a matter of fact, a metropolitan area with ten percentage more administrative units than another of the same size, experiences wages that are between 2.0% and 3.0% lower. Moreover, a ten percentage point decrease in the share of population living in the central city is estimated to reduce productivity by a small on average but highly significant amount, that is between 0.7% and 0.8%. The *distance decay parameter* is non-linearly estimated according to the procedure developed by Vega and Elhorst (2015). Its estimation provides information on the way spatial interactions fade as the distance between units increases which would not been otherwise obtained by imposing it beforehand. The estimated distance decay parameter ranges between 1.7 and 2.0, meaning that the rate of decline of agglomeration benefits is sharper than the one determined by the inverse of the distance. The coefficient for *market potential* is positive and highly significant as it ranges between 2.0% and 2.2%. The finding is in line with the literature; for example, Briant et al. (2010) and Combes et al. (2008) have similar figures in their studies.

All the specifications introduce the instrument for density, in order to control for the likely endogeneity deriving from reverse causality with wages. The instrument is the *counter-factual level of employment* that would have been achieved if the local economy was growing according to the *counter-factual growth rate* computed as the weighted average of the *imputed growth rate* (nationwide sectoral growth rate net of the individual contribution), where the weights are the initial shares of local industry employment. The instrument has a strong power in predicting density and the R-squared of the first stage estimation of the two-stages least squares is 0.91 and performs successfully in both the under-identification and weak identification tests. As a matter of fact, the relevance of the instrument cannot be rejected at the 1%, 5%, or 10% confidence level; therefore, the model is identified. Moreover, the instrument results to be not weak, with a Wald F-statistics over 300, far higher than the 10% critical value computed by Stock and Yogo (2005). The diagnostics reported in Table 3 clearly confirm that the level of metropolitan density is indeed endogenous at a confidence level of 1%. A second instrument is introduced, which is the spatial lag of the *counter-factual rate of growth*. The p-value for the over-identification test arrives at 0.66 indicating that both the instruments are valid (uncorrelated with the error term).

In Table A7 in the Appendix we report the sensitivity of the results to variations in the shape and size of the spatial units of analysis. The data used in the model which estimation results are reported in the first (second) column consider the metropolitan areas as they are defined in the initial (final) period, i.e. 1980 (2000). In both cases the specification used is the IV-SLX. Comparing the figures with the findings reported in Table 3, it turns out that estimates for metropolitan governance structure are upward biased when adopting a constant definition of the metropolitan area. Still, the findings are in line with the ones derived by applying the floating definition approach; therefore, results are robust to the modifiable areal unit problem.

Stated the negative impact of poor metropolitan governance, let's turn to the policy responses that have been applied to some metropolitan areas. Firstly **(I)** a measure of state centralization is introduced, in order to capture a possible state component in the variability of urban governance structure (McDowell and Edner, 2002). We consider the State Centralization Index (SCI), following Paytas (2001) and Grassmueck and Shields (2010). The SCI has been formulated by Stephens (1974) and updated by Stephens and Wikstrom (1999). The index rises with the level of state centralization, classified as the extent of services delivered, financial responsibility for public services and personnel adjusted for state and local differences in labour inputs versus inputs of cash and capital. The index turns out not to be significant in explaining wage differentials among metropolitan areas. A state component is already contained in the (**II**) specification, where we add two dummy variables indicating, respectively, weather a Council of Government or a Metropolitan Planning Organization act over a significant part of the metropolitan area. Both variables are highly correlated with a state dummy and present a statistically negative coefficient, pointing out how the costs related to the implementation of a governance body based on voluntary agreements between local jurisdictions outweigh benefit. The finding is in line with the literature pointing out the unbalanced representativeness of COGs and MPOs due to a voting system non proportional or not weighted by population (Lewis and Sprague, 1997; Sanchez, 2006) and the bureaucracy they add to that already existing. A detailed analysis of the services provided by Council of Governments may be found in specification (**III**). In most of the cases, whatever the services provided by the COGs, the results are not significant in statistical terms. It may be that COGs are duplicating functions provided by local governments in the metropolitan area or that they do not respond efficaciously to local preferences. The only service that has a negative but significant impact on metropolitan productivity is public safety, that maybe introduce a cost to regional economies by crowding out resources to favour security needs of citizens living in the middle-class outlying jurisdictions, which have more voice than central cities in voting boards.

Specification (**IV**) tackles the issue of geographic representativeness of Regional Councils. A dummy variable have been introduced in order to capture the geographic adherence of COGs to correspondent metropolitan area. In order to construct the variable, we compute three measures by intersecting population in metropolitan area and population in the governance body and dividing it by either population in MA (1) or population in the COG (2), and by calculating the ratio between population in the governance body with respect to that in the metropolitan area (3). By combining these indexes, six scenarios may be detected: 1) the COG is entirely contained in the territory of the metropolitan area; 2) the COG extends beyond the boundaries of the metropolitan area; 3) the COG is larger than the metropolitan area but doesn't contain it entirely; 4) the COG is smaller than the metropolitan area but it extends outside its boundaries; 5) the COG and the MA perfectly coincide; 6) there's no COG in the MA. The variable introduced in the analysis (Geographic Adherence) tests the hypothesis that perfect coincidence or slight mismatch between the two entities with one containing entirely the other , are the preferred solutions. The coefficient estimated for the dummy variable is in fact positive and statistically significant, which supports the correctness of our statement. The contribute of COGs and MPOs in alleviating coordination difficulties when metropolitan areas are highly fragmented is evaluated in (**V**) where the impact of interaction variables between both COGs and MPOs with fragmentation are assessed. The former is only marginally significant while the latter is not significant at all, meaning that the penalty due to a marginal increase in the number of local governments is not going to be reduced in the case in which a governance body is present in the metropolitan area.

