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ACCOUNTING FOR THE CHANGE IN INCOME DISPARITIES BETWEEN US CENTRAL CITIES ANDTHEIR SUBURBS FROM 1980 TO 1990

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Accounting for the Change in Income Disparities between US Central Cities and their Suburbs from 1980 to 1990

Edward W. Hill and Harold L. Wolman

Summary. In this paper we are concerned with the widely acknowledged policy problem of substantially higher levels of per capita income in suburban areas of US metropolitan areas compared to that of their central cities. We focus on causes of changes in this per capita income gap from 1980 to 1990 (for those metropolitan areas where such a gap existed in 1980) in an effort to determine what factors are associated with narrowing of these disparities. We do so by first describing the relationship between central-city and suburban per capita income across American metropolitan areas in 1980 and 1990. We review the connection between the operation of metropolitan labour markets and changes in suburban–central-city income disparities. We then develop regression models of changes in income disparities for all 111 metropolitan statistical areas (MSAs) with populations of at least 250 000 in 1980 and where suburban per capita income exceeded central-city per capita income in 1980. This is followed by a summary of the results.

1. Introduction

> Considerable research now documents strong statistical relationships between metropolitan economic performance and city–suburban disparities.... More specifically, employment grew most where income disparities were lowest. (US Department of Housing and Urban Development, 1995, p. 15)

> Recent evidence strongly indicates that the overall economic performance of metropolitan regions is linked to the performance of their central cities; cities and their suburbs tend to rise and fall together. Thus, the ability of a nation to prosper... will depend upon the economic performance of its urban regions and upon the health and vitality of the cities at their core... (Stegman and Turner, 1996, p. 158)

A recent literature has addressed the problem of substantially higher levels of per capita income in suburbs of US metropolitan areas compared to their central cities and the im-

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pact of this per capita income gap on economic performance (see, for example, Blair and Zhang, 1994; Dreier, 1995; Hill *et al*., 1995; Ledebur and Barnes, 1993; Savitch *et al*., 1993; Savitch, 1995; Voith, 1992, 1993). The gap in per capita income of central-city and suburban residents is large and grew from 1980 to 1990. These disparities in favour of suburbs reflect differences in well-being between city and suburban residents in the aggregate and constitute a real and growing social and economic problem for America's metropolitan areas.

There are at least four reasons why these place disparities, above and beyond income disparities among people within US metropolitan areas, constitute a national policy concern.[1] The first three of these reasons reflect the fiscal structure of the system of local government in the US: income disparities among local governments in metropolitan areas are translated nearly directly into fiscal disparities among these local governments with consequences that adversely affect the entire area. The fourth involves our collective sense of community.

First, investment in human capital and infrastructure is central to economic development and, in the US, the largest investor in these activities is local government. As the gap between incomes in central cities and suburbs widens, the ability of central cities to finance an adequate level of education for their children, who will constitute a large portion of the potential future labour force for the metropolitan region, becomes increasingly constricted. Secondly, that portion of the regional infrastructure located in the central city—and in the central business district in particular—plays an important role as the connective tissue of regional economies. Lower real incomes of central-city residents make it more difficult for central-city governments to pay for, and to maintain, the existing infrastructure of central business districts, as well as transport networks that run through cities. Thirdly, place disparities adversely affect equity and individual well-being, again via the fiscal system. Residents of central cities must either pay higher tax rates than suburban residents to obtain comparable service levels or accept inferior services at comparable tax rates. In fact, the first package of taxes and spending frequently exacerbates the problem, since higher tax rates increase the incentive for families who have sufficient income and can 'jump borders' to do so, to avoid redistributive taxation. The fourth problem generated by rising spatial income disparities lies in our collective sense of place. Widening income gaps ensure that cities and their suburbs become increasingly dissimilar in a number of civic and social dimensions—affecting everything from recreational opportunities and libraries to shared regional identities that are developed by sharing common civic spaces. The question we address in this paper is: what are the forces that make spatial income gaps grow?

We examined the 152 metropolitan statistical areas (MSAs) with populations of at least 250 000 in 1980. While the conventional wisdom holds that suburban per capita income exceeds central-city per capita income in all but a few of these MSAs, in fact, in 41 of them (27 per cent of the total) central-city per capita income actually exceeded suburban per capita income in 1980. (Examples of such places include: Albuquerque, New Mexico; Ann Arbor, Michigan; Bakersfield, California; Charlotte, North Carolina; Colorado Springs, Colorado; Duluth, Minnesota; Peoria, Illinois; Honolulu, Hawaii; and Wichita, Kansas.) Twenty-five of these MSAs saw real central-city per capita income increase relative to their suburbs from 1980 to 1990, while 16 saw suburban per capita incomes increase relative to their central cities. In 1990, 37 MSAs had central-city per capita incomes that exceeded suburban per capita incomes, 4 were in the Midwest, 23 were in the South, and 10 were in the West. The critical point we make is that US MSAs are not homogeneous with respect to the income relationship between central cities and their suburbs. These two sub-sets of MSAs, those where suburban per capita income exceeds central-city per capita income and those where this relationship

is reversed, most probably have different spatial-economic and social-spatial structures. Given that the policy debate has been consistently framed in terms of metropolitan areas where suburban per capita income exceeds central-city per capita income, mixing these two types of places together in statistical analyses will result in specification error.

For these reasons, our concern is with the 111 MSAs where suburban per capita incomes exceeded central-city per capita incomes in 1980.[2] In 94 per cent (or 104) of these MSAs, disparities in per capita incomes increased from 1980 to 1990. On average, the relative difference in real suburban–central-city per capita incomes in these MSAs increased by 13 per cent over the decade. Seven MSAs had suburban incomes that exceeded central-city incomes in 1980 and saw the income gap decline during the 1980s. Most of these declines were small.

The 1980s were another decade of central-city decline. In 1980 real per capita income of the median central city in our universe of 111 MSAs was $1175 lower than its own suburbs.[3] At the end of the decade, this disparity, in real terms, was $2033, an increase of $858 or 73 per cent (if the mean is used as the measure of change in disparity the real increase was 74 per cent). Not only did real income disparities between central cities and their suburbs skyrocket during the 1980s, but the experiences of these MSAs became more divergent. A measure of this growing dissimilarity is the increase in the range between the first and third quartiles of the differences between central-city and suburban per capita incomes in 1980 and 1990. The range of the differences increased by $738 in real terms, or nearly 50 per cent over the course of the decade. Income inequality between cities and their suburbs grew markedly during the decade and, at the same time, MSAs had increasingly dissimilar experiences.

