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Cultural diversity, institutions, and urban economic performance

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Abstract. Interactions between culturally diverse individuals can spur economic benefits by stimulating new ideas that raise urban residents' productivity. But diversity can also diminish economic well-being by making communication difficult, and by stimulating conflict. This paper investigates whether urban institutions—in particular residents' sense of generalized trust—determine when diversity is an economic asset and when it is a liability. To do so, data on trust, birthplace diversity, wages, and demographics in US metropolitan areas are combined. The evidence suggests that workers are much better able to harness the productivity-enhancing spillovers that arise from cultural diversity when they live in cities endowed with strong informal institutions.

Keywords: urban economic development, cultural diversity, generalized trust, social capital, immigration

1 Introduction

Like most modern economies, the United States is becoming increasingly culturally diverse. Immigration is a major source of that diversity. In 1970 around 5% of the population of the country had been born abroad. By 2000 the share of foreign born had more than doubled, and in 2010 it surpassed 13%. Immigrant-fed cultural diversity is particularly evident in American metropolitan areas: in cities like New York and Los Angeles, immigrants make up more than one third of the populace.

The effects of diversity—cultural, ethnic, linguistic, racial, etc—on a wide range of human behavior have been studied by economists, sociologists, psychologists, and other social scientists. This paper has a narrower aim: to examine mechanisms through which cultural diversity, introduced through immigration, influences productivity in cities. Theorists believe that cultural heterogeneity can stimulate economic benefits. When people from different backgrounds interact, they contribute different ways of framing problems, which can lead to novel and better solutions (Page, 2008). Diversity, following this logic, leads to innovation which raises productivity. But diversity may equally impede economic growth. One reason for this is that effective communication among people with different perspectives can be difficult (Richard et al, 2002). Moreover, cities that are heterogeneous tend to spend less on schools and other productive public goods (Alesina et al, 1999). And, in the extreme, diversity can catalyze violent conflict that generates profoundly negative economic and human consequences (Easterly and Levine, 1997).

What determines when cultural diversity is a boon and when it is a bust? Some scholars respond that, by reducing transaction costs between agents in a community, institutions can moderate the negative effects of diversity on performance (Collier and Gunning, 1999; Costa and Kahn, 2003). The mix of good and bad economic outcomes associated with diversity may depend on the degree to which places are endowed with formal and informal institutions that reflect residents' belief that their own well-being, and that of their specific cultural group, is related to the welfare of other groups in their community (Alesina and La Ferrara, 2005;

Easterly, 2001). Institutions provide members of a diverse society with a framework for working together, and an incentive to do so, in order to harness the economic potential that is latent in their collective heterogeneity.

In this paper I explore the notion that the impact of a city's level of diversity on its economic performance depends on the quality of its institutions. I focus on one particular informal institution that varies at a metropolitan level: generalized trust. Generalized trust is high when "a community shares a set of moral values in such a way as to create regular expectations of regular and honest behavior" (Fukuyama, 1995, page 153). I hypothesize that workers in highly diverse cities will earn wage premia over comparable workers in more culturally homogenous cities only when trust levels are sufficiently high. Cities represent a sensible unit of observation for measuring the potential external effects of diversity and trust, since cities facilitate the sharing, recombination, and propagation of ideas (Feldman and Audretsch, 1999; Jacobs, 1969; Jaffe et al, 1993; Marshall, 1890; Storper and Venables, 2004).

To investigate this idea empirically, I predict the joint impact of trust and immigration-induced cultural diversity on the average economic welfare of a specific group of American-born workers in approximately 240 metropolitan areas. I follow Ottaviano and Peri (2006) in focusing on a particular subset of native workers: white male workers active in the labor market who are between the ages of 40 and 50 years. Because this subset of natives share a common set of wage covariates, I can control for potential differences in urban labor force composition, and thereby more precisely identify the effect of diversity on worker productivity. My primary independent variable is a linear interaction term between trust and diversity, introduced in order to capture the hypothesized moderating role of institutions.

My main finding is that institutions moderate the positive correlation between diversity and wages in precisely the manner predicted by theory: in high-trust cities, diversity is associated with strong positive gains in expected wages, whereas its effect on wages in low-trust cities is much weaker. In high-trust cities, the positive effect of one standard deviation (1 SD) increase in urban cultural diversity on annual mean native wages is approximately 8%. In cities where trust levels are low, greater diversity is associated with native wages that are only 1% higher. The general shape of these results holds after accounting for a wide range of other potential determinants of native wage levels. It remains stable when instrumental variables techniques are used to account for potential endogeneity issues resulting from reverse causation between diversity and wages. It is also robust to various alternative measures of generalized trust.

This finding is of academic interest, but it also suggests that policies that succeed in fostering trust, community spirit, and other informal institutions may have an economic payoff, particularly in culturally diverse cities. In the context of renewed political debate on immigration policy in the US and Europe, the results also present an additional mechanism through which immigration may enhance the economic welfare of natives.

Before turning to the empirical inquiry, I first outline the theoretical literature on the role of diversity and institutions in shaping economic performance.

2 Diversity, institutions, and productivity: the literature

Cultural diversity has a double-edged relationship with urban economic performance. Some researchers believe that immigrants and culturally differentiated workers can enhance the productivity of colleagues with whom they interact. For instance, Hong and Page (2001) present a microeconomic model in which individuals have bounded skills and experiences, but when they gather together in teams, the heterogeneity of their perspectives and heuristics can help them to create better solutions to difficult problems. Researchers have found some degree of supportive evidence for this link between diversity and performance at various

levels in organizational hierarchies (Bantel and Jackson, 1989; Herring, 2009; Hoffman and Maier, 1961; Lazear, 1999; Page, 2008).

There is little reason to expect that the benefits of diversity should remain bound in teams situated in formal work environments. Economic geographers and urban economists have long argued that cities are engines of economic growth precisely because they enable and encourage people with different ideas to interact. It is this interaction that stimulates the creation of new, economically significant, products and processes (Bairoch, 1991; Duranton and Puga, 2001; Feldman and Audretsch, 1999; Glaeser et al, 1992; Jacobs, 1969; Ozgen et al, 2011). Knowledge spillovers are spatially bound in cities, because urban regions represent functionally integrated economic units, structured by repeated face-to-face contact (Conley et al, 2003; Jaffe et al, 1993; Storper and Venables, 2004). Diversity can thus be thought of as an urban public good with an effect which resembles that ascribed to spillovers from human capital: just as we know that there are rewards for workers who inhabit cities in which general levels of skill and education are high (Lucas, 1988; Moretti, 2004; Rauch, 1993), workers in ethnically diverse cities have been shown to earn more than comparable workers in less diverse places (Ottaviano and Peri, 2006).