Alternatively or side by side to COGs and MPOs, special districts may be created to address local needs of population living in outlying counties. We added the number of special purpose governments to the (**VI**) specification observing that they do not significantly affect average wages in metropolitan region. As stated by Duckett (2012) and Orfield and Gumus-Dawes (2009) special districts tend to complicate the problem by adding to local governments. Finally, we test hypothesis about the effectiveness of general purpose regional governments with extensive powers, as those in Twin Cities, MN and Portland, OR. Hence, a dummy variable that takes values one in these two cases is introduced in specification (**VII**), where it turns out to be positively and marginally significant. Actually, Minneapolis - St. Paul, MN is the only metropolitan area to have implemented a metropolitan tax-base sharing according to which revenues from property taxes are redistributed favouring low than average per capita income municipalities (Orfield, 2002). This strategy seems to be the only one (**VIII**) to give positive results. As a matter of fact, consolidated government like that of Twin Cities is expected to increase local productivity by about 6%.

Table 3: IV-SLX Estimation Results

	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
Density	0.0836***	0.0834***	0.0816***	0.0835***	0.0827***	0.0811***	0.0823***	0.0823***
	(12.40)	(12.62)	(12.96)	(12.91)	(12.93)	(13.03)	(13.01)	(12.62)
Land	0.0834***	0.0760***	0.0766***	0.0766***	0.0748***	0.0714***	0.0753***	0.0750***
	(12.15)	(10.99)	(11.49)	(10.94)	(10.63)	(9.83)	(11.43)	(10.82)
City Land	-0.0272***	-0.0241***	-0.0222***	-0.0256***	-0.0252***	-0.0242***	-0.0257***	-0.0250***
	(-4.83)	(-4.34)	(-4.28)	(-4.66)	(-4.89)	(-4.68)	(-4.81)	(-4.80)
Market Potential	0.0222***	0.0201***	0.0201***	0.0211***	0.0207***	0.0210***	0.0216***	0.0219***
	(6.60)	(6.11)	(6.06)	(6.14)	(5.94)	(6.11)	(5.97)	(6.24)
Fragmentation	-0.0214***	-0.0199***	-0.0237***	-0.0203***	-0.0340***	-0.0294***	-0.0297***	-0.0301***
	(-4.36)	(-4.30)	(-5.46)	(-4.37)	(-4.65)	(-5.19)	(-5.11)	(-4.97)
Dominance	0.0882***	0.0734***	0.0811***	0.0712***	0.0709***	0.0665***	0.0731***	0.0721***
	(3.54)	(3.16)	(3.56)	(3.12)	(3.12)	(2.98)	(3.33)	(3.28)
Distance Decay	2.051***	1.926***	1.836***	1.776***	1.745***	1.747***	1.725***	1.734***
	(9.11)	(6.11)	(6.02)	(5.64)	(5.79)	(5.39)	(5.66)	(5.79)
SCI	0.00802							
	(0.25)							
MPOs		-0.0186***	-0.0137**	-0.0162***	-0.0415**	-0.0136**	-0.0153**	-0.0151**
		(-3.26)	(-2.43)	(-2.90)	(-2.01)	(-2.33)	(-2.62)	(-2.72)
COGs		-0.0269***		-0.0311***	-0.0805***	-0.0684***	-0.0775***	-0.0789***
		(-4.86)		(-5.39)	(-3.71)	(-3.27)	(-3.66)	(-3.69)
Transport			-0.0121*					
			(-1.65)					
Environment			0.0141**					
			(1.95)					
Community			0.006					
			(0.79)					
Public Safety			-0.0321***					
			(-4.08)					
Economic Development			-0.0251*					
			(-2.04)					
WF Development			0.00476					
			(0.40)					
Geographic Adherence				0.0237**	0.0228**	0.0244**	0.0238**	0.0237**
				(2.55)	(2.39)	(2.53)	(2.57)	(2.52)
COGsXFragmentation					0.0164**	0.0123**	0.0153**	0.0157**
					(2.48)	(2.02)	(2.62)	(2.43)
MPOsXFragmentation					0.0096			
					(1.48)			
Special Districts						0.0052		
						(1.68)		
General Purpose							0.0353*	
							(1.86)	
Twin Cities								0.0606***
								(3.42)
N	546	546	546	546	546	546	546	546
MSA	182	182	182	182	182	182	182	182
Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Over Identification	3.76	0.95	0.20	0.47	0.71	0.29	0.52	0.53
(p)Over Identification	0.05	0.32	0.66	0.52	0.40	0.59	0.47	0.47
Weak Identification	330.25	361.32	320.86	353.58	353.81	291.92	345.85	345.71
Under identification	105.89	104.91	115.73	104.26	109.05	112.47	102.96	102.54
(p)Under identification	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Endogeneity	12.18	9.37	8.28	10.43	10.92	12.12	11.06	8.62
(p)Endogeneity	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Notes: t statistics in parentheses. Bootstrap Robust Standard Errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5 Conclusions

The impact on local productivity of the way in which urban agglomerations are governed has received little attention, with few exceptions (Ahrend et al., 2014a). However, this paucity of empirical studies is in stark contrast with anecdotal evidence suggesting formal structure of metropolitan governance as a channel of direct intervention for spurring local productivity. For example, local governments fragmentation has been indicated as the major cause of St. Louis inability to solve collective challenges resulting in social tensions in places like Ferguson. Back in 1876, the city of St. Louis separated from St. Louis County in order not to provide any more services to the outlying areas. Moreover, St. Louis County contains 90 municipalities, which rely mainly on revenue generated from traffic tickets and related fines. Since 1960s, population loss due to migrations from the Rust Belt to the Sun Belt has been later followed by a white flight from the city to the outlying places, leaving St. Louis suburbs with a black-majority and a white-power structure (Badger, 2015; Smith, 2014). And again, local economies and commuting patterns do not stop at municipal borders. Nonetheless, there are numerous cities where certain transport modes end at administrative boundaries. This is the case of Atlanta metropolitan area (150 cities spread across 29 counties), whose mass transit system does not extend far enough into the suburbs where workers live, causing them to waste a lot of time in commuting. The Texas Transportation Institute has estimated traffic congestion to cost extra 51 hours of commuting time each year to each Atlanta commuter and an overall sum of more than $3.1 billion a year in lost time, fuel and environmental degradation (Chapman and Trubey, 2015). More generally, the narratives show how the presence of many small jurisdictions may hinder the effectiveness of problem solving and adjustments to change at the metropolitan scale (Storper, 2010).