To control for broad differences in average incomes that exist, and persist, across metropolitan areas, we developed a standardised measure of the changes in the income gap between central-city and suburban per capita incomes from 1980 to 1990. We call this measure the percentage change in relative real income disparity (the variable is labelled CHGDISPAR, for change in disparity, in the statistical results). This measure divides changes in suburban–city differences in real per capita incomes over the decade by 1980 real MSA per capita income.[4] Dividing the change in disparity over the decade by real MSA per capita income controls for two important inter-regional differences: consistent variation in nominal earnings that exists in specific local labour markets; and differences in regional cost of living (after all, a $500 increase in the difference between suburban and central-city per capita incomes in Fresno, California, where the MSA's per capita income was $8455 in real terms in 1980, has more impact than the same dollar difference in Anaheim, where 1980 MSA per capita income was $11 612). This measure is interpreted as the change in spatial income differences as a percentage of 1980 MSA per capita income.

The largest increases in spatial income inequality from 1980 to 1990 were typically found in large, older MSAs located in America's traditional industrial belt in the north and east (Table 1). A large cluster of these places is located in the New York–Philadelphia corridor—Newark, Trenton and New Brunswick led this group, and Paterson occupied seventh place. A number of these MSAs have weak central business districts that are part of more prosperous consolidated metropolitan regions: the New Jersey central cities; Bridgeport, New Haven, and Hartford in Connecticut; Aurora, Waukegan and Milwaukee in Chicagoland; Anaheim in Los Angeles' constellation; Detroit, Flint and Toledo in greater Detroit; and Cleveland. These are mostly central cities that have lost their traditional economic function, but whose suburbs service other employment nodes in a consolidated metropolitan region. In some sense these are the most troubled cities. They, and their residents, have lost their economic function but are surrounded by reasonably healthy regional economies. These are truly dependent cities. One of their

Table 1. Where did the spatial income gaps increase the most among MSAs from 1980 to 1990?

Rank	Metropolitan area	Primary state	Percentage change in relative disparity[a]	Real Difference in per capital income 1990[b]	1980[b]
1	Newark	New Jersey	36.2	9097	5383
2	Trenton	New Jersey	33.8	7987	4668
3	New Brunswick	New Jersey	33.7	7517	3900
4	Waukegan	Illinois	33.4	9212	5118
5	Anaheim	California	32.4	6836	3078
6	Memphis	Tennessee	31.1	2788	334
7	Paterson	New Jersey	29.5	8842	5568
8	Hartford	Connecticut	28.1	5978	3175
9	New York	New York	27.6	5907	3338
10	Bridgeport	Connecticut	25.6	7355	4121
11	Salinas	California	24.6	3413	1176
12	Philadelphia	Pennsylvania	23.9	5092	2926
13	San Jose	California	23.6	5409	2688
14	Detroit	Michigan	22.5	5997	3691
15	Aurora	Illinois	22.0	3373	1110
16	Oxnard	California	21.5	3402	1306
17	Milwaukee	Wisconsin	20.5	4811	2751
18	New Bedford	Massachusett	20.5	3447	1892
19	Providence	Rhode Island	19.2	2646	1047
20	Flint	Michigan	19.1	3456	1613
21	Toledo	Ohio	18.5	2913	1236
22	Cleveland	Ohio	18.4	5917	4098
23	New Haven	Connecticut	18.3	4320	2629
24	Tucson	Arizona	17.8	3706	2165
25	Hamilton	Ohio	17.7	2363	785

[a]Relative real spatial income disparities between suburbs and their central cities from 1980 to 1990 as defined in Note 2.
[b]Real dollars are expressed in 1982–84 dollars.

new economic functions is to warehouse the region's poor.

Most of the remaining places listed in Table 1 are smaller MSAs that are located in regions that are rapidly growing and typified by low-density development. These central cities may be just filling up and development is sprawling outward. These are the California MSAs of Salinas, Oxnard and San Jose, as well as Tucson, Arizona. It is likely that the pattern of development that these regions have experienced leaves their central cities susceptible to rapid economic decline—their economies are intolerant of density and existing activities can suburbanise rapidly.

2. Modelling Changes in Spatial Income Disparities

We use ordinary least squares regression analysis to examine what caused city–suburban per capita income disparities to increase during the 1980s in those MSAs where suburban per capita income exceeded central-city per capita income in 1980. Five sets of independent variables are included in the estimating equations: changes in labour market conditions, average human capital characteristics, a variable to proxy cumulative causation or persistence of spatial economic relationships, spatial-political structure, and

regional production characteristics—which are entered in the models as a series of dummy variables. The dependent variable and each of the independent variables are discussed below.

2.1 Dependent Variable

The dependent variable, the percentage change in relative real income disparity (CHGDISPAR), was introduced above. CHGDISPAR measures the real dollar change in suburban–central-city per capita incomes as a percentage of real MSA per capita income in 1980, which is the base year. Algebraically the variable is:

$$\{((RPKY_S^{90} - RPKY_C^{90}) - (RPKY_S^{80} - RPKY_C^{80}))/RPKY_M^{80}\}*100$$

where:
RPKY signifies real per capita income in 1982–84 dollars, using CPI-U as the deflator (US Department of Commerce, 1992, p. 24); *S* signifies suburb; *C* signifies central city; *M* signifies metropolitan area; and the superscripts indicate the census year.

Thus, a positive association between the independent variables and change in spatial income disparities (CHGDISPAR) means that increases in the independent variables are associated with increases in real per capita income disparity between suburbs and their central cities between 1980 and 1990.

2.2 Independent Variables

Intertemporal changes in labour market conditions. We posit that two sets of variables related to labour market conditions influence changes in metropolitan spatial income gaps. The first captures long-term changes in the 'tightness' of local labour markets. The second measures changes in durable goods manufacturing employment.

Tightness of the local labour market. We derive two hypotheses from the literature about the impact that local labour market conditions have on the distribution of per capita income between central cities and their suburbs. We refer to these as: elastic demand for central city labour and inelastic demand for central city labour. These hypotheses have different expectations about the degree of substitutability of central-city labour for suburban labour.