This may describe an important mechanism through which diversity can enhance economic performance; but under some circumstances, diversity appears to inhibit productivity. For instance, psychologists and management scholars find that team members who share few commonalities find it hard to integrate and communicate effectively (Ancona and Caldwell, 1992; Richard et al, 2002). Very diverse work groups have also been associated with higher levels of dissatisfaction and turnover (O'Reilly et al, 1989). Bandiera et al (2005) find that when farmworkers in Britain are grouped into culturally mixed teams, they cooperate less and so they are less productive. Heterogeneity can cause problems at the urban scale as well: US cities and states fragmented by ethnicity or age spend less than do more homogenous regions on productive public goods such as roads, hospitals, and schools (Alesina et al, 1999; Goldin and Katz, 1999; Pennant, 2005; Poterba, 1997). Cross-country analyses have shown that fragmented societies tend to grow more slowly, in part because they are more conflict ridden, and because this conflict prompts rent-seeking behavior which hinders aggregate prosperity (Alesina and Drazen, 1991; Alesina and La Ferrara, 2005; Easterly and Levine, 1997; Rodrik, 1999). In extreme cases, diversity can prompt large-scale social and economic collapse, sometimes with horrific consequences, as has occurred in recent years in parts of Central Africa, the Balkans, and elsewhere.

Researchers consider that institutions can play an important role in differentiating the circumstances under which diversity leads to productivity gains or losses. These might be formal institutions that codify rules and generate confidence that society will function in a predictable manner. But formal institutions are mostly constant at the intermetropolitan scale, and so, to the extent that institutional differences matter, the relevant institutions are likely to be informal. Generalized trust is one such informal institution. The term 'generalized trust' refers to trust and reciprocity toward community members outside one's immediate network. This institution underlies all market transactions, as well as many nonmarket ones, and an economy can only flourish when it is present in sufficient quantities (Arrow, 1972; Knack and Keefer, 1995; LaPorta et al, 1997; Zak and Knack, 2001). Trust affects development by reducing the costs of economic interaction. In locations that are culturally diverse, such transaction costs are likely to be particularly high. In fact, a great deal of research demonstrates that diversity is associated with lower levels of social interaction and trust of one's fellow residents (Alesina and La Ferrara, 2000; 2002; Collier and Gunning, 1999; Costa and Kahn, 2003; Leigh, 2006; Putnam, 2007). This finding appears to be robust, at least in the short run, at scales ranging from US counties to national economies, although the relationship is

clearest when considering racial, as distinct from cultural, fractionalization. Nonetheless, this suggests that trust and diversity are endogenously related—though that is not the same as saying that trust is mechanically determined by diversity: some degree of trust is likely determined by forces that are exogenous to diversity—a byproduct of other institutions and historical circumstances.

If informal institutions like trust can reduce transaction costs in diverse environments, it might help agents to harness the productivity-enhancing externality that is latent in cultural diversity, through the kind of group boundary-spanning and reciprocity implicit in Granovetter's (1973) notion of 'weak ties', or what Putnam (2000) calls 'bridging'. In environments where trust levels are low, the relationship between diversity and productivity is less certain.

One reason why researchers find such mixed results in studying the impact of diversity on economic performance is that they scarcely account for the influence of institutions. When institutions have been accounted for, they have proven important. In work at the national scale, Easterly (2001) and Collier (2000) find that economic growth in ethnically fractionalized nations depends on the existence of clear and enforceable business rules, and democratic institutions, respectively. Diversity is damaging in countries with limited political rights, but it is not harmful in democratic countries.

There is even less research on this topic at a subnational scale. One exception is the work of Alesina and La Ferrara (2005): they investigate whether the effect of diversity on population growth in US counties depends on whether a county is initially rich or poor. They argue that economies need robust institutions to cope with diversity, and assume that initial economic welfare is a reasonable proxy for those forces. They find that counties that are both poor and ethnically heterogeneous experience negative population growth, whereas in wealthy, diverse counties this negative relationship is weakened and, in some specifications, reversed. While suggestive, this approach is unsatisfying for a number of reasons. First, metropolitan areas are more appropriate units of observation, since productivity-enhancing interactions are likely to span county boundaries that have been drawn for administrative, rather than economic, reasons. Second, population growth, the dependent variable in this study, is not an entirely convincing indicator of urban economic performance or productivity: many factors may drive population growth, many of which need not be related to productivity. Third, income may be a noisy proxy for institutions, particularly at the county level.

There is no known empirical work that directly examines the relationship between diversity, trust, and productivity in metropolitan areas, where growth-enhancing knowledge spillovers are likely to be concentrated. The remainder of the paper is dedicated to this pursuit.

3 Diversity and institutions in US cities

Given the preceding theoretical discussion, what do levels of cultural diversity and informal institutions look like in US cities? To answer this question, we need to determine how best to measure these concepts. In this paper I confine my measurement of 'cultural diversity' to the mix of individuals born in different countries. This is a restrictive definition: place of birth is only one of a host of factors determining culture. Nonetheless, people born in different countries are profoundly shaped by their immersion in a distinctive cultural environment. Given that the raw number and proportion of foreign-born individuals living and working in the US have expanded dramatically in the last forty years, as has the sheer breadth of source countries from which these individuals hail, immigration is likely to be a primary, though not exclusive, way that cultural diversity is introduced into American cities.

I adopt a measure of fractionalization used by Taylor and Hudson (1972), adapting it to describe birthplace diversity in an urban context.(1) The diversity index is defined as:

$$\mathtt{DIV}_{jt} = 1 - \sum_{i=1}^{I} \left(\frac{n_i}{N}\right)^2, \tag{1}$$

where n counts the number of residents in city j at time t who were born in country i, N is the city's total population, and I is the number of different countries represented among residents of that city. DIV measures the probability that two people who meet at random in a city were born in different countries. The index will grow larger as diversity increases. Its maximum value is $(1 - \frac{1}{I})$.

As Ottaviano and Peri (2006) point out, one advantage of this measure over a simple gauge of a city's share of foreign-born residents is that it accounts both for the number of different cultural groups in a city and for the size of each group. Capturing both dimensions is important, since an important part of the theoretical motivation for this paper is the idea that urban productivity will be enhanced when a city hosts a varied mix of cultural groups.

To construct this measure of cultural diversity for the year 2000, I use the Integrated Public Use Microdata Series (IPUMS) Decennial 5% Census extract (Ruggles et al, 2010). Each respondent in these data is asked to report their country of birth. I consider the birthplaces of all nonnative individuals who are active in the labor market, and who reside in a metropolitan area. Metropolitan areas are defined on an ongoing basis by the Office of Management and Budget to reflect functional economic integration, making them a sensible basis from which to construct urban regions. Building the indicator of diversity for the year 2000 means accounting for a sample of over 9 million individuals from 144 distinct cultural groups residing in more than 300 metropolitan areas.

Finding an adequate measure of informal institutions for a large range of cities is more challenging. Although there has been some measurement of generalized trust at an international level (Zak and Knack, 2001), little systematic evidence is available for metropolitan areas. The best available indicators account for elements of social capital—of which generalized trust is a major component. I use a composite indicator of social capital produced by Rupasingha and Goetz (2008), which combines secondary data on trust as well as civic participation at the level of US counties in 1997. Their index is the product of principal components analysis performed on measures of census mail-response rates, voter turnout in presidential elections, total not-for-profit organizations, the total number of associations per 10 000 residents, and other measures. I estimate trust levels for metropolitan areas by calculating population-weighted sums of county-level index values, using the Office of Management and Budget's geographical definitions for 2000. Ideally, components of the indicator would all be measured in 2000, not 1997. However, it seems reasonable to assume that trust levels remained fairly stable between 1997 and 2000. Although research indicates that American social capital is in decline, this change has proceeded slowly since the 1970s (Putnam, 2000; Rahn and Transue, 1998; Stolle and Hooghe, 2005).

