POWER COUPLES: CHANGES IN THE LOCATIONAL CHOICE OF THE COLLEGE EDUCATED, 1940–1990*

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College educated couples are increasingly located in large metropolitan areas. These areas were home to 32 percent of all college educated couples in 1940, 39 percent in 1970, and 50 percent in 1990. We investigate whether this trend can be explained by increasing urbanization of the college educated or the growth of dual career households and the resulting severity of the colocation problem. We argue that the latter explanation is the primary one. Smaller cities may therefore experience reduced inflows of human capital relative to the past and thus become poorer.

I. INTRODUCTION

Couples in which both husband and wife have at least a college education are increasingly, and disproportionately, located in large metropolitan areas. In 1940 32 percent of all college educated couples were located in metropolitan areas of at least 2 million. By 1970 this figure was 39 percent and by 1990 50 percent. In contrast, there has been little change in the proportion of couples in which neither spouse has a college education in large cities. In 1940 27 percent of these couples were located in large metropolitan areas, and in 1970 30 percent were. By 1990 only 34 percent were.[1]

Two main factors may account for the disproportionate increase in college educated couples' propensity to be in a large city. The college educated, regardless of marital status, may be becoming more urbanized, perhaps because the returns to education in large cities are rising relative to those in small cities or because such urban amenities as access to cultural activities are normal goods.[2] In addition, more of the college educated may now be

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1. Estimated from the integrated public use census samples [Ruggles and Sobeck 1997].

2. Of course, the cost of living in a large metropolitan area is higher rents and, for those living in central cities, such urban disamenities as crime and pollution. However, since 1970 these disamenity costs have been falling [Glaeser 1998; Kahn 1997].

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meeting and marrying in large cities because fewer of their marriages are now formed in high school or college and because more of the single college educated are moving to large cities. If they remain in large cities, the proportion of college educated couples in large cities will increase.

Second, as more households become dual career households, more of them face a colocation problem. All dual career households are more likely to be joint decision makers, and they face the difficulty of finding two jobs commensurate with the skills of each spouse within a reasonable commute from home. In 1940, among couples in which the husband was 25 to 39 and the wife 23 to 37 and in which both had at least a four-year college education, only 20 percent of wives worked. By 1990 73 percent of them were in the labor force.[3] The colocation problem is likely to be particularly severe for the college educated. As documented by Goldin [1997], by 1990 college educated women aspired to careers, not to the jobs held by their counterparts in the 1970s. The resulting colocation problem should lead to the greater concentration of college educated couples in large metropolitan areas because such areas offer many more potential job matches. Furthermore, if the returns to education are greater in larger cities because large cities permit specialization, the financial sacrifice of living in a small relative to a large metropolitan area would be greater for a dual career family than for other household types.

This paper documents trends in locational choice since 1940 between large, midsize, and small cities by household type. We examine whether the long-run trends are most consistent with a worsening of the colocation problem or with the growing urbanization of the college educated. We predict that if colocation is a plausible explanation then dual career households will be disproportionately represented in large cities relative to other couple types. In contrast, if urbanization were the primary explanation, then we should not observe a disproportionate increase in college educated couples in large metropolitan areas relative to college educated singles. We find that colocation is the most likely explanation for the observed trend in locational choice.

Our findings have implications for city growth and for family economics. As skilled professionals are increasingly bundled with an equally skilled spouse, their demand for large cities will

3. Estimated from the integrated public use census samples [Ruggles and Sobeck 1997].

increase. The presence of large numbers of highly skilled workers within a concentrated geographic area may in turn provide positive growth externalities.[4] Smaller cities, particularly those located in low amenity areas, may experience reduced inflows of human capital relative to the past and therefore become poorer. We present some suggestive evidence on the ability of firms in small cities to attract highly skilled workers by examining how the relationship between city size and the quality of university graduate programs has changed since 1970. Colocation increases inequality not only across city size but also among households. Because large cities facilitate the matching of the highly educated and because they enable professional couples to solve their joint location problem, large cities magnify household income inequality. Large cities may also preserve the marriages of dual career households because living in large metropolitan areas with diversified labor markets reduces the degree to which both husband and wife must compromise their individual gains from marriage [Mincer 1978].

II. Trends

We view all households as one of five types: "power" couples in which both spouses have a college education, "part-power" couples in which only one spouse has a college education, "low-power" couples in which neither spouse has a college education, and single households of the college educated and the noncollege educated. We define the college educated as those who have completed four or more years of college in 1940, 1970, and 1980 and those who hold a bachelor's or graduate degree in 1990 (see the Appendix for details). We distinguish between college and noncollege rather than postcollege (more than four years of college completed in 1940, 1970, and 1980 and a graduate degree in 1990), college, and noncollege because the postcollege represent a small proportion of the population and because college educated women experienced greater career growth.[5] We define two individu-

4. This insight has been incorporated in theoretical models [Lucas 1988; Acemoglu 1996] and is supported by empirical investigations of the relationship between wages and average human capital [Heckman, Layne-Farrar, and Todd 1996; Rauch 1993] and local growth and average human capital within a city [Simon 1998; Glaeser, Shleifer, and Scheinkman 1995].

5. The postcollege educated were more likely to have careers in 1970 whereas the college educated were more likely to have "jobs." In 1970 and 1990 couples in which both husband and wife had a postcollege education were more likely to be in a larger rather than a smaller metropolitan area. The growth in power couple

TABLE I
PERCENTAGE OF MARRIAGES BY COUPLE TYPE

	1940	1960	1970	1980	1990
Low-power	90.3	82.5	76.8	67.6	66.2
Part-power	7.3	12.3	14.6	18.4	18.5
Power	2.4	5.2	8.6	14.0	15.3

A power couple is defined as one in which both husband and wife are college graduates, a part-power couple as one in which only one spouse is a college graduate, and a low-power couple as one in which neither spouse is a college graduate. All numbers are estimated from the integrated public use census samples [Ruggles and Sobek 1997] and are for households in which the husband was age 25 to 39 and the wife 23 to 37.

als to be a couple if they are married to each other and are both in the same household. Singles can be either never married, divorced, or widowed. Both couples and singles may be in multifamily households. We examine couples in which the husband was 25 to 39 years of age and the wife 23 to 37. This age restriction allows us to examine couples in the early stages of their careers and also allows us to create a comparable group of singles. We impose the same age restrictions on singles.

II.1. Trends: Power Couple Formation

The proportion of married couples in which both husband and wife have at least a college education has increased from 2 percent in 1940 to 15 percent in 1990 (see Table I). The percentage increase in the proportion of couples in which only one spouse has a college education has been smaller, rising from 7 percent in 1940 to 18 percent in 1990.[6] These increases in the relative proportion of power couples arose largely from greater college attendance rates, which in turn were spurred both by the growth of public universities and of high schools and by the rising economic returns to college.[7]

Rising wives' labor force participation rates have turned couples into true dual career households and increased the fraction of couples with a colocation problem. This is particularly true for power couples because increases in wives' labor force

concentration in large metropolitan areas was slightly more pronounced among the college educated compared with the postcollege educated.