The elastic demand for central-city labour hypothesis implies that, if the composition of demand for labour skills is held constant, unemployment rates should be lower and labour force participation rates higher in faster-growing labour markets. As the most desirable labour, in terms of its human capital characteristics, tends to be involved in the world of work throughout the business cycle and it tends to reside in suburbs, growth should disproportionately attract lower-skilled individuals into the labour market, and disproportionate numbers of these lower-skilled individuals will live in central cities. This should narrow disparities in the average incomes of suburbs and central cities. This hypothesis contends that central-city labour is a substitute for suburban workers and that demand for central-city labour is elastic with respect to the cost and availability of suburban labour.[5]

Widely reported declines in earnings for workers with low levels of educational attainment, coupled with increases in the spatial income gap over the decade, indicate that central-city labour may not be a competitive substitute for suburban labour within the current operating parameters of the economy. These observations motivate the inelastic demand for central-city labour hypothesis: central-city labour is a poor substitute for suburban labour; demand for central-city labour is inelastic; and tightening labour markets actually exacerbate suburban–central-city income disparities.

Under this alternative hypothesis, tightening labour markets are expected to be accompanied by increases in spatial income disparities, as suburban employment-to-population ratios increase due to increased participation by suburban teenage youth, spouses and the elderly, while central-city ratios either decrease or remain stable. These changes in local labour markets will result in widening earnings disparities.[6]

We use change in the working age (16–64 years of age) employment-to-population ratio (DIFEMP/POP, for the difference in the employment-to-population ratio) to measure change in the tightness of metropolitan labour markets. We express the ratio in percentage form by multiplying it by 100.[7] There is a problem with using the unemployment rate, the more traditional measure of labour market conditions, as a measure of labour market tightness. The unemployment rate is an appropriate measure of the short-run condition of the labour market. Over the longer run, discouraged workers, or others who may not be part of the labour force due to their reservation wages, can be attracted into the labour force. Additionally, migration can offset short-run fluctuations in local labour market conditions. These factors make changes in the employment-to-population ratio a more attractive measure of changes in the size of the potential workforce.

Durable goods manufacturing employment. The second labour market variable we included was the growth rate in durable goods manufacturing employment (DURGROW, for percentage growth in durable goods employment) over the decade. We expect that MSAs with relatively high rates of decline in durable goods manufacturing employment from 1980 to 1990 will have larger spatial gaps in per capita incomes in 1990. This expectation is due to the fact that local labour markets with high concentrations of durable goods employment tend to have more, and higher, earnings opportunities for workers who have lower levels of education, more of whom are expected to be central-city residents. This is consistent with Bluestone and Harrison's (1982) 'deindustrialisation' hypothesis.

Differences in human capital. Recent research indicates that rates of return for different levels of educational attainment have bifurcated during the 1980s. Real earnings of those who have attained a high-school diploma or less, have declined over the decade, while earnings of those with at least some post-secondary education have increased (Packer and Wirt, 1992). We expect that spatial differences in average incomes will be positively influenced by growth in spatial educational disparities, as measured by changes in the proportion of the working-age population in the suburbs that has at least some post-secondary education compared to the proportion of central-city residents.[8] Therefore, we expect that increases in spatial educational disparities (DIFHIED, for differences in higher educational attainment) will be associated with increases in spatial earnings disparities—a positive association.

The measure of the spatial difference in educational attainment we use is, admittedly, a crude approximation of human capital accumulation. The variable simply measures the number of years of school attendance. This is a suspect measure of educational accomplishment and human capital accumulation. Employers are more concerned with what an individual knows and the types of comportment likely to be displayed on the job than they are with the highest degree attained or years of schooling *per se*. Additionally, the variable we use cannot control for quality differences—no matter the source—that exist between city and suburban school systems. Yet, these quality differences are probably perceived by employers who are familiar with the products of local school systems. This means that the variable we use probably understates the contribution that differences in educational attainment play in determining spatial differences in per capita income.

Cumulative causation or persistence. We expect that much of the spatial difference in per capita income between central cities and their suburbs is cumulative, reflecting persistent historical patterns of development and the accumulation and distribution of capital in the built environment.[9] For this reason, we introduce relative differences in suburban and central-city per capita incomes in 1980 into the equations (DISPAR^{80}, for spatial income disparity in 1980). This variable mea-

sures relative differences in suburban and central-city per capita incomes, as a percentage of MSA per capita income and is defined as:

$$\{(RPKY_S^{80} - RPKY_C^{80})/RPKY_M^{80}\}*100$$

where: RPKY signifies real per capita income in 1982–1984 dollars, using CPI-U as the deflator (US Department of Commerce, 1992, p. 24); *S* signifies suburb; *C* signifies central city; *M* signifies metropolitan area; and the superscripts indicate the census year.

We interpret our measure of spatial income disparity in 1980, $DISPAR^{80}$, in keeping with Myrdal's (1944) concept of cumulative causation. These regression equations are dominated by explanatory variables that measure change. What is left out is the base from which change is occurring; this is captured by relative per capita income disparity in 1980, $DISPAR^{80}$. We expect that the cumulative causation proxy variable will be positively associated with the dependent variables in the regression equations. Thus, metropolitan areas with the largest disparities in per capita income between suburban and central-city residents in 1980 are expected to experience the greatest increases in disparity between 1980 and 1990.

Spatial-political structure. Metropolitan areas differ in the way they are organised politically, as well as in their size and history, all of which influence the spatial distribution of income between central cities and suburbs. We included three variables to capture these influences: change in the proportion of the metropolitan area's population that resides in the central city (DIFCC/MSA, for the percentage point difference over the decade in the proportion of the MSA's population that resides in the MSA's central cities and their suburbs); the number of people residing in the metropolitan area in 1980 ($MSAPOP^{80}$, for MSA population in 1980); and change in the concentration of the African-American population (DIFRACECON, for difference in racial concentration in the MSA).