The paper tries to shed some light on the role played by metropolitan governance structure by investigating the determinants of spatial wage disparities among metropolitan areas in the US. Productivity differentials are estimated by means of a two-steps procedure, which allows us to distinguish between people and place contribution in explaining them. The part of wages variability that is not explained by observable workers characteristics or industry fixed effects represents productivity premia, which are then studied in relation to four broad drivers. The first regards the size of the local economy, and deals with population density and metropolitan land area; the second relates to the spatial extent of agglomeration benefits and it is summarized in the market potential notion, the third concerns the structure of urban governance and the fourth investigates the policy responses to the problem of fragmentation.

The results indicate that agglomeration externalities are penalized when the metropolitan area is highly fragmented into many administratively defined jurisdiction or when the population is not concentrated in the central city. Moreover, the presence of voluntary governance bodies has a negative impact on wage premia, indicating that costs related to the implementation of a governance body based on voluntary agreements between local jurisdictions outweighs benefit, even though effectiveness depends also on the geographical adherence to the metropolitan area. Portland, OR and Minneapolis - Saint Paul, MN are two exceptions to the predominant type of metropolitan governance in the US. In fact, the former has a governance body that has the status of full local government and a leadership elected by popular vote. The latter, delivers a wide range of services and benefits from an exceptionally high annual budget of USD 300 per inhabitant - compared to the the USD 3-30 per inh. range usually adopted from the other governance bodies (Ahrend and Schumann, 2014). According to our ressults, the metropolitan regional government applied to the Minneapolis-St.Paul, MN region featuring a metropolitan tax-base sharing, is expected to increase local productivity.

Appendix

Figure A1: Spatial evolution of Atlanta, GA metropolitan statistical area

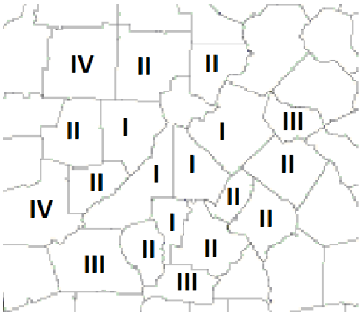

Figure A1 shows how the metropolitan area of Atlanta, GA has evolved over time. The nucleus of five counties marked with **I** refers to the 1960 definition, then in the 1970 the metropolitan area gas gained 10 counties, in 1990 other three and finally, in 2000 Atlanta metropolitan area arrived at twenty counties.