6. Among part-power couples in 1940, the husband was the college educated spouse in 76 percent of all cases. In 1990 he was the college educated spouse in 63 percent of all cases.

7. Although prime-aged women in 1970 gained little direct economic return from their degrees, their indirect gains were considerable because for them college was a marriage market [Goldin 1992].

TABLE II
EMPLOYMENT AND FERTILITY TRENDS BY EDUCATION OF COUPLE

	1940	1960	1970	1980	1990
Wife works (%)					
Low-power	18.1	27.0	36.6	52.3	64.2
Part-power	18.3	22.7	34.5	57.4	70.4
Power	20.1	29.6	43.4	64.8	73.3
Have child (%)					
Low-power	73.1	89.9	90.2	85.9	83.4
Part-power	60.9	86.8	82.7	74.6	72.6
Power	58.0	81.3	72.9	64.4	62.7
Wife works and works full-time (%)					
Low-power	73.6	68.0	64.8	66.8	68.5
Part-power	73.4	65.7	60.5	65.6	68.7
Power	68.1	62.7	58.1	68.1	70.2
Wife works and in traditionally female job (%)					
Power	71.5	71.4	73.2	59.4	42.7

A full-time job is defined as 35 hours or more per week. A traditionally female occupation is defined as one in which women were overrepresented relative to men in 1970; that is, one in which more than 50 percent of all employees age 18 to 64 were women in 1970. All couples are restricted to those in which the husband was 25 to 39 years of age and the wife 23 to 37. All numbers are estimated from the integrated public use census samples [Ruggles and Sobek 1997]. A power couple is defined as one in which both husband and wife are college graduates, a part-power couple as one in which only one spouse is a college graduate, and a low-power couple as one in which neither spouse is a college graduate.

participation rates have been larger among power than among low-power couples (see Table II).[8] The labor force participation rate of power couple wives rose from 20 to 73 percent between 1940 and 1990, whereas the increase for low-power wives was from 18 to 64 percent. Since 1970 the increase in full-time work was greatest among power wives.

Other fundamental economic changes have also increased the costs to a household of picking a city size in which the wife earns relatively little. The proportion of working power couple wives in such traditional female occupations as schoolteacher, nurse, librarian, or social worker fell from 72 to 43 percent between 1940 and 1990. The percentage with at least one child rose to 81 percent in 1960 from 58 percent in 1940, but by 1980 had fallen to 64 percent. Prime-aged college educated women in 1940 generally became schoolteachers upon graduation, leaving the labor force because of

8. Some of the growth in wives' labor force participation rates may arise from the increased propensity of women who aspire to careers to marry [Goldin 1997].

marriage bars. Goldin [1997] describes their experience as "first jobs then family." In contrast the experience of their 1970 counterparts was "first family then jobs." The majority majored in such fields as education and nursing where few men got degrees and upon graduation had been tracked into traditionally female sectors, regardless of their majors. They left the labor force when their first child was born and only reentered when all children were in school. By 1990, and to a lesser extent by 1980, college educated women aspired to "career then family" or "career and family" [Goldin 1997]. Their college majors were similar to men's, and in terms of labor supply parameters they began to resemble men as well, with small wage and income elasticities [Goldin 1990, pp 119–158].

II.2. Trends: Locational Choice

We study trends in household locational choice conditional on marital status and on the education of both spouses. That is, for every year, we estimate

(1) Prob (lives in big city|household type).

Our data come from the 1940 and 1970–1990 integrated public use census samples. We classify the suburbs of central cities as part of the labor market of the central city and create three city size categories: large metropolitan areas (those with populations of at least 2 million), midsize metropolitan areas (those with populations of between 2 million and 250,000), and small and nonmetropolitan areas (metropolitan areas with populations of less than 250,000 and nonmetropolitan areas). Although we document trends from 1940 to 1990, our discussion will emphasize the 1970 to 1990 trends because this was the period of growth in wives' careers. An additional advantage of focusing on this period is that the definition of a metropolitan area was most comparable from 1970 to 1990 and because there is likely to be less measurement error in our classifications of households by educational levels.[9] Details about variable construction and comparability are provided in the Appendix.

Table III illustrates trends in locational choice between large and midsize metropolitan areas and small localities. Note that the

9. College graduation rates are overstated in the 1940 census in part because individuals who went to the preparatory department within a college were enumerated as having gone to college. We thank Claudia Goldin for pointing this out to us.

TABLE III
PROBABILITY OF LOCATIONAL CHOICE BY HOUSEHOLD TYPE

	1940	1970	1980	1990
Conditional on power couple				
Large metropolitan area	0.321	0.391	0.414	0.495
Midsize metropolitan area	0.254	0.313	0.325	0.295
Small and nonmetropolitan area	0.426	0.296	0.261	0.210
Conditional on part-power couple				
Large metropolitan area	0.319	0.362	0.371	0.421
Midsize metropolitan area	0.268	0.326	0.334	0.308
Small and nonmetropolitan area	0.413	0.312	0.295	0.271
Conditional on low-power couple				
Large metropolitan area	0.266	0.301	0.308	0.339
Midsize metropolitan area	0.240	0.299	0.312	0.292
Small and nonmetropolitan area	0.494	0.399	0.380	0.369
Conditional on single, power man				
Large metropolitan area	0.383	0.523	0.512	0.569
Midsize metropolitan area	0.258	0.291	0.295	0.266
Small and nonmetropolitan area	0.358	0.186	0.193	0.165
Conditional on single, power woman				
Large metropolitan area	0.286	0.507	0.499	0.555
Midsize metropolitan area	0.223	0.309	0.308	0.281
Small and nonmetropolitan area	0.491	0.184	0.193	0.164
Conditional on single, low-power man				
Large metropolitan area	0.299	0.442	0.415	0.441
Midsize metropolitan area	0.225	0.297	0.305	0.278
Small and nonmetropolitan area	0.476	0.260	0.280	0.281
Conditional on single, low-power woman				
Large metropolitan area	0.307	0.455	0.430	0.444
Midsize metropolitan area	0.245	0.305	0.313	0.297
Small and nonmetropolitan area	0.448	0.240	0.257	0.260

A power couple is defined as one in which both husband and wife are college graduates, a part-power couple as one in which only one spouse is a college graduate, and a low-power couple as one in which neither spouse is a college graduate. Couples were restricted to those in which the husband was 25 to 39 years of age and the wife 23 to 37. All singles were also in that age range. A power single is a college graduate, while a low-power single is not. Large metropolitan areas are those in which the population was at least 2 million, midsize metropolitan areas as those between 2 million and 250,000, and small as those less than 250,000. Within each year for each household type, the probabilities should sum to one. Estimated from the integrated public use census samples [Ruggles and Sobeck 1997].

probability of a power couple being in a large city rose by 0.174 between 1940 and 1990 and by 0.104 between 1970 and 1990. In contrast, the increase in these probabilities for part-power couples was only 0.102 and 0.059, respectively. For college educated singles the probability of being in a large city rose sharply between 1940 and 1970, but only changed by 0.040 for men and 0.048 for women between 1970 and 1990.