Change in the proportion of MSA population residing in central cities. David Rusk (1993) emphasises the role that 'elasticity' plays in promoting equitable urban development. By this he means that cities that can annexe and grow spatially, and thereby incorporate their suburbs into a common fiscal unit, are in a better position to support services to the poor and to promote racial, as well as income, integration. From Rusk, we expect to find a negative association between change in the proportion of a metropolitan area's population that resides in central cities (DIFCC/MSA) and the suburban–central-city income gap—i.e. the greater the increase in the proportion of metropolitan residents residing in central cities (or the smaller the reduction), the smaller the increase in disparities.[10]

This expectation is reinforced by the fact that annexations, as well as out-migration from central cities, are selective. Annexations—which increase the proportion of the metropolitan population living in central cities—and out-migration—which decreases that proportion—should have different impacts, though both are supportive of the hypothesis. Central cities will attempt to annexe land containing higher-income residents, thereby increasing the per capita incomes of the central city while reducing the per capita incomes of the suburbs. This is consistent with the now-standard description of the positive income gradient within American metropolitan areas, from the core out to the rim of the area. Given this gradient, it makes sense to expect that the more geographically expansive the central city, the more of the income gradient it can capture. Out-migration, because of its selective nature, should increase income disparities, as residents with above average incomes move from central cities to suburbs.

In our universe of MSAs—those where suburban per capita income exceeded central-city per capita income in 1980—the expected relationship should be stated in the negative. Those MSAs where the percentage of the population living in the central city has declined the least should witness the smallest

increase in the gap between central-city and suburban per capita incomes. The proportion of metropolitan area population living in the central cities of this group of MSAs declined by an average of 2 per cent over the decade; the median loss was also 2 per cent.

Change in the spatial concentration of the African-American population. One reason for expecting that the concentration of the African-American population in central cities will be associated with increased per capita income disparity between suburbs and central cities is that, on average, the African-American community has lower incomes than does the white community. If the lower-income population is concentrated in one particular jurisdiction, such as a central city, average income in that jurisdiction should be lower than in other jurisdictions in the same region, holding everything else equal. This means that racial isolation should lead directly to spatial income disparity.

There are three other reasons to expect that racial concentration should be associated with increased spatial income inequality. We control for spatial differences in educational attainment, so this suspected cause of differences in income is accounted for in the estimating equations. This means that we must turn our attention to racial differences in the rates of return to education. Racial differences in rates of return can be due to quality differences in education not measured by educational attainment, as we mentioned earlier. Secondly, earnings differences can also be triggered by discrimination in the labour market, and research by the Urban Institute clearly demonstrates that hiring discrimination is substantial (Fix and Struyk, 1993; Turner *et al*., 1991). Thirdly, research on the spatial-mismatch hypothesis suggests that location in inner-city neighbourhoods of highly concentrated poverty can cause disruptions in the normal job-search networks that provide information about available employment opportunities, particularly in the suburbs, since few people in the neighbourhood have jobs, and fewer have suburban jobs (Holzer, 1994; Ihlanfeldt, 1994). Research on concentrated poverty indicates that low-income African-Americans are much more likely than low-income whites to reside in such areas and thus experience poorly functioning job-search networks (Massey and Eggers, 1990). Unfortunately, our variable is a fairly blunt instrument and cannot distinguish between these three possible explanations. Nonetheless, the existence of racial discrimination has the most support in the literature.

We measure spatial isolation cross-sectionally by subtracting the percentage of suburban residents in a given year who are African-American from the percentage of central-city residents who are African-American. We then subtracted the racial concentration variable in 1980 from the same variable in 1990 to measure change in the concentration of the African-Americans over the decade (DIFRACECON, for difference in racial concentration).[11] We expect to see a positive relationship between changes in the concentration of African-Americans from 1980 to 1990 (DIFRACECON) and change in the spatial distribution of income.

Diseconomies of scale. The last spatial-political variable that we include is the size of the metropolitan area in 1980, measured by taking the natural logarithm of the MSA population ($MSAPOP^{80}$). We use MSA population in 1980 as an explanatory variable because it is the scale at the beginning of the period that influences investment behaviour. Our universe of 111 MSAs gives us two estimating problems: the wide range of the variable and its skewed distribution. The size of MSAs ranges from Daytona Beach, Florida's 258 762 to New York's 8 274 961. MSAs are not normally distributed by size. The distribution is skewed, with most MSAs being at the smaller end of the scale. The distribution is smoothed, and the range of the distribution compressed, when the natural logarithm of population is used as the independent variable.

The expected sign of the scale economy variable is indeterminate. On one hand, there are three reasons to expect to find diseconomies of scale—marked by a positive correlation between the logarithm of population

size in 1980 and change in spatial income inequality (i.e. the greater the size of the metropolitan area, the greater will be the degree of spatial income disparity): MSAs with larger populations will be in and of themselves physically larger, increasing the opportunities for cities and suburbs to be segregated by occupation and income; larger MSAs will have longer commuting distances, increasing the cost of commuting; and, longer commuting distances will also increase the cost of obtaining information about employment opportunities. The latter two effects will have a more adverse impact on central-city residents seeking suburban jobs than on suburban residents seeking central-city jobs.

On the other hand, there are two reasons to expect to find increasing returns to scale—i.e. narrowing in spatial income inequality is associated with larger metropolitan areas—one economic and the other a statistical artifact. We hypothesise that large MSAs tend to have a larger proportion of their economic activity generated by their central business districts, opening up earnings opportunities for central-city residents and making central-city residential locations more desirable for the employed. This is due to the fact that large MSAs are, by definition, big places that have pre-existing economic specialisations in activities that are either space-intensive (activities that thrive in large and dense environments) or are, at a minimum, density-tolerant. The greater importance of central cities in large MSAs is also a statistical artifact of the US Census. Population and investment flows in large MSAs are also large. This means that when investments are made on the fringe of a large MSA, there is a greater likelihood that they will be of sufficient scale to generate a new MSA, thereby changing an existing MSA into a Primary Metropolitan Statistical Area (PMSA); the new MSA will also become a PMSA and the two will then form a Consolidated Metropolitan Statistical Area (CMSA). This generates a new PMSA out of what, in a smaller place, would be just another prosperous suburban employment node. This study uses data from MSAs and PMSAs, ignoring CMSAs.

Regional production characteristics. A set of dummy variables are entered into some of the models to account for common cost, production and growth characteristics shared by broad regions in the US. These are entered as a set of three dummy variables that represent three of the four Census Divisions: East—the New England and Middle Atlantic Census Regions; North Central—East and West North Central Regions, which we label the Midwest in our results; and South—the South Atlantic, East and West South Central Regions. The West Division—the Mountain and Pacific Regions—is omitted from the regression equations and becomes our reference region.

