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The Evolution of Occupational Segregation in the United States, 1940–2010: Gains and Losses of Gender–Race/Ethnicity Groups

Coral del Río[1,2] **· Olga Alonso-Villar**[1]

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Abstract The aim of this article is twofold: (1) to descriptively explore the evolution of occupational segregation of women and men of different racial/ethnic groups in the United States during 1940–2010, and (2) to assess the consequences of segregation for each group. For that purpose, in this article, we propose a simple index that measures the monetary loss or gain of a group derived from its overrepresentation in some occupations and underrepresentation in others. This index has a clear economic interpretation. It represents the per capita advantage (if the index is positive) or disadvantage (if the index is negative) of the group, derived from its segregation, as a proportion of the average wage of the economy. Our index is a helpful tool not only for academics but also for institutions concerned with inequalities among demographic groups because it makes it possible to rank them according to their segregational nature.

Keywords Occupational segregation · Local segregation · Race · Gender · Wages

Introduction

The literature on occupational segregation in the United States has traditionally focused on segregation by gender and more recently has turned its attention to segregation by race and ethnicity. With respect to gender, much research has documented a reduction in segregation in the second half of the twentieth century and stagnation at the beginning of the twenty-first century (Beller 1985; Bianchi and Rytina 1986; Blau et al. 2013; Levanon et al. 2009). Segregation between blacks and nonblacks also

✉ Olga Alonso-Villar
ovillar@uvigo.es

[1] Departamento de Economía Aplicada, Universidade de Vigo, Campus Lagoas-Marcosende s/n, 36310 Vigo, Spain

[2] EQUALITAS, Vigo, Spain

decreased in the second half of the past century, but segregation between Hispanics and non-Hispanics increased (Queneau 2009). However, segregation by race/ethnicity does not affect women and men equally: female groups have fewer differences in segregation than male groups (Alonso-Villar et al. 2012; Reskin et al. 2004; Spriggs and Williams 1996). On the other hand, segregation by gender does not affect all racial/ethnic groups in the same way; it seems to be more prevalent for Hispanics and less so for Asians when compared with other groups (Hegewisch et al. 2010; Mintz and Krymkowski 2011).

When exploring segregation by race/ethnicity, analyses that focus on the male population or that aggregate women and men may obscure the particular situation of some gender–race/ethnicity groups. The same problem may arise when one is concerned with segregation by gender and jointly considers various racial/ethnic groups. Because both gender and race/ethnicity contribute to shaping and maintaining inequalities in the labor market (Browne and Misra 2003), more attention should be given to their intersection—a topic that so far has received little attention in the occupational segregation literature.

The aim of this article is twofold: (1) to descriptively explore the evolution of segregation of women and men of different racial/ethnic groups in the United States during 1940–2010, and (2) to assess this evolution in terms of the monetary losses/gains of these groups associated with their segregation. For that purpose, we develop a methodology with which to address substantive questions that have not been answered thus far. The analysis involves 12 gender–racial/ethnic groups across a 70-year period, paying special attention to women and men of the largest racial/ethnic groups: whites, blacks, Hispanics, and Asians.

This article contributes to the literature on occupational segregation by race/ethnicity and gender, both empirically and methodologically. First, we explore the distinctive situation of each of these groups, using recent tools that make it possible to determine the segregation of each group without comparing it against all alternative groups. Pairwise comparisons become cumbersome when many groups are in the analysis, making it difficult to summarize the situation of a group. The approach that we follow here, which was proposed by Alonso-Villar and Del Río (2010), involves comparing the distribution of the target group across occupations with the occupational structure of the economy. These measures are labeled "local segregation measures" to distinguish them from overall or aggregate segregation measures. This approach offers a summary statistic of the situation of the group, which is especially helpful for cross-time analysis because the evolutions of various pairwise comparisons may not coincide. For example, Kaufman (2010) found that segregation between black women and either black men or white women decreased in the 1980s, but segregation between black women and white men increased. In such a situation, it does not seem possible to conclude whether black women in 1990 were more segregated or less segregated than they were in 1980. However, when using local segregation measures, one would find that the segregation of black women actually decreased in that period (Alonso-Villar and Del Río 2013). Our approach will allow us to answer the following questions: (1) Did segregation decrease for all groups of women in the second half of the twentieth century?, and (2) is the recent evolution of occupational segregation for white women (men) similar to that for minority women (men)?

Second, in this article, we also measure overall or aggregate segregation in our 12-group context, quantifying the simultaneous discrepancies that exist among all groups. Was overall segregation by gender and race/ethnicity in 2010 lower than it was several decades ago? Overall segregation in this multigroup context implies accounting not only

for disparities between women and men of the same race (as can be done by employing a binary segregation measure, such as the index of dissimilarity) but also for differences between women of a given race and men of a different race and for differences within the same gender group across races. All differences are considered simultaneously.