III. Hypotheses and Empirical Methodology

Are power couples urbanizing because they are college educated or because they have a colocation problem? We begin by considering the benefits of being in a large city for different couple types within a single year and whether changes in these factors might account for the trend.

Consider first the advantages of urbanization by couple type. If large metropolitan areas offer higher returns to education and if urban amenities are normal goods, then large metropolitan areas will appeal to the college educated, regardless of marital status. If urban areas offer such singles' amenities as marriage markets, then singles will be more concentrated in large metropolitan areas than couples of the same educational level. The concentration of power couples in large cities will increase if the returns to city size for the college educated are rising, if urban amenities continue to be normal goods, or if more college educated singles are moving to large cities because cities are becoming better marriage markets and are staying there upon marriage. We will run wage regressions to test whether the returns to city size have been rising for the college educated. We find that most of the increasing urbanization of the college educated is explained by increasing returns to city size and not because urban amenities are normal goods. We cannot directly test whether large cities are attracting more college educated singles because they are becoming better marriage markets for the college educated. But, we can provide some evidence on the marriage propensities of the college educated relative to the noncollege educated.

Second, consider the colocation problem. Large metropolitan areas offer both spouses the opportunity to pursue careers. The diversified labor markets of larger cities also insure against health and unemployment shocks to one spouse. All couples face a colocation problem. Because the college educated are more versatile (and can take jobs for which they are overqualified), the colocation problem may be less severe for the college educated. But, because the college educated may be more career oriented or may have more specialized skills, the colocation problem may be severer for the college educated.[10] Large cities offer more potential job matches, so the probability of drawing a good initial match is higher. The probability of drawing good subsequent matches is also higher, and this increased job mobility will lead to greater lifetime wage growth [Topel and Ward 1992]. Furthermore, if the initial match was a poor one, then the probability of drawing a good match on the second try will be higher than in a smaller city. A spouse who knows that the other spouse has these options in a large city can make firm-specific career investments. The long-run financial sacrifice to being in a large city is therefore likely to be smaller. A worsening colocation problem should therefore increase the proportion of couples, particularly power couples, in large cities, but not affect the proportion of singles.

We test whether the increase in the proportion of power couples in large cities is determined by colocation by comparing power couples with other couple types and to singles. Our comparisons with singles are based upon "coincidental" couples. We refer to a coincidental couple as two individuals (one male and one female) coincidentally living in a large metropolitan area. Trends in coincidental couple concentration allow us to analyze trends in the urbanization of the college educated independent of colocation. Suppose that there are 100 single power men and women and that 40 of the men are in large cities and 60 are in small cities and that 60 of the women are in large cities and 40 are in small cities. At most 80 "marriages" could form—40 in large cities and 40 in small cities. The probability of a coincidental couple being in a large city is therefore 0.5. We therefore take our estimates of the probability of a single power man living in city size $s(p_s^{M,P})$ and our estimates of the probability of a single power woman living in city size $s(p_s^{F,P})$ and take the minimum of these probabilities $(\min(p_s^{M,P}, p_s^{F,P}))$. We then estimate the probability that a coincidental couple will be living in a given city size $(\min(p_s^{M,P}, p_s^{F,P})/\Sigma_s \min(p_s^{M,P}, p_s^{F,P}))$.[11]

Table IV provides a schematic illustration of our strategy to identify the colocation problem of power and low-power couples and the differential colocation problem of power relative to

10. Baumgardner [1988] documents the greater specialization among physicians found in large cities. See Kim [1989] for a model of labor specialization and the size of the labor market.

11. Note that this method assumes that the numbers of single power men and single power women are the same. Although this is a reasonable assumption in most years, in 1940 there were more single unmarried power women because of the low marriage propensities of college educated women.

TABLE IV
CHANGE IN BENEFITS OF LIVING IN A LARGE CITY BY COUPLE TYPE

Couple type	Benefits of living in a large city
1 Power couple	colocation power urbanization power (urban amenities, education)
2 Coincidental power couple	urbanization power singles' amenities (e.g., marriage markets)
3 Double difference (1–2)	colocation power, singles' amenities
4 Low-power couple	colocation low-power urbanization low power (urban amenities)
5 Coincidental low-power couple	urbanization low power singles' amenities
6 Double difference (4–5)	colocation low-power, singles' amenities
7 Triple difference (3–6)	colocation power relative to low-power

A power couple is defined as one in which both husband and wife are college graduates, and a low-power couple as one in which neither spouse is a college graduate. A coincidental power couple consists of two single college educated individuals (one male and one female) coincidentally living in the same city size. A coincidental low-power couple consists of two single noncollege educated individuals (one male and one female) coincidentally living in the same city size.

low-power couples. The increase in power couple concentration in large metropolitan areas could be driven by a worsening colocation problem and the growing urbanization of the college educated. The increase in the concentration of coincidental couples could be driven by the urbanization of power couples or the increased value of singles' amenities (including changes in the value of large urban areas as marriage markets). If the value of singles' amenities has not changed and if urban amenities are of the same value to singles as they are to married couples, then the double difference (the increase in power couple concentration minus the increase in coincidental couples concentration) measures the differential effect of colocation. Note that any differences in the valuation of urban amenities of married couples and singles will not be differenced out. Therefore, an alternative explanation for the increase in power couple relative to power single concentration in large metropolitan areas is the increased amenity value of metropolitan areas to couples. Now consider the case of low-power couples. The increased concentration of low-power couples in large metropolitan areas could arise either from growing urbanization or from colocation. The growing concentration of low-power singles could arise either from growing urbanization or from the growing value of such singles' amenities as a marriage market. If the value of singles' amenities has not changed and if urban amenities are of the same value to singles as they are to married couples, then the double difference (the increase in low-power couple concentration minus the increase in coincidental low-power couple concentration) yields the effect of colocation for low-power couples. Again, differences in the valuation of urban amenities to married couples and to singles will not be differenced out. The triple difference yields the differential effect of colocation for power relative to low-power couples, assuming either that there are no differences in the valuation of urban amenities between married couples and singles or, if there are, that these differences are the same for the college educated as for the noncollege educated.

The triple difference estimate of the differential effect of colocation for power relative to low-power couples can be further refined. Because labor force participation rates of single women are higher than those of married women and because only couples in which the wife works have a colocation problem, we also compare power and low-power couples in which the wife works with coincidental couples in which the woman works and calculate the triple difference. Larger double and triple differences for couples in which the wife works than for all couples would suggest that colocation, not differences in amenity values, determines the concentration of power couples in large metropolitan areas.