Actual diversity index values range between 0.023 and 0.609.(2) The minimum observed value of the trust index is −1.602 and the maximum is 1.435. Table 1 lists the metropolitan areas with the highest and lowest diversity levels as measured by the index of fractionalization. The most diverse cities tend to be populous urban areas (with the exception of Salinas), while culturally homogenous metropolitan areas are smaller. In the rightmost column, the table also

(1) My approach in constructing this variable closely follows that of Ottaviano and Peri (2006). The main difference in my approach is that I do not bundle together small cultural categories.

(2) One city, Miami, has a higher value than 0.609. However, some key data on Miami were missing, hence it is not included in the analytical sample.

Table 1. High-diversity and low-diversity metropolitan areas, 2000.

	Diversity	Trust
Most diverse metropolitan areas		
New York–Northern New Jersey–Long Island, NY–NJ–PA	0.609	−0.721
Los Angeles–Long Beach–Santa Ana, CA	0.578	−0.551
San Jose–Sunnyvale–Santa Clara, CA	0.568	−0.199
San Francisco–Oakland–Fremont, CA	0.549	0.477
Salinas, CA	0.476	−0.199
Least diverse metropolitan areas		
Florence–Muscle Shoals, AL	0.022	−0.114
Altoona, PA	0.026	0.228
Johnstown, PA	0.031	0.304
Decatur, IL	0.032	0.482
Danville, VA	0.032	0.011

displays corresponding scores on the trust index. The table broadly supports a correlation noted by Putnam (2007) as well as others: diversity and generalized trust are negatively related ($r = -0.42$, SE = 0.000). Despite the fact that trust levels tend to be lower in more diverse cities, there is no mechanical relationship between these two indicators. Even in the highly restricted snapshot of the data shown in the table, San Francisco manages to combine strong informal institutions with substantial cultural diversity, whereas residents of Florence are both culturally homogeneous as well as untrusting.

4 Estimation strategy and data

The primary empirical task of this paper is to examine the degree to which trust and diversity, both public goods defined at the urban scale, are jointly associated with the average wages of native-born workers. The following equation is estimated to explore this relationship:

$$\ln(\bar{w}_{jt}) = \alpha + \beta_1 \mathtt{DIV}_{jt} + \beta_2 \mathtt{TRUST}_{jt} + \beta_3 \mathtt{DIV}_{jt} \times \mathtt{TRUST}_{jt} + \beta_4 \boldsymbol{C}^{\mathrm{T}} + \varepsilon_{jt}\,, \tag{2}$$

where $\bar{w}$ indicates average annual wages in city j at time t, DIV measures urban diversity, TRUST indexes trust levels, $\boldsymbol{C}^{\mathrm{T}}$ is a vector of controls, and ε is a random error term with the usual properties. The primary variable of interest is the linear interaction of the measures of diversity and trust, which will indicate whether, and in what manner, the relationship between diversity and wages depends on trust levels in cities.

Rather than estimating the relationship in equation (2) for all native workers, I focus on a specific subset in order to identify the joint effect of cultural diversity and trust. I use the 2000 IPUMS Census 5% extract to estimate the average wages of US-born white male workers between the ages of 40 and 50 years, mimicking the approach taken by Ottaviano and Peri (2006) for 1970 and 1990. Their method has the advantage of avoiding bias from gender, race, experience, and other individual-level characteristics that are known to affect wage levels. It also nullifies distortions that could arise from urban composition effects (Ottaviano and Peri, 2006).

I include a number of controls in various specifications, each calculated at the level of the metropolitan area. My primary control is average educational attainment for the group of US-born white male workers aged 40 to 50 years, calculated from the same 2000 IPUMS 5% sample. Labor economists have exhaustively established that there are positive returns to education. If education levels among native workers differ systematically from city to city, I expect this to give rise to differences in their average wages.

Additionally, I include variables that measure urban population in hundreds of thousands, and population density per square mile, obtained from the 2000 Census Summary File 1. Economic geographers and urban economists have long argued that cities persist as the dominant form of human settlement, despite congestion costs and secular declines in the cost of some forms of transportation, because worker productivity is enhanced when human activity is densely clustered in space (Ciccone and Hall, 1996; Rosenthal and Strange, 2004). Therefore, population (as a measure of overall scale) and population density (indicating the potential for human interaction) ought to be related to the wages of urban workers, although the net effect could either be positive—as a function of agglomeration economies (Henderson, 1985; Krugman, 1996; Marshall, 1890; Storper and Venables, 2004)—or negative, in the form of a congestion-fueled consumption disamenity (Roback, 1982).[3]

Foreign-born workers may also sort themselves geographically by skill in order to 'match' more effectively with local labor markets, and these differences could be correlated with the included independent variables. To the extent that this is true, the economic value of these immigrants might be situated not in their foreignness but, rather, in their greater skill or expertise. To explore this idea, I include two variables that describe the extent to which the distribution of skills among immigrants varies from city to city. Using IPUMS data, I calculate average years of educational attainment, as well as work experience, for all foreign-born workers active in the labor market in each metropolitan area. Work experience was calculated by subtracting 16 years from each worker's current age.

There could still be important interurban compositional differences that distinguish the work undertaken by white native males of a certain age and educational level. Many dimensions of human capital are hard to directly observe, and workers with high ability levels might be self-selecting into cities that offer high levels of diversity and trust. If so, this selection effect, rather than diversity and trust themselves, might explain the observed interurban wage differences. One way to attempt to measure these differences is by examining variation in the kinds of tasks performed in a city. If the task structure of a city suggests that it is particularly sophisticated, this ought to stimulate wages. To the extent that differences in task structure are correlated with urban diversity and trust, their absence from the foregoing estimation process could bias results. To model task structure, I create an index that differentiates urban economies on the basis of the cognitive 'nonroutineness' of the occupations that compose their labor force. Highly nonroutine occupations are those that intensively require complex interpersonal interactions, or analytical tasks that are hard to systematize. Financial managers, software developers, lawyers, and scientists are examples of occupations that intensively require nonroutine tasks. Hence, cities that have larger proportions of their workforce engaged in such occupations will score highly on the nonroutineness index. To assign nonroutineness levels to cities, I combine 2000 IPUMS Census 5% data on individuals with occupation-specific scores for a subset of variables in the Dictionary of Occupational Titles (DOT), adapting a method used at a national level by Autor et al (2003).[4] The result is an index that gauges the relative importance of nonroutineness in the context of an economy's overall task structure.

As an additional control, I include an indicator of educational diversity. This is motivated by Sparber's (2009) finding that racial diversity is correlated with the extent to which regions contain workers with a diverse mix of education levels. To the extent that this also applies to cultural diversity, estimates may be wrongly attributing an effect to culture instead of to the urban mix of education levels. I construct the measure of educational diversity by applying a

[3] Although a measure of employment density would be superior, I expect there to be a strong positive correlation between regional employment density and population density.