Figure A2: Map of the MSAs included in the analysis

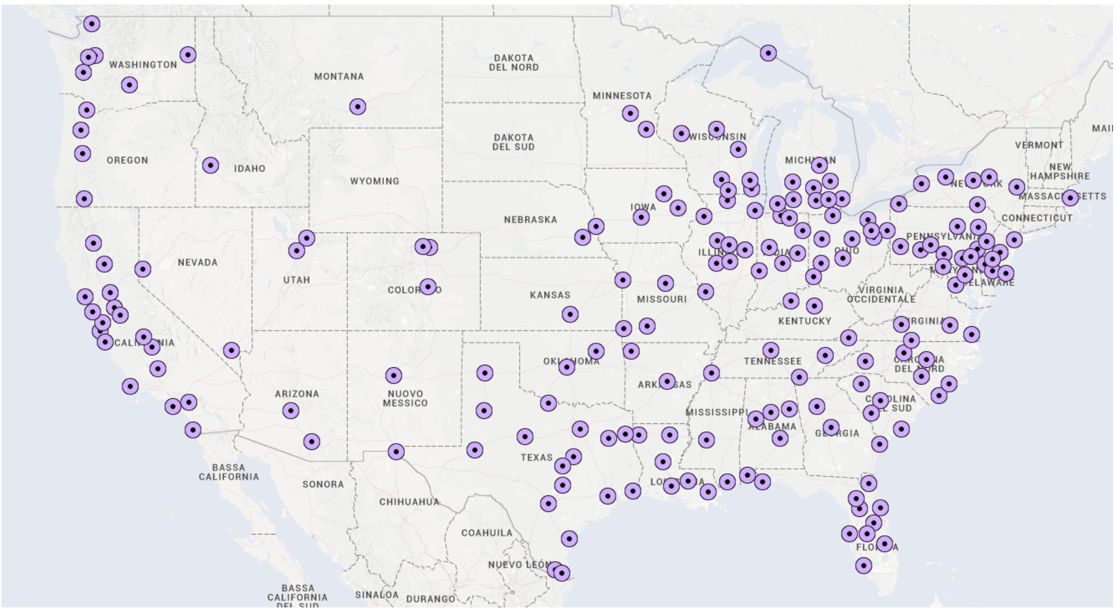

Table A1: Metropolitan Areas Definition

	Absolute Values			**Percentage Change**		
Density	1980	1990	2000	1980	1990	2000
1980	*310.5* *(477.9)*	339.6 (500.7)	380.9 (546.6)	0.00% (0.0%)	1.46% (1.7%)	8.72% (2.7%)
1990	305.5 (470.2)	*334.7* *(492.5)*	375.1 (537.3)	-1.63% (-1.7%)	0.00% (0.0%)	7.07% (0.9%)
2000	285.9 (466.5)	312.6 (488.3)	*350.4* *(532.4)*	-8.60% (-2.4%)	-7.06% (-0.9%)	0.00% (0.0%)
Land	1980	1990	2000	1980	1990	2000
1980	*2471.6* *(2549.4)*	2471.6 (2549.4)	2471.6 (2549.4)	0.00% (0.0%)	-1.38% (0.2%)	-16.91% (-33.5%)
1990	2508.6 (2544.5)	*2506.2* *(2543.6)*	2508.6 (2544.5)	-1.48% (-1.5%)	0.00% (0.0%)	-15.67% (-33.6%)
2000	2974.5 (3832.1)	2974.5 (3832.1)	*2974.5* *(3832.1)*	16.91% (33.47%)	15.75% (33.63%)	0.00% (0.0%)
Fragmentation	1980	1990	2000	1980	1990	2000
1980	*0.660* *(0.41)*	0.609 (0.40)	0.548 (0.38)	0.00% (0.0%)	0.88% (8.7%)	-6.44% (-0.7%)
1990	0.654 (0.38)	*0.603* *(0.37)*	0.543 (0.35)	-0.89% (-9.3%)	0.00% (0.0%)	-7.26% (-8.7%)
2000	0.710 (0.41)	0.653 (0.40)	*0.585* *(0.38)*	7.13% (0.9%)	7.59% (8.8%)	0.00% (0.0%)
Dominance	1980	1990	2000	1980	1990	2000
1980	*0.380* *(0.185)*	0.370 (0.187)	0.358 (0.187)	0.00% (0.0%)	0.59% (-1.66%)	4.32% (0.39%)
1990	0.378 (0.189)	*0.367* *(0.191)*	0.356 (0.190)	-0.59% (1.87%)	0.00% (0.0%)	3.72% (2.08%)
2000	0.365 (0.185)	0.355 (0.186)	*0.343* *(0.186)*	-4.06% (-0.20%)	-3.62% (-2.21%)	0.00% (0.0%)

Mean of Density, Land Area, Fragmentation and Dominance according to the approach adopted. Standard deviations in parenthesis. Rows reports the year of definition of the metropolitan area, according to the OMB official bulletins. Columns are the years to which the observations refer. By reading on the rows, the values are those corresponding to the *constant area approach*, while the values corresponding to the *floating area approach* (in italic) may be read on the principal diagonal. Corresponding percentage change with respect to the latter approach on the last three columns.

Table A2: Second Stage Variables Description

Variable Name	**Description**	**Sources of the Data**
Wage Premium	MSA fixed-effect derived from the First Stage	Integrated Public Use Microdata Series (IPUMS) and authors' elaborations
Density	Population density of the MSA[a] inh/km^2 (natural logarithm)	Bureau of Economic Analysis
Land	Land of the MSA[a] in km^2 (natural logarithm)	Census of Governments - Government Organization - County Area Counts (1977, 1987, 1997)
City Land	Land of the central city in km^2 (natural logarithm)	Census of Governments Gazzeettee 1980, 1990, 2000
Fragmentation	Number of municipalities[a] (natural logarithm)	Census of Governments - Government Organization - County Area Counts (1977, 1987, 1997)
Dominance	Share of population living in the central city in percentage terms	National Historical Geographic Information System / Bureau of Economic Analysis (1980, 1990, 2000)
Special Districts	Number of special districts[a] (natural logarithm)	Census of Governments - Government Organization - County Area Counts (1977, 1987, 1997)
MPOs	Dummy=1 if a Metro Planning Organization covers a significant part of the MSA	National Association of Regional Councils
COGs	Dummy=1 if a Council of Government covers a significant part of the MSA	National Association of Regional Councils
Geographic Adherence	Dummy=1 if the Council of Government is geographically adherent to the MSA	Office of Management and Budget and authors' elaborations
Market Potential	Sum of population density in neighbouring[a] MSA discounted by distance	Bureau of Economic Analysis and authors' elaborations
State Centralization Index	Index of state centralization based on the services delivered by the state, the financial responsibility of the state and state government personnel	Stephens (1997) as calculated for 1995
General Purpose[b]	Dummy=1 if a Metro Planning Organization has strong general purpose governance structures	National Association of Regional Councils

[a] Data at the county level, then aggregated at the metropolitan level according to the delineations provided by the Office of Management and Budget (OMB, 1980-1990-2000)

[b] There are only two MPOs, i.e. the Twin Cities' Metropolitan Council and Portland's Metro, that resemble a full-fledged regional system necessary to integrate land use, transportation, housing and environmental policy on a metropolitan scale.

Table A3: Descriptive Evidences

MSA	Wage Premium	Population	Fragmentation	Dominance	Governance Body
Los Angeles, CA	0.58	9,538,191	88	0.39	Yes
New York, NY	0.96	9,326,888	52	0.86	Yes
San Francisco, CA	0.86	4,135,875	88	0.19	Yes
Atlanta, GA	0.64	4,049,569	105	0.10	Yes
St. Louis, MO	0.51	2,629,933	233	0.13	Yes
Seattle, WA	0.70	2,420,080	56	0.23	Yes
San Jose, CA	1.00	1,684,947	15	0.53	Yes
Sacramento, CA	0.58	1,638,114	13	0.25	No

Data refer to the year 2000. Wage Premia as estimated in the I Stage, normalized with respect to the mean. *Fragmentation* measures the number of municipalities in the Metropolitan Statistical Area, *Dominance* indicates the share of people living in the central city with respect to the whole metropolitan population.