One of the econometric problems encountered in the estimation is the high degree of collinearity between the regional dummy variables and some of the other independent variables, especially the growth rate of durable goods employment (DURGROW). We report the equations with and without the regional dummies so that the effect of multicollinearity can be observed.

3. Findings: Change in Per Capita Income Disparities from 1980 to 1990

The statistically significant determinants of increases in relative disparity in per capita income between central cities and their suburbs from 1980 to 1990 are:

(1) increases in the tightness of the regional labour market;
(2) higher rates of decline of durable goods employment from 1980 to 1990;
(3) increases in the difference in the percentage of adults who obtained education beyond secondary school;
(4) higher relative levels of income disparity in 1980—what we call persistence or cumulative causation;
(5) increases in the proportion of the metropolitan area population that live in the central city—because the central cities of

Table 2. Change in per capita disparities between suburbs and their central cities from 1980 to 1990: 111 MSAs and PMSAs with 1980 populations of 250 000 or more, and suburban per capita incomes greater than central-city per capita incomes in 1980

Dependent variable: CHGDISPAR

	Equation (1)	Equation (2)
R^2	0.629	0.659
Adjusted R^2	0.607	0.628

Independent variable	Estimated coefficient	*t*-statistic	Significance	Estimated coefficient	*t*-statistic	Significance
DIFEMP/POP	0.50	2.03	**	0.43	1.74	*
DURGROW	−0.69	−3.60	***	−0.47	−1.91	*
DIFHIED	1.49	6.74	***	1.52	6.87	***
$DISPAR^{80}$	0.32	6.41	***	0.29	5.71	***
DIFCC/MSA	0.62	2.96	***	0.39	1.72	*
$MSAPOP^{80}$	−0.09	−0.66		0.02	0.12	
DIFRACECON	0.24	1.98	**	0.25	2.10	**
EAST				2.05	1.06	
MIDWEST				−0.79	−0.41	
SOUTH				−2.84	−1.60	

***significant at the 0.01 level.
**significant at the 0.05 level.
*significant at the 0.10 level.

the 111 MSAs in our universe lost population over the decade, it is more appropriate to interpret the result as decreases in the proportion of the population living in central cities being associated with narrowing spatial income disparities; and

(6) increases in the concentration of the African-American population in the central cities of MSAs.

Equation (1) in Table 2 is the basic estimating model, purged of regional dummy variables, while equation (2) includes the regional dummies.[12] None of these dummies is significantly different from zero, however there is evidence from the variance–covariance matrix that the change in the employment-to-population ratio and change in durable goods employment both co-vary with the Eastern and Midwestern dummy variables (the co-variance is relatively large and negative in the case of change in the employment-to-population ratio, and large and positive in the case of change in durable goods employment) which would influence the standard errors of all three variables. We caution the reader to remember that our universe is of MSAs where suburban per capita incomes were higher than central-city per capita incomes in 1980. There were 41 MSAs where this relationship was reversed and they were concentrated in the southern and western Census Divisions. We now turn to an examination of each of the sets of factors that we hypothesise influence changes in the city–suburban income gaps.

3.1 Changes in Labour Market Conditions

The two labour market hypotheses are directly tested in each equation in Table 2. Our expectation, based on the first hypothesis—central-city labour can serve as a substitute for suburban labour—is that the sign of change in the employment-to-population ratio, DIFEMP/POP, would be negative, indicating that tightening labour markets are associated with narrowing relative income disparities. Our expectation, based on the alternative hypothesis—that central-city labour is not a substitute for suburban labour over the range of currently acceptable macroeconomic conditions—is that the sign of the change in the employment-to-population ratio will be positive, indicating that

tightening employment-to-population ratios are associated with increasing relative per capita income disparities.

Tightening employment-to-population ratios over the decade in MSAs where suburban per capita income exceeded central-city per capita income in 1980 are associated with widening suburban–central-city per capita income differences at the 0.05 level of significance.[13] The association weakens a bit when the regional dummies are entered into the equation.

The growth rate in durable goods manufacturing employment over the decade is negatively associated with changes in spatial differences in relative real per capita income—that is, higher rates of durable goods employment decline (DURGROW) are associated with widening suburban–central-city differences in per capita income.

3.2 Differences in Human Capital

Given the increasingly important role that post-secondary education plays in the US labour market, we expect that changes in the difference in suburban and central-city higher educational attainment (DIFHIED) will be positively related to changes in spatial income gaps—i.e. increased spatial differences in higher educational attainment will be associated with increased spatial income gaps. The statistical results strongly support this expectation. Each 1.0 percentage point change in the difference in higher educational attainment between suburbs and their central cities is associated with about a 1.5 per cent increase in the relative gap between suburban and central-city per capita incomes. What is clear from these results is that spatial differences in the percentage of the adult population who have some post-secondary education are at the root of spatial differences in per capita income.

3.3 Cumulative Causation

Change in spatial income inequality over the decade between central cities and their suburbs is heavily predicated upon the degree of spatial income inequality at the beginning of the period. Every percentage point difference between suburban and central-city per capita incomes in 1980 generated between a quarter and a third of a percentage point increase in spatial inequality at the end of the period. These results indicate that, on the whole, spatial inequalities are long-lasting.

3.4 Spatial-political Structure

Three spatial-political variables are included in the regression models. We expected the relationship between changes in the percentage of the MSA population residing in the central city (DIFCC/MSA) and changes in spatial differences in per capita income to be negative—increases in the proportion would lead to narrowing spatial per capita income differences. Instead, the results are strongly, and consistently, positive—i.e. decreases in the proportion of an MSA's population living in its central city are associated with narrowing disparities.

How do we explain this result? First, we control for changes in the educational attainment of suburban and central-city populations, and income levels are more closely associated with education than any other variable. The lesson to be learned is that it is not the proportion of the population that any jurisdiction houses that determines average income levels, but whom it houses. Secondly, a number of these MSAs have been experiencing substantial decline, both in absolute and relative terms, since the 1950s and some sort of low-level equilibrium may have been reached (implying that there are suburbs that nearly match the average level of economic distress that depicts the central city).

The size of the MSA in 1980 had no statistically significant impact on changes in the spatial income gap. We cannot make a statement about the existence of either scale economies or diseconomies.