[4] The data appendix provides a detailed description of the construction of this variable. Fuller details of this indicator are available in Autor et al (2003) and in Kemeny and Rigby (2011).

Table 2. Descriptive statistics for main variables in 2000 (n = 255).

Variable	Mean	SD	Minimum	Maximum
Wages, white male natives, age 40–50	47 934	9 423	30 474	82 558
Diversity	0.163	0.135	0.023	0.609
Trust	0.029	0.473	−1.60	1.25
Schooling years, white male natives, age 40–50[a]	13.57	0.481	12.16	15.20
Population density per square mile	548	1 242	5.4	8159
Population	1 380 612	3 161 509	101 528	18 352 743
Immigrant schooling years	12.22	1.40	7.84	15.63
Immigrant work experience	21.28	4.11	14.02	39.11
Nonroutine cognitive task intensity	0.344	0.045	0.236	0.472
Schooling diversity	0.765	0.010	0.721	0.782

[a] The mean schooling years indicator adjusts the standard IPUMS EDUC variable in order to make as close to cardinal as possible. I add 6 to EDUC values 3 through 11; a value of 6.5 is assigned to 2; code 1 is assigned a value of 2.5; and a code of zero is set to zero. This requires some assumptions about code values at the low end of the educational spectrum: for instance, assuming that grades 5 through 8 are equally well represented in code 2. However, this scheme comes closest to measuring schooling years in a manner that permits sensible interpretation of city-average values. Work experience is estimated by subtracting 16 from a worker's age, presuming that the average worker begins accumulating meaningful experience at the age of 16.

Herfindahl index to data on educational attainment from the IPUMS 2000 Decennial Census 5% sample.

As is common in intranational research in the United States, each specification also includes variables that account for geographical differentiation. Deeply rooted historical circumstances have dictated longstanding regional variation in wage levels and other factors that drive them, most evidently in the South. In order to capture these region-specific determinants of wage levels, I include Census Division fixed effects. Alternative estimates were also produced using State fixed effects. Table 2 shows descriptive statistics for key variables of interest for the year 2000.

5 Results

Table 3 shows the heteroscedasticity-robust, ordinary least squares (OLS) regression results for several variations of equation (2).[(5)] The diversity index is standardized to aid interpretation, such that its mean is 0 and standard deviation is 1. Column 1 shows the estimates predicting average urban wages as a function of diversity and educational attainment. I confirm for 2000 what Ottaviano and Peri (2006) find for 1970 and 1990: metropolitan levels of cultural diversity are positively correlated with the log of mean wages for US-born workers between 40 and 50 years of age.[(6)]

Model 2 adds the trust index, which has also been standardized, as well as the interaction term between trust and diversity. The interaction term is significant at the 1% level. The degree of trust in a given city appears to moderate the relationship between cultural diversity and the wages of its US-born workers. This relationship holds in model 3, which adds urban

[(5)] Results shown in the tables are not population weighted. However, population-weighted estimates were calculated—they differ insubstantially from the reported estimates.

[(6)] Regression diagnostics on a basic OLS estimate of models 1 to 3 did not reveal significant problems with influential observations, outliers, and leverage. Robust regression was conducted chiefly to minimize bias from mild hetereoscedasticity and nonnormality of the residuals.

Table 3. Determinants of metropolitan average wages; dependent variable: log mean wage for white US-born workers, age 40–50 years.

	Model						
	(1) OLS[a]	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS	(7) FE[b]
Cultural diversity	0.084***	0.111***	0.064***	0.070***	0.038**	0.055***	0.498**
	(0.008)	(0.013)	(0.013)	(0.014)	(0.015)	(0.016)	(0.203)
Trust		−0.008	−0.000	0.002	−0.012	−0.001	
		(0.013)	(0.012)	(0.012)	(0.011)	(0.012)	
Diversity × trust		0.032***	0.043***	0.043***	0.034***	0.034***	0.413***
		(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.084)
Schooling years, US-born	0.220***	0.210***	0.172***	0.154***	0.100***	0.085***	0.075***
	(0.017)	(0.020)	(0.018)	(0.022)	(0.022)	(0.023)	(0.013)
Population density			−0.000**	−0.000**	−0.000	−0.000	0.0001
			(0.000)	(0.000)	(0.000)	(0.000)	(0.0001)
Population (millions)			0.004***	0.004***	0.003***	0.003***	0.009**
			(0.001)	(0.001)	(0.001)	(0.001)	(0.004)
Immigrant schooling years				0.009	0.002	0.005	0.009*
				(0.007)	(0.006)	(0.007)	(0.005)
Immigrant work experience				−0.003	−0.003*	−0.003*	0.004**
				(0.002)	(0.002)	(0.002)	(0.002)
Nonroutineness index					1.296***	1.313***	
					(0.216)	(0.211)	
Education diversity						1.804**	
						(0.722)	
Constant	7.814***	7.948***	8.454***	8.637***	9.014***	7.789***	9.479***
	(0.223)	(0.273)	(0.249)	(0.281)	(0.270)	(0.553)	(0.204)
Year	2000	2000	2000	2000	2000	2000	1980–2008
Census divisions	yes	yes	yes	yes	yes	yes	no
Year dummies	no	no	no	no	no	no	yes
Observations	255	255	255	255	255	255	921

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Note: Robust standard errors in parentheses. [a] OLS—ordinary least squares; [b] FE—fixed effects.

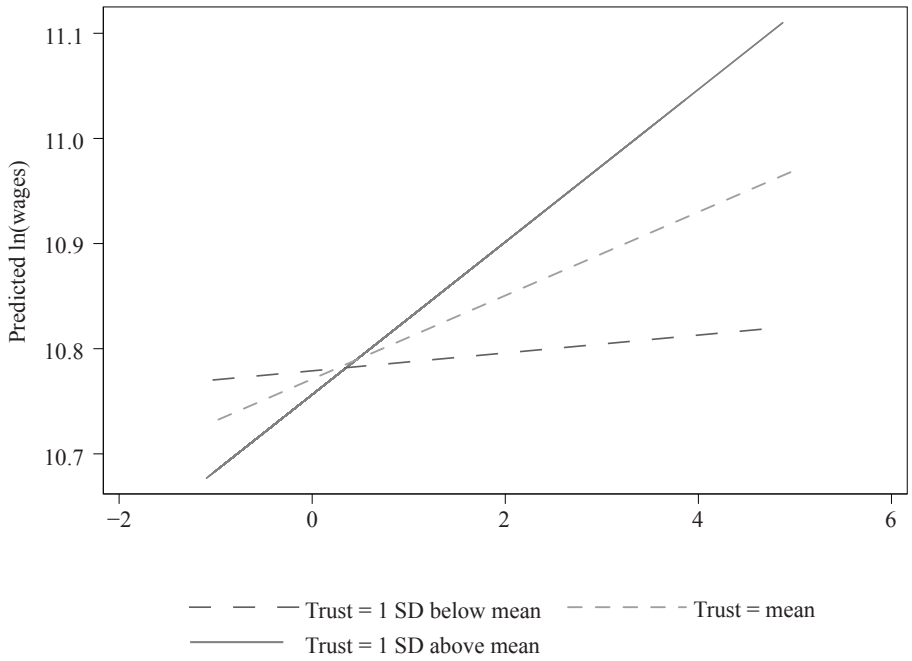

Figure 1. Trust moderates the effect of diversity on the wages of urban native workers.