Table A4: Descriptive Statistics

Variable	Mean	Std. Dev.	Min.	Max.	Skewness	Kurtosis
Wage Premium	0.733	0.089	0.496	1.067	0.33	3.21
Density	4.479	0.813	2.41	7.842	0.25	4.20
Land	8.529	0.763	6.385	11.541	0.24	3.51
City Land	3.865	1.017	1.334	6.633	0.20	2.84
Fragmentation	3.146	0.893	1.317	5.75	0.33	2.91
Dominance	0.36	0.189	0.058	0.915	0.75	3.03
Special Districts	3.595	1.091	0	6.544	-0.14	3.37
SCI	3.989	0.098	3.793	4.264	-0.86	2.76
MPOs	0.516	0.500	0	1		
COGs	0.582	0.494	0	1		
Geographic Adherence	0.108	0.311	0	1		
General Purpose	0.011	0.104	0	1		

Table A5: List of Metropolitan Statistical Areas with corresponding Council of Government and/or Metropolitan Planning Organization

Metropolitan Area	COGs	MPOs
Abilene, TX	West Central Texas Council of Governments	Abilene Metropolitan Planning Organization
Akron, OH		Akron Metropolitan Area Transportation Study
Albany-Schenectady-Troy, NY	Capital Region Regional Economic Development Council	Capital District Transportation Committee
Albuquerque, NM	Mid Region Council of Governments	
Alexandria, LA		Alexandria-Pineville Metropolitan Planning Organization
Allentown-Bethlehem-Easton, PA/MA		
Altoona, PA	Southern Alleghenies Planning and Development Commission	Blair County Metropolitan Planning Organization
Amarillo, TX	Panhandle Regional Planning Commission	Amarillo Metropolitan Planning Organization
Ann Arbor, MI	Southeast Michigan Council of Governments	
Anniston, AL	East Alabama Regional Planning and Development Commission	Calhoun Metropolitan Planning Organization
Appleton-Oshkosh-Neenah, WI	East Central Wisconsin Regional Planning Commission	Appleton/Fox Cities MPO
Atlanta, GA	Atlanta Regional Commission	
Atlantic City, NJ		South Jersey Transportation Planning Organization
Augusta-Aiken, GA/SC	Central Savannah River Area Regional Development Center	Augusta-Richmond County Planning Commission
Austin, TX	Capital Area Council of Governments	
Bakersfield, CA	Kern Council of Governments	
Baltimore, MD		Baltimore Metropolitan Council
Baton Rouge, LA	Capital Regional Planning Commission	
Beaumont-Port Arthur-Orange, TX	South East Texas Regional Planning Commission	
Bellingham, WA	Whatcom Council of Governments	
Benton Harbor, MI		
Billings, MT		Billings-Yellowstone County Metropolitan Planning Organization
Biloxi-Gulport, MS	Gulf Regional Planning Commission	
Binghamton, NY	Southern Tier Regional Economic Development Council	Binghamton Metropolitan Transportation Study
Birmingham, AL		Regional Planning Commission of Greater Birmingham
Bloomington-Normal, IL		McLean County Regional Planning Commission
Boise City, ID	Community Planning Association of Southwest Idaho	
Boston, MA		Boston Region MPO
Bremerton, WA	Puget Sound Regional Council	
Brownsville-Harlingen, TX	Lower Rio Grande Development Council	Brownsville MPO
Buffalo-Niagara Falls, NY	Western New York Regional Economic Development Council	Greater Buffalo-Niagara Regional Transportation Council
Canton, OH		
Cedar Rapids, IA	Iowa Northland Regional Council of Governments	
Champaign-Urbana-Rantoul, IL		Champaign County Regional Planning Commission
Charleston, SC	Berkeley-Charleston-Dorchester Council of Governments	Charleston Area Transportation Study
Charlotte-Gaston-Rock Hill, NC/SC	Centralina Council of Governments	Charlotte Regional Transportation Planning Organization
Chattanooga, TN/GA	Southeast Tennessee Development District	Chattanooga-Hamilton County Regional Planning Agency
Chicago, IL		Chicago Metropolitan Agency for Planning
Chico, CA	Butte County Association of Governments	
Cincinatti-Hamilton, OH/KY/IN	OKI (Ohio-Kentucky-Indiana) Regional Council of Governments	Cincinnati-Northern Kentucky MPO
Cleveland, OH		Northeast Ohio Areawide Coordinating Agency

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Metropolitan Area	COGs	MPOs
Colorado Springs, CO		
Columbia, MO	Mid-Missouri Regional Planning Commission	Columbia Area Transportation Study Organization
Columbia, SC	Central Midlands Council of Governments	
Columbus, OH	Mid-Ohio Regional Planning Commission	
Corpus Christi, TX	Coastal Bend Council of Governments	Corpus Christi MPO
Dallas, TX	North Central Texas Council of Governments	
Danville, VA	West Piedmont Planning District	Danville MPO
Davenport-Moline-Rock Island, IA/IL		
Dayton-Sprinfield, OH		
Daytona Beach, FL	East Central Florida Regional Planning Council	Volusia MPO
Decatur, IL		Decatur Urbanized Area Transportation Study
Des Moines, IA		Des Moines MPO
Detroit, MI	Southeast Michigan Council of Governments	
Duluth-Superior, MN/WI		Duluth-Superior Metropolitan Interstate Council
Eau Claire, WI		
El Paso, TX	Rio Grande Council of Governments	El Paso MPO
Elkhart-Goshen, IN		Michiana Area Council of Governments
Erie, PA	Northwest Commission	Erie Area Transportation Study MPO
Eugene-Sprinfield, OR	Lane Council of Governments	
Fayetteville, NC	Mid-Carolina Council of Governments	Fayetteville Area MPO
Fayetteville-Springdale, AR		Northwest Arkansas Regional Planning Commission
Flint, MI		
Fort Collin-Loveland, CO		North Front Range Transportation and Air Quality Planning Council
Fort Lauderdale-Hollywood-Pompano Beach, FL	South Florida Regional Planning Council	Broward County MPO
Fort Myers-Cape Coral FL	Southwest Florida Regional Planning Council	Lee County MPO
Fort Wayne, IN	Northeastern Indiana Regional Coordinating Council	
Fresno, CA	Fresno Council of Governments	
Gainesville, FL	North Central Florida Regional Planning Council	Gainsville Metropolitan Transportation Planning Organization
Grand Rapids, MI		
Greeley, CO		
Greensboro-Winston-Salem-Highpoint, NC	Piedmont Triad Council of Governments	Greensboro Urban Area MPO
Greenville-Spartanburg-Anderson, SC	South Carolina Appalachian Council of Governments	Greenville-Pickens Area Transportation Study
Hagerstown, MD		Hagerstown/Eastern Panhandle MPO
Harrisburg-Leban-Carlisle, PA	Capital Region Council of Governments	Harrisburg Area Transportation Study
Hickory-Morgantown, NC	Western Piedmont Council of Governments	Greater Hickory MPO
Houston, TX	Houston-Galveston Area Council	
Indianapolis, IN		Indianapolis MPO
Jackson, MI		
Jackson, MS	Central Mississippi Planning and Development District	
Jacksonville, FL	Northeast Florida Regional Planning Council	First Coast MPO
Jacksonville, NC	Eastern Carolina Council	Jacksonville Urban Area MPO
Janesville-Beloit, WI		Janesville MPO