We expected that changes in the spatial concentration of the African-American population over the decade will accentuate changes in per capita income disparities and

show a positive sign (i.e. increases in concentration will lead to increases in disparities). There was a positive association between the percentage point change in racial concentration over the decade (DIFRACECON) and the dependent variable. In these equations, a one percentage point increase in racial concentration over the decade was associated with a 0.25 per cent increase in relative spatial per capita income inequality.

3.5 Summary

Cumulative causation and changes in spatial differences in educational attainment are closely associated with increases in spatial inequality in per capita income. When the difference in educational attainment of suburbs and central cities diverges by a percentage point, spatial inequality increases by 1.5 percentage points. For the group of MSAs we modelled, each percentage point difference in suburban and central-city per capita income in 1980 is associated with a 0.3 per cent increase in spatial inequality 10 years later. The decline in durable goods employment also affected spatial income inequalities; a 1 per cent decline in durable goods employment is associated with an increase in the spatial income gap of between 0.5 per cent and 0.7 per cent. Each percentage point increase in the concentration of the African-American population resulted in a quarter percentage point increase in spatial inequality. Finally, once differences in educational achievement and the other variables included in the equation have been taken into account, expanding the political reach of the central city did not solve spatial income inequality—in fact, increasing the proportion of a metropolitan area's population residing in central cities is associated with increased inequality.

In the next section of the paper, we compare sub-sets of the MSAs in our universe in an attempt to determine what differentiates those places that most narrowed city–suburban income differences. We want to know what works.

4. Comparing High and Low Performance MSAs

Since public policy is especially concerned with metropolitan areas where suburban incomes exceed central-city incomes, and is especially interested in those MSAs that experienced the smallest changes in this spatial income relationship to determine what helps central cities to retain their wealthier population, we subjected our universe of MSAs to additional examination. We compared and contrasted two groups of high-performance MSAs (those with the smallest change in spatial income gaps) with their lower-performance reference groups.

First, we combined the 7 MSAs that narrowed spatial income gaps over the decade with the 10 MSAs that had the smallest increase in their spatial income gaps, calling them the 'national high-performance' group, and contrasted them with the remainder of the universe of MSA, which form the reference group.[14] This is the comparison in the upper half of Table 3. We then took all of the MSAs in the New England, Middle Atlantic and East North Central Census regions (for convenience sake we call these the 'Rust Belt' MSAs) and divided them into two groups: those with the nine lowest spatial per capita income gaps and the remainder.[15] This test forms the lower half of Table 3. The MSAs that are in each comparison group are listed in Table 4. The national group is listed in the upper half of the table and the Rust Belt high-performance group in the lower half. The goal of these last two exercises was to identify differences between the better- and poorer-performing MSAs.

We used a *t*-test to identify which of the independent variables used in the regression equations, or variables used to construct the independent variables, differed the most among these high- and low-performing MSAs. We also examined the percentage difference in the means of the two groups, to see which were qualitatively large. We decided that if the difference in the means was 100 per cent above or below the grand, or group, mean, it would be included even if the

Table 3. Difference in means tests: national MSA comparison (17 National high-performance groups compared to the Remaining 94 MSAs) and Rust Belt MSA comparison (9 MSAs with the lowest change in spatial income gap in the New England, Middle Atlantic and East North Central Census Regions versus the other 50 MSAs)

Variable	Reference Group Mean (%)	High Performance Mean (%)	*t*-statistic[a]	Significance	Difference in Means (%)[b]
National comparison					
$HIED^{90}$	7.3[c]	−1.2[d]	1.977	**	140.7
$HIED^{80}$	4.4	−2.4	2.057	**	203.0
DIFHIED	2.9	1.3	3.398	***	60.0
PCT CITY $HIED^{80}$	29.4	37.3	−1.680	*	−25.7
DIFRACECON	1.4	−0.3	1.287		146.8
DURGROW	−4.3	−2.0	−4.512	***	59.5
Rust Belt comparison					
$HIED^{90}$	9.8[e]	−3.2[f]	3.910	***	166.8
$HIED^{80}$	7.1	−3.6	3.255	***	197.1
DIFHIED	2.7	0.4	4.205	***	97.8
DIFRACECON	2.3	−0.4	3.274	***	142.3
DIFCC/MSA	−1.9	−0.7	−1.819	*	70.4

[a] *t*-test is for two independent samples: $t = (M_1 - M_2)/S$ and $S = \{((S_1 + S_2)/(N_1 + N_2 - 2))*((1/N_1) + (1/N_2))\}$ where: M_i represents the mean of the ith sample, S_i represents the sum of squared differences in the ith group, $(X_{ji} - M_i)^2$ for the jth observation of the ith group; N_i is the number of cases in group i.
[b] Difference in means: $\{\{M_1 - M_2\}/\{(M_1*(N_1/N)) + (M_2*(N_2/N))\}\}*100$.
[c] Mean of 94 MSAs.
[d] Mean of 17 MSAs.
[e] Mean of 50 MSAs.
[f] Mean of 9 MSAs.
***significant at the 0.01 level,
**significant at the 0.05 level,
*significant at the 0.10 level.

t-test indicated that there was not a significant difference between the two values. The racial concentration variable (DIFRACECON) for the national comparison group was included under this criterion.

The largest group of variables consists of the higher educational attainment variables. In both tests, the percentage of adult central-city residents of high-performance MSAs with advanced education exceeded the percentage in their own suburbs (both $HIED^{80}$ and $HIED^{90}$ are negative in the second column of numbers and positive in the first). Also, the gap between cities and their suburbs in the proportion of their population with higher education increased at a lower rate between 1980 and 1990 in the two sets of high-performance MSAs (DIFHIED). The change in the proportion of the regional workforce employed in durable goods industries (DURGROW) is strongly associated with narrowing spatial income disparities. The 17 national high-performance MSAs lost 2 per cent of their durable goods workforce over the decade, while the reference group lost over 4 per cent of their durable goods employment base.