population (in 100 000s) and population density as controls. According to this model, for a city with trust levels which are 1 SD above the mean, a one-unit increase in diversity is associated with an 8% increase in average native wages. For cities with average trust levels, the positive relationship between diversity and wages is reduced to 4.4%; it drops to 1% in cities with trust levels which are 1 SD below the mean. To put this in perspective, the expected average annual wage income of a white native-born worker aged 40–50 years is approximately $3700 higher as the odds of two people born in two different countries meeting in the street in a high-trust city rises by 12%—which amounts to the difference in cultural diversity found in a metropolitan area like Durham–Chapel Hill, NC, compared with one like Washington DC. The predicted association of this kind of increase in diversity and average native wages in a city with low levels of generalized trust is only $470. Figure 1 provides a visual depiction of the predicted mediating role of generalized trust on the relationship between urban diversity and wages, as estimated in model 3.

In model 4 I present estimates that include indicators of foreign-born schooling and years of work experience in order to gauge interurban differences in human capital levels among foreign-born workers. Neither immigrants' educational attainment nor their work experience emerge as significant predictors of native wages after accounting for the other controls. However, both foreign-born education levels and experience are significantly related to native wages in specifications that exclude native education levels, to which the indicators of foreign-born skill are fairly highly correlated. Specifically, immigrant education is positively related to native wages, while experience is negatively related to native wages.[(7)] Most importantly, after accounting for the effect of these controls, the interaction between trust and diversity remains statistically significant and it retains its overall shape.

Model 5 includes the indicator of nonroutineness, as an attempt to gauge hard-to-observe differences in worker abilities. The coefficient on the nonroutineness index is positively and significantly related to wage levels, suggesting that workers earn more when they reside in cities where work activities are focused on complex interpersonal and analytic tasks that are hard to routinize. Although the coefficient on the diversity variable in this model is somewhat

[(7)] These estimates are not shown here, but are available upon request.

diminished, trust continues to moderate the relationship between diversity and wages in the manner reported throughout this study. Model 6 adds the indicator of urban educational diversity. As Sparber (2009) found, schooling diversity is positively and significantly associated with mean wages. Native workers who live in cities whose workforces feature a greater mix of educational attainment do better than those working in educationally homogenous environments. However, the inclusion of this indicator does not materially affect the main relationship between cultural diversity, trust, and native wages.

To account further for potential bias from unobserved heterogeneity, model 7 shows the results of a fixed effects (FE) model estimated on a panel of the main variables, constructed from IPUMS Decennial Census samples for 1980 (1%), 1990 (5%), 2000 (5%), and a three-year, 3% combined sample of the American Community Survey (ACS), covering the years 2006 to 2008. A fixed-effects approach has some advantages and some disadvantages in the current context. By examining within-city variation over time, it will control for any time-invariant intermetropolitan differences that might materially affect wages, but which are not included as predictors in the regression estimates. I also include time dummy variables that account for dynamic factors that affect the entire national economy, such as business cycles. The main drawback of the use of a fixed-effects model here is that it requires repeated measures of all key variables. This is a problem because comparable data on trust are not readily available across multiple census years. As a result, the trust measure was dropped from the within-city estimates. However, the role of trust is partially captured in the time-varying interaction term between diversity levels in each census extract and trust levels in 2000. To the extent that trust levels are relatively stable across time, this should not unduly bias results. In the resulting estimate over 232 metropolitan areas, the main interaction is significant at the 1% level and it is related to average native wages in a manner broadly consistent with the previous models. This result lends support to the notion that the results reported thus far are not driven by unmeasured factors.[8]

5.1 Endogeneity and instrumental variables

The findings presented thus far speak only to a significant interactive relationship between diversity, trust, and wages. However, the direction of causality, especially with respect to the link between diversity and wages, remains unclear. While diversity might spur higher wages, it seems likely that high native wages will also attract immigrants, thereby raising the diversity index. Local diversity might thus be a function of local wages, as much as wage levels might be stimulated by the presence of immigrants with complementary capabilities.

In the absence of a randomized experiment, instrumental variables (IV) estimation represents the best method of addressing these kinds of endogeneity problems. However, its effectiveness depends entirely on the availability of an appropriate instrument. As the primary instrument, I construct a 'predicted' diversity index, built in a manner analogous to the shift-share method used by Saiz (2007), Card (2001), and Ottaviano and Peri (2006) in a similar context. This measure attributes the composition of a metropolitan area's immigrants in 2000 by relating each cultural group's relative size in 1980 to the historical population growth of each group in the entire US between 1980 and 2000. Historical population growth rates for cultural groups in the country as a whole are given by:

$$(g_n)_{1980\text{–}2000} = \left[\left(\frac{n_i}{N}\right)_{2000} - \left(\frac{n_i}{N}\right)_{1980}\right]\left(\frac{n_i}{N}\right)_{1980}, \quad (3)$$

[8] As an additional check for bias due to omitted variables, I reestimated models 1–5 using state fixed-effects rather than census divisions. Results were uniformly robust to the inclusion of state dummy variables.

where g_n is the growth rate for birthplace n in the US population N between 1980 and 2000. I group some cultures together in order to calculate equation (3), because a fixed collection of cultures in both 1980 and 2000 is required to calculate growth rates. Without such grouping, the list of 'sender' countries differs in 1980 and 2000 since, over this period, some countries have been created while others have ceased to exist; at the same time, some countries have emerged as origins for migration while others have ceased to send migrants. I use the same groups as Ottaviano and Peri (2006) for this procedure. Those groups are listed in the data appendix.

Given growth rates g_n, let the predicted population in 2000 of a given cultural group in a city be :

$$\left(\widehat{\frac{n_j}{N_j}}\right)_{2000} = \left(\frac{n_j}{N_j}\right)_{1980} [1 + (g_n)_{1980\text{–}2000}]. \quad (4)$$

This predicted share of each cultural group can then be substituted into equation (1) in order to yield the predicted diversity index for metropolitan areas in 2000. The use of this predicted

Table 4. IV (2SLS)[a] estimates of determinants of metropolitan average wages, 2000; dependent variable: log mean wage for white US-born workers, age 40–50 years.

	Model	
	(8)	(9)
Cultural diversity[a]	0.027	0.031
	(0.024)	(0.024)
Trust	−0.025**	−0.023**
	(0.014)	(0.013)
Diversity × trust	0.031***	0.031***
	(0.010)	(0.010)
Schooling, US-born	0.209***	0.208***
	(0.024)	(0.021)
Population density	0.0001**	0.0001**
	(0.00005)	(0.0001)
Population (millions)	0.002**	0.002**
	(0.001)	(0.001)
Constant	7.883***	7.903***
	(0.305)	(0.299)
First-stage regression		
Predicted diversity	9.332***	9.281***
	(1.173)	(1.175)
Distance to Miami		0.0004**
		(0.0001)
Partial R^2	0.356	0.382
Census divisions	yes	yes
Observations	224	224
First-stage F-statistic	63.28	37.86
Hansen J-statistic	-	0.204
		(p = 0.651)

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Note: Robust standard errors in parentheses.
[a] Predictors include all variables used in model 3.

diversity index as an instrument for actual diversity levels is motivated by the fact that immigrants tend to settle in areas to which immigrants of the same nationality have moved in the past.