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Metropolitan Area	COGs	MPOs
Johnson-Kinsport-Bristol, TN/VA	First Tennessee Development District	Johnson City Metropolitan Transportation Planning Organization
Johnstown, PA	Southern Alleghenies Planning and Development Commission	Johnstown Area Transportation Study
Joplin, MO		
Kalamazoo, MI		
Kansas City, MO/KS	Mid-America Regional Council	
Kileen-Temple, TX	Central Texas Council of Governments	Killeen-Temple MPO
Knoxville, TN	East Tennessee Development District	Knoxville Regional Transportation Planning Organization
Lafayette, LA		Lafayette MPO
Lafayette, IN		Tippecanoe County Area Plan Commission
Lakeland-Winter Haven, FL	Central Florida Regional Planning Council	
Lancaster, PA		
Lansing-East Lansing, MI		
Las Vegas, NV		Regional Transportation Commission of Southern Nevada
Lexington-Fayette, KY		Lexington Area MPO
Lima, OH		
Lincoln, NE		Lincoln MPO
Little Rock-North Little Rock, AR		Metroplan - Little Rock
Longview-Marshall, TX	East Texas Council of Governments	Longview MPO
Los Angeles-Long Beach, CA	Southern California Association of Governments	
Louisville, KY/IN	Kentuckiana Regional Planning & Development Agency	
Lubbock, TX	South Plains Association of Governments	Lubbock MPO
Macon, GA	Middle Georgia Regional Development Center	Macon-Bibb County Planning & Zoning
Madison, WI	Capital Area Regional Planning Commission	Madison Area Transportation Planning Board
Mansfield, OH		
McAllen-Edinburg-Mission, TX	Lower Rio Grande Development Council	
Medford-Ashland, OR	Rogue Valley Council of Governments	
Memphis, TN/AR/MS	Memphis MPO	Memphis MPO
Milwaukee-Waukesha, WI	Southeastern Wisconsin Regional Planning Commission	
Minneapolis-St. Paul, MN		Metropolitan Council
Mobile, AL	South Alabama Regional Planning Commission	
Modesto, CA		
Monroe, LA	Ouachata Council of Governments	
Montgomery, AL	Central Alabama Regional Planning and Development Commission	Montgomery Area MPO
Muncie, IN		Delaware-Muncie Metropolitan Plan Commission
Nashville, TN	Greater Nashville Regional Council	Nashville Area MPO
New Orleans, LA	New Orleans Regional Planning Commission	
New York, NY	New York City Regional Economic Development Council	New York Metropolitan Transportation Council
Norfolk-Virginia Beach-Newport News, VA	Hampton Roads Planning District Commission	
Ocala, FL	North Central Florida Regional Planning Council	Ocala/Marion County Transportation Planning Organization
Odessa, TX	Permian Basin Regional Planning Commission	Midland-Odessa Transportation Organization
Oklahoma City, OK	Association of Central Oklahoma Governments	
Olympia, WA		

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Metropolitan Area	COGs	MPOs
Omaha, NE/IA	Metropolitan Area Planning Agency (Omaha-Council Bluffs)	
Orlando, FL	East Central Florida Regional Planning Council	Metroplan Orlando
Pensacola, FL	West Florida Regional Planning Council	Pensacola MPO
Peoria, IL	Tri-County Regional Planning Commission	
Philadelphia, PA/NJ	Delaware Valley Regional Planning Commission	
Phoenix-Mesa, AZ	Maricopa Association of Governments	
Pittsburgh, PA	Southwestern Pennsylvania Commission	
Portland-Vancouver, OR/WA		Portland Area Comprehensive Transportation System (METRO)
Provo-Orem, UT	Mountainland Association of Governments	
Racine, WI	Southeastern Wisconsin Regional Planning Commission	
Raleigh-Durham, NC	Triangle J Council of Governments	
Reading, PA		
Redding, CA		Shasta County Regional Transportation Planning Agency
Reno, NV		Washoe County Regional Transportation Commission
Richmond-Petersburg, VA	Richmond Regional Planning District Commission	
Riverside-San Bernadino, CA		
Roanoke, VA	Roanoke Valley-Alleghany Regional Commission	
Rochester, NY	Finger Lakes Regional Economic Development Council	
Rockford, Il		
Sacramento, CA		
Saginaw-Bay City-Midland, MI		Saginaw County Metropolitan Planning Commission
St. Cloud, MN		St. Cloud Area Planning Organization
St. Louis, MO/IL	East-West Gateway Council of Governments	
Salem, OR	Mid-Willamette Valley Council of Governments	Salem-Keizer Area MPO
Salinas-Sea Side-Monterey, CA		
Salt Lake City-Ogden, UT	Wasatch Front Regional Council	
San Antonio, TX	Alamo Area Council of Governments	
San Diego, CA	San Diego Association of Governments	
San Francisco, CA	Association of Bay Area Governments	
San Jose, CA	Association of Bay Area Governments	
Santa Barbara-San Maria-Lompac, CA	Santa Barbara County Association of Governments	
Santa Cruz, CA	Association of Monterey Bay Area Governments	
Santa Rosa-Petaluma, CA	Association of Bay Area Governments	
Savannah, GA		Chatham County-Savannah Metropolitan Planning Commission
Scranton-Wilkes-Barre-Hazleton, PA		
Seattle-Everett, WA	Puget Sound Regional Council	
Shreveport, LA	Northwest Louisiana Council of Governments	
South Bend, IN		
Spokane, WA		Spokane Regional Transportation Council
Springfield, IL		Springfield-Sangamon City Regional Planning Commission
Springfield, MO		
Stockton, CA		