IV. Basic Results

Testing the theories requires us to examine differential trends in locational choice by couple type. We present these trends in this section, standardized on race and age. That is, we estimate

(2) Prob (lives in city size s and wife works | household ltype)

(3) Prob (lives in city size s and wife does not work | household type)

for couples and

(4) Prob (lives in city size s and works | household type)

(5) Prob (lives in city size s and does not work | household type)

for singles. For couples these probabilities can be thought of as the outcome of a joint decision between city size and wife's labor force participation. Because of data limitations we cannot unravel whether the low labor force participation rate of wives in smaller cities arises from the choice of these areas by wives with little attachment to the labor force or whether it arises from wife's wage effects of being in a small city.

We estimate the probabilities in equations (2) through (5) by means of a multinomial logit choice model. We use information on what city size category a couple chooses to live in and whether the wife works to create six groups, one each for wife's labor force participation status and the city size category. We then estimate a multinomial logit of the choice of wife's labor force participation and city size as a function of the husband's age and race and the educational attainment of the husband and wife (dummies for less than high school graduate, high school graduate, college graduate, and postcollege graduate with less than high school graduate as the omitted dummy). Thus, defining $P_{s,ww}$ as the probability of being in one of three city sizes s and ww as an indicator equal to one if the wife works, we estimate

$$\log\left(\frac{P_{s,ww}}{P_{s=0,ww=1}}\right) = \beta' X \tag{6}$$

for $s = 1$ to 2 and $ww = 0, 1$ and $s = 0$ and $ww = 0$. We calculate robust standard errors clustering on metropolitan areas (or on the state in the case of nonmetropolitan areas). Finally, we predict the choice of location and wife's labor force participation, $P_{s,ww}$, for a white household in which the husband is 35 years of age and the wife 33 conditional on being a power, part-power, or low-power couple. For single individuals we estimate similar multinomial logit specifications (separately for men and women) except that labor force status is own labor force status and we control only for own characteristics. We then predict locational choice for single, white men age 35 and single, white women age 33 conditional on being a power or a low-power individual and estimate locational choice for coincidental couples.[12] Recall that a coincidental couple consists of two single individuals (one male and one female) coincidentally living in a large metropolitan area.

Table V shows the predicted probabilities, conditional on being a power, part-power, or low-power couple, of locational choice across city sizes and the wife's labor force participation status for a white couple in which the husband was 35 years old and the wife 33. Power couples are leaving nonmetropolitan areas

12. The base group is small or nonmetropolitan area and wife out of the labor force. Our results are robust to the choice of base group.

TABLE V
PREDICTED PROBABILITIES OF LOCATIONAL CHOICE AND WIFE'S LABOR FORCE PARTICIPATION (LFP) STATUS CONDITIONAL ON HOUSEHOLD TYPE

	1940	1970	1980	1990
Conditional on power				
Large metropolitan area, LFP = 1	0.083	0.146	0.255	0.348
Large metropolitan area, LFP = 0	0.264	0.240	0.157	0.141
Midsize metropolitan area, LFP = 1	0.045	0.136	0.206	0.218
Midsize metropolitan area, LFP = 0	0.217	0.183	0.121	0.080
Small and nonmetropolitan area, LFP = 1	0.067	0.142	0.179	0.165
Small and nonmetropolitan area, LFP = 0	0.325	0.152	0.082	0.049
Conditional on part-power				
Large metropolitan area, LFP = 1	0.058	0.092	0.187	0.262
Large metropolitan area, LFP = 0	0.276	0.258	0.179	0.142
Midsize metropolitan area, LFP = 1	0.043	0.101	0.176	0.210
Midsize metropolitan area, LFP = 0	0.226	0.222	0.152	0.097
Small and nonmetropolitan area, LFP = 1	0.064	0.116	0.174	0.205
Small and nonmetropolitan area, LFP = 0	0.333	0.210	0.132	0.084
Conditional on low-power				
Large metropolitan area, LFP = 1	0.048	0.083	0.145	0.200
Large metropolitan area, LFP = 0	0.246	0.205	0.157	0.132
Midsize metropolitan area, LFP = 1	0.044	0.106	0.159	0.191
Midsize metropolitan area, LFP = 0	0.200	0.196	0.152	0.100
Small and nonmetropolitan area, LFP = 1	0.070	0.153	0.196	0.245
Small and nonmetropolitan area, LFP = 0	0.392	0.258	0.190	0.133

All predictions are from a multinomial logit model in which the outcome variables were city size and labor force participation rate. The independent variables were husband's age, age squared, and race; wife's age and age squared, and dummy variables for educational levels (less than high school, high school, college, college plus) of the husband and of the wife. The predictions are for a white couple in which the husband was 35 years old and the wife 33. Robust standard errors ranged from 0.001 to 0.006. Conditional on couple type, the rows should sum to one. Estimated from the integrated public use census samples.

and moving to the largest metropolitan areas. In 1940 39 percent were in nonmetropolitan areas whereas by 1970 the figure was 29 percent and by 1990 21 percent. In 1940 35 percent were in the largest metropolitan areas, and in 1970 39 percent were; whereas in 1990 49 percent were. Power wives' labor force participation rates are lower in larger metropolitan areas in 1970, 1980, and 1990, suggesting that higher returns to city size for college educated husbands are inducing them to leave the labor force.

Power couples are increasingly concentrating in large metropolitan areas relative to part-power or low-power couples. Between 1970 and 1990 the predicted proportion of low-power couples located in nonmetropolitan areas fell only slightly from 41 to 38 percent, and their share in the largest metropolitan areas increased from 29 to 33 percent. The predicted percentage of part-power couples in the largest metropolitan areas rose from 35 to 40 percent.

Table VI presents predictions of locational choice from multinomial logit models for unmarried men and women conditional on their education. Note that between 1940 and 1970 the probability of singles being in a large metropolitan area increased substantially, rising from 29 to 49 percent among power women. Between

TABLE VI
PREDICTED PROBABILITIES OF LOCATIONAL CHOICE, UNMARRIED MEN AND WOMEN, CONDITIONAL ON EDUCATION

	1940	1970	1980	1990
Single, power man				
Large metropolitan area	0.394	0.526	0.518	0.542
Midsize metropolitan area	0.267	0.294	0.291	0.273
Small and nonmetropolitan area	0.339	0.180	0.191	0.185
Single, power woman				
Large metropolitan area	0.289	0.489	0.501	0.534
Midsize metropolitan area	0.230	0.319	0.305	0.291
Small and nonmetropolitan area	0.482	0.192	0.193	0.175
Coincidental power couple				
Large metropolitan area	0.337	0.508	0.510	0.544
Midsize metropolitan area	0.268	0.305	0.296	0.278
Small and nonmetropolitan area	0.395	0.187	0.194	0.178
Single, low-power man				
Large metropolitan area	0.313	0.432	0.406	0.411
Midsize metropolitan area	0.232	0.304	0.305	0.282
Small and nonmetropolitan area	0.454	0.264	0.290	0.308
Single, low-power woman				
Large metropolitan area	0.323	0.420	0.415	0.413
Midsize metropolitan area	0.250	0.316	0.317	0.304
Small and nonmetropolitan area	0.428	0.264	0.269	0.283
Coincidental low-power couple				
Large metropolitan area	0.322	0.425	0.414	0.421
Midsize metropolitan area	0.238	0.308	0.311	0.289
Small and nonmetropolitan area	0.440	0.267	0.274	0.290

All predictions are derived from a multinomial logit model and are for white 35 year old men and white 33 year old women. Within each year for each group the predicted probabilities for singles and coincidental couples should sum to one. The independent variables used in the multinomial logit were age, age squared, race, and educational level. The outcome variables were city size and labor force participation. With the exception of 1940, relatively few individuals were out of the labor force. The results that are presented are the predicted probabilities summed over city size. Robust standard errors ranged from 0.002 to 0.006. Estimated from the integrated public use census samples [Ruggles and Sobeck 1997].