Based on the assumption that immigrants tend to settle near immigrant 'gateway' cities (Ottaviano and Peri, 2006), I build other instruments based on the great-circle distance between each metropolitan area and the largest gateways in the United States—Los Angeles, New York, and Miami—as well as the distance to the Mexican border. I also include a measure of the distance to the nearest of the three gateway cities as an additional instrument. In theory, one would expect there to be a negative relationship between these distance variables and diversity.

Table 4 shows selected results from two-stage least squares (2SLS) IV estimates of a model including each of the predictors in model 3. In initial tests, measures of the distance to Los Angeles, New York, the Mexican border, and the nearest gateway distance each prove to be weak predictors of diversity, and hence poor instruments. Model 8 presents first-stage and second-stage results when instrumenting using only the predicted diversity measure created using the shift-share method. The F-statistic indicates that it is a sufficiently strong instrument, while the partial R2 suggests that the diversity instrument predicts 35% of the variation in diversity that is orthogonal to the other predictors. The second-stage coefficients in model 8 are consistent with the foregoing OLS and FE estimates. In model 9 the distance-to-Miami indicator as well as the predicted diversity measure are used as instruments for diversity. First-stage results are little changed, with a small uptick in the predicted variation in diversity. The results of the Hansen J-statistic, which can only be calculated when there are more instruments than potentially endogenous regressors, indicates that at least one of the instruments can be treated as exogenous, and the difference-in-Sargan test, run on the predicted diversity measure, indicates that this variable can be treated as exogenous. Having thus established both the validity and orthogonality of the instruments, we can be relatively comfortable that the second-stage results produce estimates that are sufficiently efficient and consistent. As the coefficients and significance levels for the key predictors in table 4 reveal, those estimates are entirely in line with previous findings. Ideally, one would additionally want to instrument for the interaction term. In some exploratory work, an instrumented interaction was created by calculating the product of the predicted diversity measure and trust levels. However, this turned out to be a very weak instrument for the interaction term. Given the absence of a suitable instrument for the interaction term, there remains some uncertainty regarding causal direction. Nonetheless, the results in table 4 suggest that we can more confidently interpret that the findings describe a situation in which diversity stimulates urban economic performance, rather than the other way around, with an effect moderated by urban trust levels.[9]

[9] Further robustness checks were undertaken to address potential bias from measurement error. Although generalized trust is an important feature of social capital, and the two ought to be strongly correlated (Putnam, 2007), they are not identical. To help reduce the likelihood of measurement error, I examined a variety of alternative indicators of trust and informal institutions. Instead of the main trust indicator, I included a Gini coefficient that describes metropolitan wage and salary inequality in 2000, which a variety of scholars have shown is associated with low levels of mutuality at multiple scales (Bjørnskov, 2007; Costa and Kahn, 2003; Putnam, 2000; Rothstein and Uslaner, 2006; Zak and Knack, 2001). I also used several additional measures of trust, including a city-specific index of social trust built from the 2000 Social Capital Community Benchmark Survey (SCCBS), state-level indicators of both social capital and social trust as constructed by Putnam (2000) from General Social Survey data, and a measure of civic participation using results from the DDB Life Style Survey between 1975 and 1998 (http://bowlingalone.com/?page_id=8). Each of these variables is moderately correlated with the main trust indicator. In each case, I reestimated models 3-5 with the alternative trust measure and the interaction between this indicator and urban diversity levels. The results matched the main results presented in table 3, in terms of the general direction and significance of the key relationship. The finding that urban trust levels moderate the positive relationship between diversity and wages holds across a variety of different indicators of generalized trust.

5.2 Gains in productivity or reductions in quality of life?

Though the results thus far demonstrate that the relationship between diversity and wages depends on generalized trust, we have no direct evidence that diversity affects wages specifically by enhancing worker productivity. Another possibility is that white native male workers between the ages of 40 and 50 years do not much like living in diverse cities, and indeed they require a wage premium to endure it. In this case, we can consider diversity to be a consumption disamenity, rather than a productive amenity. On the face of it, this seems implausible—to the extent that diversity is a consumption disamenity, then the preceding results imply that workers residing in locations with high levels of generalized trust require even more compensation for it than those living in cities where trust levels are low. Nonetheless, we might more clearly identify the channel through which diversity affects wages by estimating a model predicting employment alongside that predicting wages (Roback, 1982; Suedekum et al, 2009). I estimate a model based on equation (2), substituting levels of urban employment for US-born white male workers between the ages of 40 and 50 years as the dependent variable. Given the results in this paper which indicate that diversity is uniformly positively related to wages, we can interpret a positive relationship between diversity and US-born urban employment levels as confirmation that diversity affects wages by enhancing productivity. If diversity is negatively related to employment, this indicates that native workers may require compensation for having to live in culturally diverse urban environments.

Table 5. Estimates of determinants of metropolitan employment, 2000; dependent variable: log employment for white US-born workers, age 40–50 years.

	Model		
	(10) OLS	(11) OLS	(12) FE
Cultural diversity	8 737***a	5 879***	398 804***
	(2 000)b	(2 182)	(138 785)
Trust	4 913***	1 789	
	(1 834)	(1 783)	
Diversity × trust	2 283**	2 314**	143 779
	(1 076)	(1 023)	(115 217)
Schooling years, US-born	4 082	1 134	10 830
	(3 049)	(3 860)	(8 132)
Nonroutineness		109 262***	
		(33 888)	
Immigrant schooling years		−69	−1 102
		(1 308)	(4 568)
Immigrant work experience		655**	−145
		(280)	(611)
Constant	−6 566	−35 993	−145 038
	(23 771)	(25 909)	(164 299)
Year	2000	2000	1980–2008
Census divisions	yes	yes	yes
Year dummies	no	no	yes
Observations	275	275	999

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Note: Robust standard errors in parentheses.

Table 5 presents estimates predicting native employment levels.[10] I estimate this model with a somewhat reduced set of controls, specifically omitting population and population density, since they are highly collinear with employment levels. Model 10 presents a baseline model; model 11 includes a set of additional controls. In both cases, diversity is positively and significantly associated with urban native employment levels: cities that have higher diversity levels also have higher levels of employment in 2000. Estimates of this relationship may not be sufficient to conclude whether diversity affects wages through productivity or a consumer disamenity, however, since one cannot observe adjustments on the margin when observing only a cross-sectional relationship between these variables. For this reason, model 12 presents results gained by estimating a fixed-effects model analogous to model 7, using IPUMS Census and ACS data for 1980, 1990, 2000, and 2006–08. In model 12, diversity is again positively related to employment, controlling for time-invariant city-specific variation, as well as location-independent temporal variation. On the basis of these results, we can more confidently conclude that native wages are higher in more diverse cities not because US-born workers demand higher pay to offset their distaste for culturally diverse contexts, but because diversity enhances these workers' productivity.