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Metropolitan Area	COGs	MPOs
Syracuse, NY	Central New York Regional Economic Development Council	Syracuse Metropolitan Transportation Council
Tampa-St. Petersburg-Clearwater, FL	Tampa Bay Regional Planning Council	Hillsborough County MPO
Terre Haute, IN	West Central Indiana Economic Development District, Inc	
Toledo, OH/MI		Toledo Metropolitan Area Council of Governments
Trenton, NJ	Delaware Valley Regional Planning Commission	
Tucson, AZ	Pima Association of Governments	
Tulsa, OK	Indian Nations Council of Governments	
Tuscaloosa, AL	West Alabama Regional Commission	
Tyler, TX	East Texas Council of Governments	Tyler MPO
Utica-Rome, NY	Mohawk Valley Regional Economic Development Council	
Vineland-Millville-Bridgetown, NJ		South Jersey Transportation Planning Organization
Visalia-Tulare-Porterville, CA	Tulare County Association of Governments	
Waco, TX	Heart of Texas Council of Governments	Waco MPO
Washington DC, MD/VA/WV	Metropolitan Washington Council of Governments	
Waterloo-Cedar Falls, IA	East Central Iowa Council of Governments	
Wausau, WI	North Central Wisconsin Regional Planning Commission	Wausau MPO
Wichita, KS		Wichita Area MPO
Wichita Falls, TX	Nortex Regional Planning Commission	Wichita Falls MPO
Williamsport, PA	Central Keystone Council of Governments	Williamsport Area Transportation Study
Wilmington, DE/NJ/MD		Wilmington Area Planning Council
Wilmington, NC	Cape Fear Council of Governments	Wilmington Urban Area MPO
Yakima, WA	Yakima Valley Conference of Governments	
York, PA	Capital Region Council of Governments	York Area MPO
Youngstown-Warren, OH	Eastgate Regional Council of Governments	

Notes on the computation of the variable *Geographic Adherence*

Geographic Adherence is a dummy variable which takes value 1 if the boundaries of the Metropolitan Statistical Area (MSA) coincides or there is just a slight mismatch with those of the Council of Government (COG). In order to assign a value for each of the MSAs under analysis, we firstly compute two measures that relate the geographic extensions of the two territorial entity and then we present the whole set of resulting scenarios. Finally, we identify the scenario representing the situation in which the geographic extension of the Metropolitan Statistical Area is barely the same as that of the corresponding Council of Government.

We named *Ratio* the first measure of geographic adherence as it indicates the ratio between the number of people under a COG jurisdiction with respect to the population of the corresponding MSA, i.e.:

$$Ratio = \frac{Population\ COG}{Population\ MSA}$$

Thereafter, *Coverage* measures the share of population living in the MSA that is represented in the corresponding Council of Government, i.e.:

$$Coverage = \frac{Population\ MSA \cap Population\ COG}{Population\ MSA}$$

By combining the values obtained from the two measures, it is possible to identify three general scenarios: a) the MSA is entirely contained in the COG; therefore, $Ratio > 1$ and $Coverage = 1$; b) the COG is entirely contained in the MSA, i.e. $Ratio < 1$ and $Coverage < 1$; c) the COG and the MSA overlaps but both of them have only a fraction that intersects the other. In the latter case, $Ratio$ may be whatever while $Coverage < 1$.

Hence, we hypothesis that the most effective scenario is the one characterised by $Coverage = 1$ and $1.0 \leq Ratio \leq 1.2$, meaning that all the people living in the MSA are represented by the correspondent COG, which geographical extension is identical to that of the MSA or just a little bit greater, in such a way to control for further extension of the autonomous local economic system.

Notes on the First Stage

Data:

The source of CENSUS data is the Integrated Public Use Microdata Series (IPUMS). Samples used are 1% samples for the years 1980 1990 2000. The analysis has been restricted to workers aged between 25 and 65 years old and excludes "self-employed" workers (using the variable CLASSWRK).

Dependent variable:

Hourly wage = *Labour income* / (*Weeks Worked* * *Hours usually worked per week*)

Labour income is the variable INCWAGE, which reports each respondent's total pre-tax wage and salary income - that is, money received as an employee - for the previous year. Sources of income in INCWAGE include wages, salaries, commissions, cash bonuses, tips, and other money income received from an employer. Payments-in-kind or reimbursements for business expenses are not included. Amounts are expressed in contemporary dollars; therefore, they have been adjusted for inflation by using CPI99 that provides the CPI-U multiplier available from the Bureau of labour Statistics to convert dollar figures to constant 1999 dollars.

Weeks Worked is the variable WKSWORK1 for years 1980 and 1990 and variable WKSWORK2 for years 2000. The variables report the number of weeks that the respondent worked during the previous calendar year.