The change in the spatial concentration of the African-American population (DIFRACECON) was another significant difference between the two groups of higher-performing MSAs and their reference groups. While the difference was not statistically significant between the 17 national high-performance MSAs and their reference group, there was a 147 per cent difference in the mean values in this variable. In the 17 national high-performance MSAs, racial concentration decreased a bit (0.3 per cent) while it increased in the reference group by 1.4 per cent. On

Table 4. Comparison groups for the difference in means tests; MSAs where suburban per capita incomes exceeded city incomes but the gaps either narrowed, or didn't grow by very much: national high-performance MSAs (7 MSAs that narrowed the income gap and 10 MSAs with the lowest increase in the spatial income gap) and Rust Belt high-performance MSAs (9 Northeastern and Midwestern industrial MSAs with the smallest increase in the suburban–central-city gap in per capita income)

MSA	State	CHGDISPAR	$DISPAR^{90}$	$DISPAR^{80}$
National high-performance MSAs				
Wilmington	Delaware	0.15	2018	2003
Tampa	Florida	1.47	689	565
Daytona Beach	Florida	1.68	1223	1089
Columbia	South Carolina	1.69	1319	1183
Las Vegas	Nevada	1.84	419	234
Pittsburgh	Pennsylvania	2.21	1318	1114
Austin	Texas	2.33	413	207
Denver	Colorado	2.44	978	714
Washington	District of Columbia	3.16	1201	815
Portland	Oregon	3.38	914	569
Fresco	California	− 0.35	463	493
Atlanta	Georgia	− 3.92	1380	1746
New Orleans	Louisiana	− 3.39	903	1192
Chattanooga	Tennessee	− 0.85	180	247
Beaumont	Texas	− 0.21	432	451
San Diego	California	− 0.44	− 35	7
Seattle	Washington	− 3.72	− 385	35
Rust Belt high performance MSAs				
Pittsburgh	Pennsylvania	2.21	1318	1114
Madison	Wisconsin	4.60	611	160
Rockford	Illinois	4.67	561	113
Evansville	Indiana	5.20	1335	871
Jersey City	New Jersey	5.48	1776	1346
Columbus	Ohio	5.76	1853	1337
Saginaw	Michigan	6.26	1072	511
Utica	New York	6.98	1115	602
Indianapolis	Indiana	7.20	1206	528

average, the 9 higher performance Rust Belt MSAs also saw a decline in the spatial concentration of their African-American population (0.4 per cent) while the 50 MSAs in the reference group saw racial concentration in their central cities increase by 4.3 per cent.

The MSAs listed as high-performance MSAs in Table 4 are suggestive. Four of the nine higher-performance MSAs in the Rust Belt are state capitals and/or major university centres: Pittsburgh, Madison, Columbus and Indianapolis. The same holds true for 8 of the 17 high-performance MSAs in the national comparison group (Pittsburgh is a member of both groups). The implication is that state government and large urban concentrations of higher education are sectors of the economy that both grew in the 1980s and are sectors where central cities can compete to house the higher-paid members of the workforce.

A second characteristic shared by the MSAs in the two high-performance groups is that, with the exception of Washington, DC, they are relatively isolated; they are not part of large conurbanised regions. A third characteristic is that all of the seven MSAs that narrowed spatial income gaps are lo-

cated in the South and West. These seven MSAs are: Atlanta, Beaumont, Chattanooga, Fresno, New Orleans, San Diego and Seattle. All but 3 of the 17 national high-performance MSAs are also in the South or West. This result has little or no bearing on the relationship between spatial income equality and the temperature–humidity index and everything to do with the economic age of the metropolitan areas and the rate of growth of the industries that make up their economic bases (with the prominent exception of New Orleans; some of its suburbs have suffered more severely from the collapse of the oil and shipping industries than has the central city).

5. Summary

We have seven findings:

(1) We examined two hypotheses with respect to the impact of changes in labour market conditions on spatial income disparities. We found the demand for central-city labour to be inelastic in the currently acceptable macroeconomic environment. Tightening labour markets (as measured by changes in the ratio of employed workers to working-age population) resulted in increased disparities because, we speculate, such conditions induced a greater labour force participation response in the suburbs from secondary earners (such as teenagers, women and elders).

(2) The decline in durable goods employment was directly related to the degree of disparity and to changes in disparity.

(3) Differences in human capital between suburbs and cities play a very strong role in explaining changes in disparities in per capita income between suburbs and central cities in metropolitan areas. The greater the change between suburbs and cities in the proportion of their population with more than a high school education in a metropolitan area, the greater the disparity in per capita income between suburb and central city.

(4) The change in disparity between 1980 and 1990 was closely related to the degree of disparity in 1980. We take this to mean that cumulative causation processes are at work.

(5) The proportion of a metropolitan area's population that is located in the central city is descriptively related to the extent of a metropolitan area's disparity—i.e. the larger the increase (or slower the decline) in the proportion of the metropolitan area's population living in the central city, the lower the disparities. However, when examined in a multivariate context, this relationship disappears. The relationship between the proportion of a metropolitan area's population residing in the central city and spatial income disparity is apparently spurious. This relationship instead reflects the impact of other variables that co-vary with the proportion of metropolitan population in the central city.

(6) Racial concentration is related to change in disparity over time. The greater the change in racial concentration, the wider the disparity in per capita income. We believe that this finding reflects the lower incomes that African-Americans receive as a result of racial discrimination in metropolitan labour and housing markets.

(7) When the lists of high-performance MSAs are examined, the results suggest that state capitals and/or major university centres perform better than do other MSAs. The implication is that state government and higher education are sectors of the economy that both grew in the 1980s and are sectors where central cities can still compete to house higher-paid members of the workforce. A second characteristic shared by the MSAs in the two high-performance groups is that, with the exception of Washington, DC, they are relatively isolated; they are not part of large conurbanised regions. A third characteristic is that all of the 7 MSAs that narrowed spatial income gaps are located in the South and West, and of

the 17 national high-performance MSAs, all but 3 are in the South or West. This result is most likely to be related to the economic age of these metropolitan areas and the rate of growth of the industries that make up their economic bases.