6 Conclusion

In this paper I set out to explore the economic significance of cultural diversity in cities. In particular, the goal has been to examine the conditions under which having a diverse mix of immigrants enhances the productivity of fellow urban workers—and when it fails to do so. Institutions have been hypothesized to moderate the effect of diversity on productivity, but little empirical work exists in which their impact has been examined at the metropolitan scale, where economic geographers predict that knowledge spillovers should be concentrated. My aim in this paper has been to begin to address these issues, using generalized trust as a gauge of the relevant informal institutions.

Overall, the results suggest that generalized trust plays an important role in catalyzing the potential benefits of cultural heterogeneity. Greater urban cultural diversity, signified by the presence of a large and mixed group of immigrants, is associated with considerably higher productivity levels among US-born white male late-career workers who live in metropolitan areas endowed with sufficient levels of generalized trust. In cities where trust is low, native workers gain much less from the presence of a diverse workforce. Specifically, diversity is significantly and positively associated with wage and salary income in high-trust cities, with a one-unit standard deviation in diversity boosting workers' wages by as much as 8%. In metropolitan regions where trust is below the mean, the effect of diversity remains positive but is much weaker, raising wages for natives by approximately 1%. This moderating role for trust survives a wide array of controls. The shape of the relationship is consistent when several alternative measures of trust are used. Additionally, instrumental variables estimates suggest that the arrow of causality in the relationship runs from diversity to wages, not the other way around. Moreover, results predicting employment levels and employment growth confirm that diversity affects wages by raising productivity, not by reducing quality of life.

[10] Estimated coefficients in table 5 appear large because the dependent variable—employment for the subset of white native male late-career workers—was estimated using IPUMS samples taking in account national person-level sampling weights. This means that estimated employment numbers do not directly correspond with actual city-specific numbers: rather, each represents the extrapolation to the nation as a whole. The alternative would be to ignore sampling weights. The decision to include or ignore sampling weights should in no way materially affect the estimates here, where we are not interested in interpreting the relationship in detail beyond signs and significance levels. Most importantly, true interurban differences in employment levels for the subset of workers of interest ought to be described using either procedure.

More work can be done to strengthen confidence in these conclusions. Despite attempts to account for unobserved heterogeneity, consensus exists that hard-to-measure differences between workers may explain a considerable part of interurban wage differences (Combes et al, 2008; Venables, 2011). This could apply in the current context, despite the attempts described above to account for this issue. Further exploration of endogeneity and measurement error would also improve the robustness of the findings, especially estimates that instrument not only for diversity but also for its interaction with trust. Additional work can also be done to explore how these effects might vary across different segments of the workforce, especially decomposing by skill levels (Suedekum et al, 2009).

While concrete policy implications are premature, the results confirm that debates about the benefits and costs of heterogeneity, which include conversations about the proper manner by which to conduct immigration policy, need to be framed in a larger context that includes characteristics of the society in which this heterogeneity is located. We already know this from cross-national studies, in which similar diversity levels are associated with very different outcomes in countries with democratic and less democratic political institutions. The results of this study show that institutions, broadly conceived, may be equally important at an urban scale. Policymakers considering how best to accommodate and reap the benefits from heterogeneity ought to think about measures aimed at fostering generalized trust in their communities.

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References

Alesina A, Drazen A, 1991, "Why are stabilizations delayed?" *The American Economic Review* **81** 1170–1188

Alesina A, La Ferrara E, 2000, "Participation in heterogeneous communities" *Quarterly Journal of Economics* **115** 847–904

Alesina A, La Ferrara E, 2002, "Who trusts others?" *Journal of Public Economics* **85** 207–234

Alesina A, La Ferrara E, 2005, "Ethnic diversity and economic performance" *Journal of Economic Literature* **43** 762–800

Alesina A, Baqir R, Easterly W, 1999, "Public goods and ethnic divisions" *Quarterly Journal of Economics* **114** 1243–1284

Ancona D, Caldwell D, 1992, "Demography and design: predictors of new product team performance" *Organization Science* **3** 321–341

Arrow K, 1972, "Gifts and exchanges" *Philosophy and Public Affairs* **1** 343–362

Autor D, Levy F, Murnane R, 2003, "The skill content of recent technological change: an empirical exploration*" Quarterly Journal of Economics* **118** 1279–1334

Bairoch P, 1991 *Cities and Economic Development: From the Dawn of History to the Present* (University of Chicago Press, Chicago, IL)

Bandiera O, Baranka I, Rasul I, 2005, "Cooperation in collective action" *Economics of Transition* **13** 473–498

Bantel K, Jackson S, 1989, "Top management and innovations in banking: does the composition of the top team make a difference?" *Strategic Management Journal* **10** S1 107–124

Bjørnskov C, 2007, "Determinants of generalized trust: a cross-country comparison" *Public Choice* **130** 1–21

Card D, 2001, "Immigrant inflows, native outflows, and the local labor market impacts of higher immigration" *Journal of Labor Economics* **19** 22–64

Ciccone A, Hall R, 1996, "Productivity and the density of economic activity" *The American Economic Review* **86** 54–70

Collier P, 2000, "Ethnicity, politics and economic performance" *Economics and Politics* **12** 225–245