Hours usually worked per week is the variable UHRSWORK which reports the number of hours per week that the respondent usually worked, if the person worked during the previous year. Hourly wage statistics are constructed only for those workers who usually work more than 30 hours per week and more than 30 weeks a year, and whose hourly wage is higher than half of the minimum wage in the corresponding year (1.55 in 1980, 1.90 in 1990, 2.575 in 2000).

Independent variables:

Age, which is the variable AGE that reports the person's age in years as of the last birthday.

Educational Dummies that are constructed by using variable EDUC, indicating re-

spondent's educational attainment, as measured by the highest year of school or degree completed. Four categories are defined: a) Less than high school, b) High school c) 1 to 3 years of college d) 4 years of college or higher.
Gender Dummy that is constructed by using the variable SEX: Gender = 0 if Female.
Ethnicity Dummy that uses RACE: Ethnicity = 0 if Not White.
Occupational Dummies which derive from the census variable OCC. The occupational classification system gets redefined for every decennial Census, especially in 2000. In order to track detailed occupations over time, I followed Autor and Dorn (2013) who provide crosswalk necessary to match occupation codes for different Census year. The authors develop a new occupation system covering the years 1980, 1990, 2000, 2005. Six categories are defined: 1) Managerial and Professional Specialty Occupations, 2) Technical, Sales and Administrative Support Occupations, 3) Service Occupations, 4) Precision Production, Craft and Repair Occupations, 5) Machine Operators, Assemblers and Inspectors and 6) Transportation, Construction, Mechanics (Mining and Agricultural Occupations).
Industrial Dummies which it are obtained from IND1990 which classifies industries from all years since 1950 into the 1990 Census Bureau industrial classification scheme. IND1990 offers researchers a consistent long-term classification of industries. Twelve categories are defined: 1) Agriculture, Forestry and Fishing, 2) Mining, 3) Construction, 4) Manufacturing, 5) Transportation, Communications, and other Public Utilities, 6) Wholesale Trade, 7) Retail Trade, 8) Finance, Insurance, and Real Estate, 9) Business and Repair Services, 10) Personal Services, 11) Entertainment and Recreation Services and 12) Professional and Related Services.
Time Dummies: for the years 1980 1990 2000
Metro Area Dummies: MIGMET5 identifies the metropolitan area in which the respondent used to work five years earlier, if the respondent's workplace was in an identifiable metropolitan area, given confidentiality restrictions (182 metro areas).

Estimation Results Table A6 presents the First Stage estimates for the set of workers observable characteristics (age, ethnicity, gender, education, occupation), industry fixed effect as well as Metropolitan Area fixed effects interacted with time dummies.

Table A6: First Stage Specifications Results - Details

	(I)	(II)	(III)	(IV)
Age	0.0614***	0.0564***	0.0561***	0.0536***
	(85.47)	(84.27)	(84.08)	(81.57)
Experience	-0.0006***	-0.0006***	-0.0006***	-0.0005***
	(-74.63)	(-69.71)	(-69.48)	(-67.22)
Ethnicity	0.232***	0.159***	0.158***	0.156***
	(119.78)	(88.46)	(87.47)	(87.66)
Gender	0.242***	0.246***	0.239***	0.221***
	(160.16)	(176.81)	(170.43)	(148.82)
Very High Education		0.672***	0.674***	0.664***
		(242.70)	(238.20)	(231.14)
High Education		0.382***	0.386***	0.373***
		(140.65)	(141.05)	(136.97)
Medium Education		0.227***	0.232***	0.220***
		(85.10)	(86.76)	(83.22)
Manager/Professional			0.0884***	0.0993***
			(32.85)	(37.23)
Production			0.202***	0.163***
			(25.19)	(20.33)
Transportation/Construction			0.173***	0.148***
			(32.17)	(27.82)
Machine Operators			0.129***	0.0631***
			(19.72)	(9.61)
Clerical			-0.0153***	-0.00389
			(-4.25)	(-1.10)
Agriculture				-0.249***
				(-33.30)
Mining				0.244***
				(23.16)
Construction				0.101***
				(27.82)
Manufacturing				0.130***
				(49.45)
Transportation				0.166***
				(54.08)
Wholesale Trade				0.0804***
				(21.19)
Retail Trade				-0.120***
				(-40.97)
Finance				0.130***
				(39.48)
Business				0.0310***
				(8.28)
Entertainment				-0.0508***
				(-7.18)
Professional				0.0132***
				(5.16)
N	540740	540740	540740	540740
R^2	0.9626	0.9682	0.9684	0.9693
MSA X Year Dummies	Yes	Yes	Yes	Yes

MSA clustered t statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ Reference categories for OCCUPATION: Occupation=Service Occupations; for EDUCATION: Education=Low; for GENDER: Gender=Female; for ETHNICITY: Ethnicity=Not White; for INDUSTRY: Industry=Personal Services.

Sensitivity of the results to different approaches to define Metropolitan Areas

Table A7: Sensitivity Results

	(Initial)	**(Final)**
Density	0.080***	0.075***
	(0.006)	(0.006)
Land	0.084***	0.085***
	(0.007)	(0.007)
City Land	-0.023***	-0.021**
	(0.006)	(0.006)
Market Potential	0.034***	0.038***
	(0.004)	(0.004)
Fragmentation	-0.026***	-0.024***
	(0.005)	(0.004)
Dominance	0.122***	0.126***
	(0.026)	(0.026)
Distance Decay	1.76***	1.69***
	(0.200)	(0.182)
Observations	546	546
Year FE	Yes	Yes
Metropolitan Areas	182	182
Over Identification	0.599	0.360
(p)Over Identification	0.439	0.548
Weak Identification	514.51	401.73
Under Identification	118.72	103.58
(p)Under Identification	0.000	0.000
Endogeneity	8.69	7.56
(p)Endogeneity	0.00	0.00

OLS estimates with Standard Errors clustered by metropolitan area in parenthesis.$*\rho < 0.10$, $**\rho < 0.05$,$***\rho < 0.01$.

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