1970 and 1990 changes were much more modest. Among power men the probability of being in a large city rose from 53 to 54 percent. The increase among coincidental couples was from 51 to 54 percent. The probability of low-power men and women being in a large city decreased somewhat, with a decline from 43 to 42 percent among coincidental couples.

We summarize standardized trends in locational choice by couple type, including coincidental couples (see Table VII). Between 1970 and 1990 the probability of power couples being in a

TABLE VII
TRENDS IN PROPENSITY TO LIVE IN GIVEN CITY SIZE, 1970–1990, BY COUPLE TYPE (BASED UPON PREDICTED PROBABILITIES)

	City size		
	Large	Midsize	Small
Differences, 1990–1970			
Power couples (Δ^{P})	0.103	−0.022	−0.081
	(0.007)	(0.006)	(0.006)
Part-power couples (Δ^{PP})	0.054	−0.016	−0.038
	(0.006)	(0.006)	(0.006)
Low-power couples (Δ^{LP})	0.043	−0.011	−0.033
	(0.003)	(0.002)	(0.004)
Coincidental power couple (Δ^{CP})	0.036	−0.027	−0.009
	(0.005)	(0.010)	(0.005)
Coincidental low-power couple (Δ^{CLP})	−0.004	−0.019	0.023
	(0.005)	(0.004)	(0.004)
Power, wife works ($\Delta^{P,W}$)	0.202	0.082	0.023
	(0.004)	(0.004)	(0.005)
Part-power, wife works ($\Delta^{PP,W}$)	0.170	0.109	0.089
	(0.004)	(0.004)	(0.004)
Low-power, wife works ($\Delta^{LP,W}$)	0.117	0.085	0.092
	(0.002)	(0.002)	(0.003)
Power, wife does not work ($\Delta^{P,NW}$)	−0.099	−0.103	−0.103
	(0.005)	(0.005)	(0.006)
Part-power, wife does not work ($\Delta^{PP,NW}$)	−0.116	−0.125	−0.126
	(0.004)	(0.004)	(0.004)
Low-power wife does not work ($\Delta^{LP,NW}$)	−0.073	−0.096	−0.125
	(0.003)	(0.003)	(0.004)
Coincidental power, woman works ($\Delta^{CP,W}$)	0.037	−0.031	−0.006
	(0.007)	(0.007)	(0.006)
Coincidental low-power, woman works ($\Delta^{CLP,W}$)	−0.011	−0.029	0.040
	(0.004)	(0.005)	(0.004)

Differences are in probability units. Probabilities are calculated from Tables V and VI, except for coincidental couples in which the woman works. These were calculated by using the multinomial logit predictions for working women only.

large metropolitan area rose by 0.103, whereas that of part-power, low-power, and coincidental power couples being in a large city rose by 0.054, 0.043, and 0.036, respectively. The increase in coincidental couple concentration suggests that at most 35 percent of the increase in power couple concentration in large cities is attributable to the growing urbanization of the college educated. Among power couples in which the wife works, the probability of being in a large city rose by 0.202; whereas among power couples in which the wife does not work, this probability fell by 0.099. Among coincidental power couples the probability of being in a large city rose by only 0.036, and among low-power coincidental couples it fell by −0.004. Urbanization of the noncollege educated therefore cannot explain the rise in low-power concentration in large cities.

The differential trend for power couples' probability of being in a large metropolitan area was 0.049 relative to part-power couples, 0.060 relative to low-power couples, and 0.067 relative to coincidental couples (see Table VIII). The latter figure implies that at least 65 percent of the 0.103 rise in power couple concentration in large cities is attributable to colocation. The differential trend of 0.047 in low-power relative to coincidental low-power couple concentration implies that all of the 0.043 increase in low-power couple concentration in large cities is attributable to colocation. The triple difference shows that 0.020 (19 percent) of the increase in power couple concentration is accounted for by the unique colocation problems of the college educated relative to the noncollege educated.

Recall that we can further refine our triple difference estimate by restricting ourselves to couples (including coincidental couples) in which the woman works. We would only expect a colocation problem among working couples. Among couples in which the woman works, the differential trend in power couples' probability of being in a large city was 0.032 relative to part-power couples, 0.085 relative to low-power couples, and 0.165 relative to coincidental couples. The comparison with coincidental couples implies that 87 percent of the rise in working power couple concentration can be explained by colocation. The differential trend in low-power couples' probability of being in a large city relative to coincidental couples was 0.128, conditional on the woman being in the labor force. This figure implies that all of the increase in working low-power couple concentration in large cities can be explained by colocation. The triple difference estimate of

TABLE VIII
DIFFERENTIAL TRENDS IN PROPENSITY TO LIVE IN GIVEN CITY SIZE, 1970–1990, BY COUPLE TYPE (BASED UPON PREDICTED PROBABILITIES)

	City size		
	Large	Midsize	Small
Double differences, 1990–1970			
$\Delta^{P} - \Delta^{PP}$	0.049	−0.006	−0.043
	(0.009)	(0.008)	(0.008)
$\Delta^{P} - \Delta^{LP}$	0.060	−0.011	−0.048
	(0.008)	(0.006)	(0.007)
$\Delta^{P} - \Delta^{CP}$	0.067	0.005	−0.072
	(0.009)	(0.007)	(0.008)
$\Delta^{LP} - \Delta^{CLP}$	0.047	0.008	−0.056
	(0.006)	(0.004)	(0.006)
$\Delta^{P,W} - \Delta^{CP,W}$	0.165	0.113	0.029
	(0.008)	(0.008)	(.007)
$\Delta^{LP,W} - \Delta^{CLP,W}$	0.128	0.114	0.052
	(0.004)	(0.005)	(0.005)
Triple differences, 1990–1970			
$[\Delta^{P} - \Delta^{CP}] - [\Delta^{LP} - \Delta^{CLP}]$	0.020	−0.003	−0.016
	(0.010)	(0.008)	(0.010)
$[\Delta^{P,W} - \Delta^{CP,W}]] - [\Delta^{LP,W} - \Delta^{CLP,W}]$	0.037	−0.001	−0.023
	(0.009)	(0.009)	(0.009)

Δ^{P}, Δ^{PP}, Δ^{LP}, and Δ^{CP} represent the change from 1970 to 1990 of the probability of being in a given sized metropolitan area for power, part-power, low-power, and coincidental power couples, respectively. $\Delta^{P,W}$, $\Delta^{LP,W}$, $\Delta^{CP,W}$, and $\Delta^{CLP,W}$ represent the probability of being in a given sized metropolitan area for power and low-power couples in which the wife works and this probability for coincidental power and low-power couples in the woman works, respectively. Probabilities are calculated from Tables V and VI.