Collier P, Gunning J, 1999, "Explaining African economic performance" *Journal of Economic Literature* **37** 64–111
Combes P, Duranton G, Gobillon L, 2008, "Spatial wage disparities: sorting matters!" *Journal of Urban Economics* **63** 723–742
Conley T, Flyer F, Tsiang G, 2003, "Spillovers from local market human capital and the spatial distribution of productivity in Malaysia" *Advances in Economic Analysis and Policy* **3**(1) article 5
Costa D, Kahn M, 2003, "Civic engagement and community heterogeneity: an economist's perspective" *Perspectives on Politics* **1**103–111
Duranton G, Puga D, 2001, "Nursery cities: urban diversity, process innovation, and the life cycle of products" *American Economic Review* **91** 1454–1477
Easterly W, 2001, "Can institutions resolve ethnic conflict?" *Economic Development and Cultural Change* **49** 687–706
Easterly W, Levine R, 1997, "Africa's growth tragedy: policies and ethnic divisions" *Quarterly Journal of Economics* **112** 1203–1250
Feldman M P, Audretsch D B, 1999, "Innovation in cities: science-based diversity, specialization and localized competition" *European Economic Review* **43** 409–429
Fukuyama F, 1995 *Trust: The Social Virtues and the Creation of Prosperity* (The Free Press, New York)
Glaeser E L, Kallal H D, Scheinkman J A, Shleifer A, 1992, " Growth in cities" *The Journal of Political Economy* **100** 1126–1152
Goldin C, Katz L, 1999, "Human capital and social capital: the rise of secondary schooling in America, 1910–1940" *Journal of Interdisciplinary History* **29** 683–723
Granovetter M, 1973, "The strength of weak ties" *American Journal of Sociology* **78** 1360–1380
Henderson J, 1985 *Economic Theory and the Cities* (Academic Press, London)
Herring C, 2009, "Does diversity pay?: race, gender, and the business case for diversity" *American Sociological Review* **74** 208–224
Hoffman L, Maier N, 1961, "Quality and acceptance of problem solutions by members of homogeneous and heterogeneous groups" *Journal of Abnormal and Social Psychology* **62** 401–407
Hong L, Page S, 2001, "Problem solving by heterogeneous agents*"* *Journal of Economic Theory* **97** 123–163
Jacobs J, 1969 *The Economy of Cities* (Random House, New York)
Jaffe A B, Trajtenberg M, Henderson R, 1993, "Geographic localization of knowledge spillovers as evidenced by patent citations" *The Quarterly Journal of Economics* **108** 577–598
Kemeny T, Rigby D, 2011, "Trading away what kind of jobs? Globalization, trade and tasks in the US economy" *Review of World Economics* pages 1–16, doi:10.1007/s10290- 011-0099-5
Knack S, Keefer P, 1995, "Institutions and economic performance: cross-country tests using alternative institutional measures" *Economics and Politics* **7** 207–227
Krugman P, 1996, "Urban concentration: the role of increasing returns and transport costs*"* *International Regional Science Review* **19**(1–2) 5–30
La Porta R, Lopez-de Silanes F, Shleifer A, Vishny R, 1997, "Trust in large organizations" *The American Economic Review* **87** 333–338
Lazear E, 1999, "Globalisation and the market for team-mates" *The Economic Journal* **109** 454 15–40
Leigh A, 2006, "Trust, inequality and ethnic heterogeneity" *Economic Record* **82**(258) 268–280
Lucas R, 1988, "On the mechanics of economic development" *Journal of Monetary Economics* **22** 3–42
Marshall A, 1890 *Principles of Economics* 8th edition (Macmillan, London)
Moretti E, 2004, "Estimating the social return to higher education: evidence from longitudinal and repeated cross-sectional data" *Journal of Econometrics* **121**(1–2) 175–212
O'Reilly C, Caldwell D, Barnett W, 1989, "Work group demography, social integration, and turnover" *Administrative Science Quarterly* **34** 21–37
Ottaviano G, Peri G, 2006, "The economic value of cultural diversity: evidence from US cities*"* *Journal of Economic Geography* **6** 9–44
Ozgen C, Nijkamp P, Poot J, 2011, "Immigration and innovation in European regions", IZA DP 5676, Bonn

Page S, 2008 *The Difference: How the Power of Diversity Creates Better Groups, Firms, Schools, and Societies* (Princeton University Press, Princeton, NJ)
Pennant R, 2005, "Diversity, trust and community participation in England", Research Development and Statistics Directorate Paper 253, Home Office, London
Poterba J, 1997, "Demographic structure and the political economy of public education" *Journal of Policy Analysis and Management* **16** 48–66
Putnam R, 2000 *Bowling Alone: The Collapse and Revival of American Community* (Simon and Schuster, New York)
Putnam R, 2007, "E pluribus unum: diversity and community in the twenty-first century. The 2006 Johan Skytte Prize lecture" *Scandinavian Political Studies* **30**(2) 137–174
Rahn W, Transue J, 1998, "Social trust and value change: the decline of social capital in American youth, 1976–1995" *Political Psychology* **19** 545–565
Rauch J, 1993, "Productivity gains from geographic concentration of human capital: evidence from the cities" *Journal of Urban Economics* **34** 380–400
Richard O, Kochan T, McMillan-Capehart A, 2002, "The impact of visible diversity on organizational effectiveness: disclosing the contents in Pandora's black box" *Journal of Business and Management* **8** 265–292
Roback J, 1982, "Wages, rents, and the quality of life" *The Journal of Political Economy* **90** 1257–1278
Rodrik D, 1999, "Where did all the growth go? External shocks, social conflict, and growth collapses" *Journal of Economic Growth* **4** 385–412
Rosenthal S, Strange W, 2004, "Evidence on the nature and sources of agglomeration economies" *Handbook of Regional and Urban Economics* **4** 2119–2171
Rothstein B, Uslaner E, 2006, "All for one: equality, corruption, and social trust" *World Politics* **58** 41–72
Ruggles S, Alexander J, Genadek K, Goeken R, Schroeder M, Sobek M, 2010, "Integrated public use microdata series: version 5.0", Minnesota Population Center, Minneapolis, MN
Rupasingha A, Goetz S, 2008, "US county-level social capital data, 1990–2005", The Northeast Regional Center for Rural Development, Pennsylvania University, University Park, PA
Saiz A, 2007, "Immigration and housing rents in American cities" *Journal of Urban Economics* **61** 345–371
Sparber C, 2009, "Racial diversity and aggregate productivity in US industries: 1980–2000" *Southern Economic Journal* **75** 829–856
Stolle D, Hooghe M, 2005, "Inaccurate, exceptional, one-sided or irrelevant? The debate about the alleged decline of social capital and civic engagement in Western societies" *British Journal of Political Science* **35** 149–167
Storper M, Venables A J, 2004, "Buzz: face-to-face contact and the urban economy" *Journal of Economic Geography* **4** 351–370
Suedekum J, Wolf, K, Blien U, 2009, "Cultural diversity and local labour markets" IZA DP 4619, Bonn
Taylor C, Hudson M, 1972 *World Handbook of Political and Social Indicators* (Yale University Press, New Haven, CT)
Venables A, 2011, "Productivity in cities: self-selection and sorting" *Journal of Economic Geography* **11** 241–251
Zak P, Knack S, 2001, "Trust and growth" *The Economic Journal* **111**(470) 295–321

Data appendix

Construction of the nonroutineness index: The nonroutineness index is constructed by combining worker-level data from an IPUMS 5% Decennial Census sample with data on occupations from the 1991 paper The Fourth Revision of the Dictionary of Occupational Titles (DOT). From a large set of DOT occupational characteristics in the 1991 DOT revision, I select those that reveal the intensity with which a specific job type demands nonroutine versus routine tasks. For the purposes of this analysis, 'nonroutineness' is made up of analytic and interactive components, while the remainder of the task dimensions represents routine manual and routine cognitive work, as well as unstandardized physical coordination. Task values are linked directly by occupation to census worker data. The metropolitan-specific nonroutineness index is constructed as follows:

$$\mathrm{NR}_{jt} = \frac{\sum \mathrm{task}_j^{nr}}{\sum \mathrm{task}_j^{r}} \tag{5}$$

where r is the set of all tasks, j indexes cities, and nr is a subset of r which identifies nonroutine tasks. NR is thus the share of nonroutine-task values in the sum of all task values that are associated with the occupational structure of a region.

Country groups used in shift-share calculation: Mexico, Caribbean Countries, Central America, China–Hong-Kong–Singapore, South America, South East Asia, Korea and Japan, Philippines, Australia–New Zealand–Canada–UK, India and Pakistan, Russia and Central Europe, Turkey, North Africa and Middle East, Northwestern Europe and Israel, Southwestern Europe, Sub-Saharan Africa, Cuba.