Notes

1. A longer discussion of these points is contained in Mieszkowski and Mills (1993) and Hill *et al.* (1995).
2. The Bureau of the Census uses a four-part definition to identify municipalities as central cities (US Department of Commerce 1991, p. 356). The definition identifies a number of municipalities as central cities that upon inspection appear to be either very large suburbs with significant employment bases—in this sense they resemble 'edge cities' or suburban corporate headquarters campuses—or former factory towns that were once economically independent of true central cities and have now been swallowed up by expanding metropolitan areas. We narrowed the Census definition of a central city to better suit our purposes. First, we defined the largest municipality in a MSA or PMSA, as identified by the Census Bureau, as a central city. We also classified the next-largest municipality in the MSA or PMSA as a central city if: (a) it has a population of at least 100 000; (b) it has an employment-to-resident ratio greater than or equal to 0.75; and (c) less than 60 per cent of the employed residents out-commute. We use these criteria to include large 'twin' central cities, such as Los Angeles and Long Beach, yet to exclude very large suburban communities that are part of the same large urban complexes, such as Pasadena. Other municipalities are classified as central cities if they are at least half the size of the primary central city and (a) have an employment-to-resident ratio greater than or equal to 0.75; and (b) less than 60 per cent of the employed residents out-commute. These criteria are used to include cities that are part of metropolitan areas that evolved from proximate independent groups of approximately equal-sized industrial cities. Here the tri-city area of Albany, Troy and Schenectady in New York State serves as an example. We then aggregated across the central cities that were thus identified.
3. These are real 1982–84 dollars.
4. We use total family income as reported in the Census of Population to measure income for individual reporting units. In other words, these figures are true means not grouped means based on averaging the per capita incomes for the various units of government. Reported income is the annual amount for the calendar year that precedes the Census. The percentage change in relative real income disparity is: $\{\{RPKY_S^{90} - RPKY_C^{90}\} - \{RPKY_S^{80} - RPKY_C^{80}\}\} / RPKY_M^{80}\}*100$. Where RPKY represents real per capita income in 1982–84 dollars using CPI-U as the deflator (US Department of Commerce, 1992, p. 24); *S* represents suburb; *C* represents central city; *M* represents metropolitan area; and the superscripts indicate the census year.
5. Recent work by Timothy J. Bartik (1996) supports this hypothesis.
6. There was a second change over the decade that contributed to increases in income disparities. Many states lowered real per capita income transfers to the poor, particularly Aid for Families with Dependent Children (AFDC) and General Assistance (GA). As the metropolitan poor disproportionately live in central cities, lowering transfers adds to existing disparities caused by restructuring of the demand for labour. Changes in transfer policies varied among the states but, on the whole, decreases in the real per capita value of transfers added to increased earnings disparities to produce widened spatial income disparities.
7. The employment-to-working-age population ratio is multiplied by 100 providing two improvements in interpreting the results. First, it makes the variable of the same order of magnitude as the other independent variables, allowing the regression coefficient to be more easily compared. Secondly, the interpretation of the relationship between the independent and dependent variables is improved because by definition a ratio can never exceed one and therefore it makes no sense to increase the ratio by one unit.
8. The variable is constructed by subtracting the percentage of the central-city adult population with educational attainment beyond secondary school from the proportion of the adult suburban population with educational attainment beyond secondary school. The variable for 1990 is labelled $HIED^{90}$, and for 1980 it is $HIED^{80}$. The percentage point change in the difference over the decade ($HIED^{90}$-$HIED^{80}$) is DIFHIED. We also measured changes in the difference in the occupational composition of central cities and their suburbs over the decade. As rates of

return for different levels of education have shifted over the decade, so have rates of return for different occupations. Earnings for professional and managerial workers have kept pace over the decade, while earnings for blue-collar and semi-skilled labour have declined. We defined $PROF^{90}$ as the percentage change in the difference between suburbs and central cities in the proportion of people employed in professional and managerial occupations in 1990. Unfortunately, the distribution of this variable is nearly identical to the educational attainment variable and could not be included in the estimating equations. The correlation coefficient between $PROF^{90}$ and $HIED^{90}$ was 0.96.

9. Bartik (1991) found that metropolitan job growth had "extremely persistent" impacts on labour force participation rates and unemployment rates (see pp. 81–112).
10. CC/MSA^{90} measures the percentage of the MSA's population that resides in central cities in 1990 and CC/MSA^{80} measures the same percentage for 1980. DIFCC/MSA measures the percentage point change over the decade. The central-city population variable we use is based on Census definitions of central cities and, as such, they must be interpreted with care. This variable is the percentage point change in the percentage of MSA residents who live in the central *cities* of a metropolitan area, as we have defined them. It is tempting to interpret DIFCC/MSA as the change in the percentage of people who live in the primary central city of the MSA, but this is wrong because the Bureau of the Census defines more municipalities than the primary central city as being a central city.
11. Racial concentration in 1990 ($RACECON^{90}$) is calculated as: $\{\{AA_C^{90}/POP_C^{90}\}*100 - \{AA_S^{90}/POP_S^{90}\}*100\}$. The variable for 1980 is labelled $RACECON^{80}$. AA represents the African-American population; POP is total population; *S* represents suburb; *C* represents central city; the superscripts indicate the Census year. The variable DIFRACECON measures the percentage point difference in these two variables over the decade: $\{RACECON^{90} — RACECON^{80}\}$.
12. There is always a concern over the possible impact of collinearity in equations such as these. Several variants of the basic model were run so that the impact of collinearity could be inspected. There are two areas of concern. First is the high correlation between the regional dummy variables and change in durable goods employment (DURGROW). The second is between the eastern dummy variable and the cumulative causation variable ($DISPAR^{80}$). We report equations that were estimated without a constant term. This was done for two reasons. First, there was a high degree of correlation between the constant and the logarithm of MSA population in 1980 (-0.98) and the cumulative causation variable (0.43). The MSA population variable essentially acts as the intercept for the equation. Secondly, the equations are robust and there is little difference in the signs and significance of the independent variable, with one exception. The labour market variable (DIFEMP/POP) appears to be adversely affected by the interaction of the constant term and the EAST dummy variable.
13. There is a high degree of first-order correlation between the MSA population variable, $MSAPOP^{80}$, and the change in the employment-to-population ratio (DIFEMP/POP), -0.77. We estimated this equation without $MSAPOP^{80}$ to determine the impact of possible collinearity. All of the variables retained their signs and degrees of significance in the re-estimated equation, however, the exact *t*-ratios and estimated coefficients did change a bit. In the end, the results did not change drastically.
14. Where a line is drawn and which MSAs are included in any group is ultimately arbitrary. We selected the lowest 10 in the Suburb Gap Increases group based on the distribution of the percentage point change in spatial per capita income disparity over the decade (CHGDISPAR) within this group. This included all MSAs where the percentage point change in spatial per capita income disparity over the decade (CHGDISPAR) was less than 4. All were 1.20 standard deviations below the mean value. One standard deviation below the mean would have included 18 cases, and one and a half standard deviations below would have included just one case.
15. We chose the lowest nine because these were all one standard deviation below the mean value.

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