0.037 suggests that 36 percent of the increase in power couple concentration is accounted for by the unique colocation problems of the college relative to the noncollege educated.

V. URBANIZATION AND THE COLLEGE EDUCATED

Two factors could account for the increasing urbanization of the college educated: increasing returns to city size by education and the increasing value of urban amenities to the college educated (including marriage markets). To test the labor market incentives of moving to large metropolitan areas, we estimate the returns to city size by education in every decade. We therefore estimate wage regressions of the form

$$\ln(w) = \beta_0 + \beta_1 \ln(d) + \beta_2 X + u \tag{7}$$

for white, full-time, and full-year wage and salary workers for every decade and every education level, where w is the hourly wage in 1997 dollars, d is metropolitan area population, X is a vector consisting of age and age squared, and u is an error term. We include both married and unmarried men and women in our sample.[13] Because we cannot observe population in area of residence for individuals living in nonmetropolitan areas, we omit these individuals from our regressions. For ease of exposition we estimate separate equations by educational attainment. When income is topcoded, we multiply the topcode by 1.45. The 1970 census reported weeks and hours of work only as intervals. We take the midpoint of the interval. We drop all individuals whose hourly earnings are less than half of the minimum wage. We also drop individuals earnings more than $500 per hour.

Table IX shows the returns to city size by education for individuals living in a metropolitan area (β_1). Note that returns to city size are greater for the highly educated. For each increase in the logarithm of population in 1970 the logarithm of a man's wage increases by 0.065 for those with a graduate degree and by 0.060 for those with a college degree in 1970 whereas for those with a high school education it only increases by 0.049 and for those with less than a high school education by 0.034. Only the returns to city size for those with a graduate school education are statistically significantly different from the returns for those with less than a high school education (at the 5 percent level). By 1990 the logarithm of the husband's wage increases by 0.101 for those with a graduate education, by 0.078 for those with a college education, by 0.076 for those with a high school education, and by 0.023 for those with less than a high school education. The returns to city size for those with a graduate, college, and high school education are statistically significantly different from the returns to those with less than a high school education, at the 1, 10, and 1 percent level, respectively. Returns to city size by education barely changed between 1970 and 1980, a period characterized by falling returns to education [Katz and Murphy 1992].

Women's returns to city size by educational attainment exhibit similar patterns as those of men, but only in 1990 are the returns to city size for those with a graduate education statistically significantly different from the returns to those with less than a high school education. One possible explanation is that

13. The results are very similar when we restrict the sample to the married.

TABLE IX
RETURNS TO CITY SIZE BY EDUCATION

	1940	1970	1980	1990
Men				
Less than high school	0.045	0.034	0.007	0.023
	(0.008)	(0.014)	(0.019)	(0.015)
High school	0.053	0.049	0.041	0.076
	(0.005)	(0.006)	(0.010)	(0.006)
College	0.044	0.060	0.051	0.078
	(0.010)	(0.007)	(0.005)	(0.010)
Graduate degree	−0.002	0.065	0.061	0.101
	(0.019)	(0.005)	(0.007)	(0.014)
Women				
Less than high school	0.065	0.062	0.040	0.065
	(0.007)	(0.011)	(0.012)	(0.014)
High school	0.060	0.066	0.058	0.075
	(0.012)	(0.006)	(0.007)	(0.009)
College	0.085	0.069	0.055	0.071
	(0.018)	(0.007)	(0.006)	(0.009)
Graduate degree	0.072	0.038	0.056	0.091
	(0.028)	(0.011)	(0.010)	(0.013)

Estimated returns are for individuals living in a metropolitan area only. We estimated regressions by educational attainment in which the logarithm of the hourly wage was the dependent variable and the independent variables were the logarithm of metropolitan area population and age and age squared. Robust standard errors are in parentheses. Estimated from the integrated public use census samples.

many women work in the nonprofit sector and in this sector wage differences across city size may be smaller and may have grown more so over time. In the case of schoolteachers this may have been spurred by the move away from direct local funding to state and federal funding and the move toward collective bargaining agreements [Flyer and Rosen 1997]. In fact, when we exclude schoolteachers, those in government jobs, or those in traditionally female jobs (a job in which women were overrepresented relative to men in 1970), we find that in 1990 the returns to city size were 0.058, 0.093, 0.089, 0.123 for those with less than a high school education, a high school education, a college education, and a graduate education, respectively. The returns to city size for those with a high school education or greater were statistically significantly different from the returns for those with less than a high school education.

Table IX shows that the returns to city size for the college educated rose between 1970 and 1990, with most of the increase taking place between 1980 and 1990. We predict that when the returns to city size for the college educated are rising then the college educated should move to large cities and that they should leave large cities when these returns are falling. Between 1970 and 1980, when the returns to city size by education were stagnant or falling, coincidental couples migrated to large cities at a slower rate (0.002) than between 1980 and 1990, when the returns to city size by education were rising (0.034). These figures suggest that most of the 0.036 increase (0.032 = 0.034 − 0.002) in coincidental power concentration in large cities between 1970 and 1990 can be explained by increasing returns to city size for the college educated. Note also that between 1970 and 1980, when the returns to city size were stagnant, power couples still migrated to large cities at a faster rate (0.026) than coincidental couples (0.002), implying that the immediate pecuniary gains to city size are not the sole motivation for power couple migration.[14]

Our final hypothesis for the urbanization of the college educated was that power singles may be more likely to migrate to large cities because cities may be becoming better marriage markets. Most power singles are in a large metropolitan area (see Table VI) and, because fewer marriages are now formed in high school or college, the value to being in an area with a large concentration of singles may be rising. It is also conceivable that a forward looking highly educated single will foresee a future colocation problem and will therefore prefer to meet someone who already has invested in a large city. But, if there is value to being in an area with a large concentration of singles, this has not increased the probability of marriage. Power singles in large cities are now less likely to marry relative to low-power singles.[15]

We therefore conclude that 35 percent of the increased concentration of power couples in large cities can be explained by the increasing urbanization of the college educated and that virtually all of this 35 percent was due to increasing returns to city size for the college educated.

14. Such couples, however, may recognize long-term pecuniary gains. Glaeser and Maré [forthcoming] show that there are returns to city experience. Large cities allow for greater job mobility and hence for greater lifetime wage growth and for insurance against job loss.

15. Among individuals living in a large city 5 years ago and less than 30 years of age, marriage rates among power men fell from 55 to 54 percent between 1980 and 1990, whereas those of low-power men rose from 58 to 63 percent. Among power women marriage rates fell from 48 to 47 percent and among low-power women they fell from 66 to 65 percent. Because we do not know metropolitan area of residence from the 1970 census five years ago, we only present results for 1980 to 1990.

VI. Colocation

The major pieces of evidence suggesting that colocation is an important explanation for the rise in power couple concentration are the double and triple differences based upon coincidental power couple comparisons. The double differences suggest that colocation explains up to 65 percent of the trend in power couple concentration in large cities and all of the trend in low-power couple concentration in large cities. The triple difference suggests that 19 to 36 percent of the trend in power couple concentration is attributable to the unique colocation problems faced by the college educated and 29 to 46 percent to the colocation problems faced by all couples.

Second, consider the prediction that power couples should be concentrating in large metropolitan areas faster than part- or low-power couples and that the increase in power couple concentration in large cities should mainly be among couples in which the wife works. As previously discussed, Table VIII shows that the differential trend in power couples being in large cities compared with low- and part-power couples was 0.060 and 0.049. Table VII shows that between 1970 and 1990 the predicted proportion of working power couples located in large cities rose by 0.202, whereas the proportion of power couples in which the wife does not work fell by 0.099. Note that the predicted proportion of working power couples in major cities grew relative to working part-power and low-power couples. The respective differential trends were 0.032 and 0.085 (see Table VII). In contrast, when the wife does not work, the differential trend in the predicted locational choice of power couples and part-power and low-power couples is smaller (0.017 and −0.026, respectively).

Finally, colocation also predicted that the trend in power couple concentration in large cities should be most pronounced among those couples in which the wife is working full-time or is in a nontraditional occupation and among power couples in which the husband and wife were in different professional occupations.[16] In the largest metropolitan areas the predicted proportion of

16. Although the choice of city size is likely to affect hours of work, full-time work may be an indicator of attachment to the labor force, particularly among the college educated. City size could affect occupation as well, but a wife who has at least a college education and is in an occupation that was traditionally male, say law or medicine, is more likely to need the diversified labor market of a large city than a wife who is in such a traditionally female occupation as that of schoolteacher. Husbands and wives in the same occupation may not need the diversified labor market offered by a large city.

power couples in which the wife was in a nontraditional occupation rose by 0.167 between 1970 and 1990. The increase among power couples in which the wife was in a traditional occupation was only 0.055. The predicted proportion of power couples in which the wife works full-time and who were in a large metropolitan area rose by 0.166 between these years, whereas the increase among couples in which the wife works part-time was only 0.053. Power couples in which the wife is in the same occupation increased their concentration in metropolitan areas by only 0.025 between 1970 and 1990, whereas those in which the wife is in a different occupation increased their concentration by 0.197.

The in-migration of power couples to large cities could reduce power couples' incentive to stay in or move to large cities. But, Table IX shows that wages are providing a continued incentive for power couples to continue to move to large cities. Increasing returns to scale models (such as Acemoglu [1996]) provide a microfoundation for why the demand for highly skilled workers increases with their numbers.[17] As returns to education increase the financial sacrifice of being in a small city rises, particularly for dual career households.

While wages provide an incentive for power couples to move to large cities, rents are a disincentive.[18] Because power, part-power, and low-power couples face the same rents but the wage incentives to power couples of being in a large city have increased, our results suggest that small cities have become relatively less attractive to power than to part-power or low-power couples.

VII. Implications

Our finding that since 1940 power couples have been increasingly likely to locate in large metropolitan areas and that the growth of the colocation problem accounts for a large proportion of this trend has implications for city growth. As the probability that power couples choose a large metropolitan area rises, mean educational levels in the city will rise. Educational levels in a city are in turn positively related to city wages [Rauch 1993] and city growth [Glaeser, Scheinkman, and Shleifer 1995].

17. Acemoglu's [1996] search model shows that ex ante investment and bilateral search in the labor market will make the rate of return on human capital increasing in the average human capital of the workforce. In Becker and Murphy's [1992] model the greater density of urban areas lowers the costs of coordinating specialists.

18. For evidence, see Rauch [1993] or Gyourko and Tracy [1991].

As the share of power couples among all the college educated rises, firms in smaller cities may find that it is becoming harder and harder to attract highly skilled individuals. We illustrate the difficulties faced by firms in small cities with suggestive evidence on a particular type of firm—the university. One advantage of examining universities is that their capital-to-labor ratio is fairly fixed. Another is that universities, unlike firms, rarely move. We therefore examine whether the relative quality of graduate research doctorate programs in small cities in the United States has fallen since 1970 to learn whether a firm that employs highly skilled workers is now less likely to locate to a small city.

We use the National Research Council's data set, *Research Doctorate Programs in the United States,* to obtain rankings of 1142 graduate programs of 100 universities in 1993, 1983, and 1970, and we link these data to metropolitan area population. (We use the same metropolitan areas as in our previous empirical work.) We classify all programs into quintiles in every year: distinguished, strong, good, adequate, and marginal. The relative proportion of programs in each category is therefore constant across years, but between 1970 and 1993 58 percent of programs changed categories. We then estimate an ordered probit model in which the dependent variable consists of a categorical variable for our five groups and in which the independent variables are the logarithm of metropolitan area population, dummy variables for broad program field (arts and humanities, biological sciences, engineering, physical sciences and mathematics, and social and behavioral sciences), and a dummy variable equal to one if the university was a public institution.

Table X presents the derivatives with respect to the logarithm of metropolitan area population from the ordered probit model.[19] Note that the relationship between graduate program ranking and population size is stronger in 1993 than in 1970. In 1970 an increase of one in the logarithm of population increased the probability that a program would be ranked distinguished by 0.007 and decreased the probability that it would be ranked marginal by 0.010. Both the increase and decrease in these respective probabilities for 1993 was 0.027. The relative decline in quality of universities in small cities suggests that, if there are spillover effects from universities, larger rather than smaller cities are more likely to reap these benefits.

19. The derivatives for the ordered probit model were calculated by taking the derivative for every observation and then taking the mean over all derivatives.

TABLE X
DERIVATIVES OF PROBABILITY THAT GRADUATE SCHOOL PROGRAM IS DISTINGUISHED STRONG, GOOD, ADEQUATE, AND MARGINAL WITH RESPECT TO LOGARITHM OF CITY POPULATION, 1993, 1983, AND 1970

	Derivative wrt logarithm of city population		
	1970	1983	1993
Mean of logarithm of population	7.075	7.547	7.673
Probability			
Distinguished (top quintile)	0.007	0.024	0.027
	(0.007)	(0.008)	(0.009)
Strong	0.007	0.013	0.007
	(0.006)	(0.004)	(0.003)
Good	−0.000	−0.006	−0.011
	(0.001)	(0.003)	(0.004)
Adequate	−0.005	−0.016	−0.017
	(0.005)	(0.006)	(0.006)
Marginal (bottom quintile)	−0.010	−0.027	−0.027
	(0.013)	(0.019)	(0.020)

1142 observations in all years. Population is in the 1000s. The categorical outcome variable for the ordered probit model is the quintile ranking, and the independent variables are the logarithm of population, dummy variables for broad program field, and a dummy variable equal to one if the university was a public institution. Derivatives are mean derivatives. Standard errors are in parentheses. We rejected the hypothesis that 1970 and 1993 and 1970 and 1983 should be pooled. Estimated from *Research Doctorate Programs in the United States.*

VIII. CONCLUSION

This paper has documented the rising concentration of power couples in larger over smaller metropolitan areas and over nonmetropolitan areas relative to other household types and to that which would have been predicted for two observationally identical single individuals. We argued that up to 65 percent of the increased concentration of power couples in larger metropolitan areas could be explained by the colocation problem. Of this 65 percent, 19 to 36 percent was accounted for by the unique colocation problems faced by the college educated and 29 to 46 percent by the colocation problems faced by all couples. The remaining 35 percent could be explained by the increasing urbanization of the college educated because of rising returns to city size by education.

The increased concentration of power couples in large metropolitan areas may have implications for the dynamics of city growth. Economic growth depends upon the ability to absorb existing knowledge and to create new knowledge, both of which are directly related to the existing stock of human capital. Smaller markets have always exported the highly skilled to larger markets and, as this paper has documented, this phenomenon has been magnified by the increased bundling of the highly skilled with other highly skilled spouses. Cities, especially low amenity cities, may face a greater net "brain drain" than in the absence of power couple bundling. The colocation problem may also affect a small city's adjustment to local labor market shocks. Regional adjustment to local labor market shocks is primarily driven by labor mobility [Blanchard and Katz 1992]. But, because of bundling a small city may only slowly attract high skilled talent despite a local boom. Foreseeing this, firms may be unwilling to locate in smaller cities. Universities provide suggestive evidence. We have shown that although the quality of graduate doctoral programs was positively related to city size in both 1970 and in 1993, the relationship between program ranking and city size has become stronger.

This paper has sketched a 50-year trend in power couple locational choice, but will information technology affect future locational choice? It is possible that the growth of information technology that permits highly skilled workers to telecommute may solve the colocation problem for some couples by permitting at least one spouse to live far from where their employer is located. This could allow smaller cities to attract a highly skilled couple. But, as more couples become true dual career households, an increasing proportion will be faced with a colocation problem. Both the 50-year trend and the increase in returns to city size by education suggest that power couples will turn to large cities. Furthermore, information technologies may be a complement, not a substitute, for living in a large city if they facilitate making new business contacts [Gaspar and Glaeser 1998]. Power couples are likely to have a comparative advantage in making new contacts relative to two highly educated single people. Although this paper has not explicitly explored the couple "synergies" of two highly educated people being married, a power couple may work as a "team" to maximize household income. They will therefore both seek potential business contacts who can work with them or their spouse, and such contacts are more likely to be found in large cities.

Data Appendix

We use the 1940 and 1970–1990 censuses of population and housing.[20] For each person we observe marital status, age, sex, race, education, labor force status, occupation, and metropolitan area. Our couples are all married and living in the same household, and our singles are either never married, divorced, or widowed. We treat cohabitating couples (whom we can only identify in 1990) as singles. All estimates use the population weights for 1940 and 1990. With the exception of 1970 we observe metropolitan area five years ago.

We construct the following variables.

1. Metropolitan area size classifications.

   Although the concept of a metropolitan area has remained essentially the same throughout the years, the boundaries of metropolitan areas have grown, new metropolitan areas have emerged, and there were slight variations in how the concept was defined from census to census and in the confidentiality criteria that had to be met for a metropolitan area identified. We use metropolitan area size classifications that allow for comparability across all census years.

   Our first step in creating metropolitan area size classifications is to classify the suburbs of central cities as part of the labor market of the central city (e.g., Westchester county is classified as part of the New York City labor market). We allow for the expansion of metropolitan areas into farmland at the periphery. For example, the 1940 and 1970 censuses did not include Santa Rosa as part of the San Francisco Bay Area, whereas those of 1980 and 1990 did. Our definition of the San Francisco Bay Area excluded Santa Rosa in 1970 (when it was still a small, rural town) but included it in 1980 and 1990 (when it had become a suburb). We have experimented with consistent definitions of metropolitan area across census years and our results are not affected by the definition that we used.[21]

   Our final step is to create three city size categories: large

20. We use the integrated public use micro samples available at http://www.ipums.umn.edu/. Earlier censuses did not identify education. We cannot use the 1950 census because education is known only for the sample line person. We cannot use the 1960 census because metropolitan area is not identified.

21. Jaeger et al. [1998] show how to construct consistent definitions of metropolitan areas from 1970 to 1990.

metropolitan areas (those with populations of at least 2 million), midsize metropolitan areas (those with populations of between 2 million and 250,000), and small and nonmetropolitan areas (metropolitan areas with a population of less than 250,000 and nonmetropolitan areas). The 1940 census identified metropolitan areas if the population in these areas was at least 100,000 in 1980 and the 1980 and 1990 censuses identified metropolitan areas with populations of at least 100,000 in the census year. The 1970 census identified metropolitan areas with populations of at least 250,000 in 1970. Our definition of small and nonmetropolitan areas is therefore consistent across time.

2. Educational level
   The definition of education differed across census years. We use the highest grade of school or year of college completed for 1940, 1970, and 1980. Education is overstated in 1940 [Goldin 1998]. In 1990 the education variable gives the respondent's highest grade of school completed through the eleventh grade, but classifies high school graduates according to their highest diploma or degree earned. We therefore define our categories of less than high school as grade 11 or less, high school as grade 12 in 1940, 1970, and 1980 and as twelfth grade, high school diploma, or GED in 1990, college as four or more years in 1940, 1970, and 1980 and as a bachelor's or graduate degree in 1990. We classify those who did not complete college (less than four years in 1940, 1970, and 1980 and some college but no degree or occupational/academic associate degree in 1990) together with the high school graduates.
3. Hourly Wage
   Our hourly wage variable is constructed from annual wage and salary divided by annual hours worked (current weekly hours multiplied by weeks worked in the past year). We examine wage and salary income only because self-employment income is unavailable in 1940. We adjust all income numbers to 1997 dollars. We multiply the topcode by 1.45. In 1980 a larger proportion of the population was covered by topcoding than in 1970 or 1990. However, our results remain unchanged when we impose a new topcode in 1970 and in 1990.

The 1940, 1980, and 1990 censuses provide actual hours worked during the reference week and actual weeks worked in the past year. The 1970 census only provides intervals. We therefore take the midpoint of these intervals.

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