This approach is important because when dealing with segregation by race, scholars usually consider only two groups: blacks and whites. This black–white segregation is what is usually contrasted with segregation by gender to determine whether segregation by race is higher or lower than segregation by gender. However, by using multigroup overall segregation measures, one can simultaneously include not only three or more races/ethnicities in the analysis—which seems pertinent in a multiracial society like the United States—but also gender. By doing so, one can measure how much overall segregation changes when one of these dimensions, either race/ethnicity or gender, is removed from the analysis, as we do in this article. This type of assessment is not possible with binary segregation measures. To measure overall segregation, we use the mutual information index (Frankel and Volij 2011).

Third, an important methodological contribution of this article involves the assessment of segregation. Segregation measures quantify how uneven the distributions of social groups across occupations are, but the situation of a group of people mainly concentrated in high-paying occupations is clearly different from that of another group concentrated in low-paying ones. To explore the nature of segregation that a group experiences, this article defines a novel index that measures the monetary loss or gain of a group for being overrepresented in some occupations and underrepresented in others, as a proportion of the average wage of the economy. Is the segregation of Asian women more serious than that of white or black women? Should one care more about the segregation of Hispanic men than about that of their female counterparts? Are the consequences of segregation more severe for women than they are for men of the same race/ethnicity? This index also allows us to quantify the proportion of each group's (wage) earning gap that arises from its occupational segregation. Our analysis reveals that in 2010, occupational segregation still accounted for the majority of the earnings gap for most gender–race/ethnicity groups, which is in line with other studies that emphasize the role played by occupations in generating social stratification (Mouw and Kalleberg 2010; Petersen and Morgan 1995).

Methodology and Data

Segregation Measures

The index of dissimilarity is a well-known segregation measure that has been extensively used to quantify occupational segregation by gender. Moreover, to compute segregation in a multigroup context, scholars have often employed it to measure disparities between pairs of groups. However, these pairwise comparisons become cumbersome when there are many groups, especially if there is interest in trends over a 70-year period, for example.

Alternatively, to summarize the performance of each group, one could compare the distribution of that group across occupations with the occupational structure of the economy. This means, for example, that black women are segregated so long as they are overrepresented in some occupations and underrepresented in others, whether those

latter occupations are filled by white women, Hispanic women, black men, white men, or any other group. This approach was formally developed by Alonso-Villar and Del Río (2010), who defined several segregation measures in a multigroup context and explored their properties. These measures, labeled "local segregation measures" to distinguish them from overall segregation measures, allow the researcher to quantify the segregation of a group. In our empirical analysis, we use one of those measures:

$$\Phi_1^g(c;t) = \sum_j \frac{c_j^g}{C^g} \ln\left(\frac{c_j^g/C^g}{t_j/T}\right), \tag{1}$$

where c_j^g denotes the number of individuals of group g in occupation j, t_j is the number of jobs in that occupation, $C^g = \sum_j c_j^g$ is the size of group g in the economy, and $T = \sum_j t_j$ is the total number of jobs in the economy. This index ranges from a minimum of 0 to a maximum of $\ln(T)$.[1]

In a multigroup context, apart from calculating the segregation of a group, one might also be interested in determining overall segregation. The literature offers several measures with which to summarize the simultaneous discrepancies that exist among all groups (Boisso et al. 1994; Frankel and Volij 2011; Reardon and Firebaugh 2002; Silber 1992).[2] As in the two-group case, no segregation exists if every group is evenly distributed among occupations (i.e., if the population share of the group in each occupation, c_j^g/C^g, is the same for all groups). As Alonso-Villar and Del Río (2010) showed, several of these overall segregation measures can be written as weighted averages of local segregation measures applied to each of the mutually exclusive groups into which the whole population is partitioned, with weights equal to their share on the total workforce. In particular, the mutual information index, $M = \sum_g \frac{C^g}{T} \ln\left(\frac{T}{C^g}\right) - \sum_j \frac{t_j}{T}\left[\sum_g \frac{c_j^g}{t_j} \ln\left(\frac{t_j}{c_j^g}\right)\right]$, borrowed from the information theory and characterized by Frankel and Volij (2011) in terms of basic segregation properties, can be written as the weighted average of index Φ_1^g for each of the groups:

$$M = \sum_g \frac{C^g}{T} \Phi_1^g. \tag{2}$$

Consequently, using the segregation of each group and its demographic weight in the economy, the contribution of each group to overall segregation can be quantified:

$$\text{Contribution of group } g \ = \frac{\frac{C^g}{T}\Phi_1^g}{M}. \tag{3}$$

Ceteris paribus, overall segregation increases as the distribution of a group across occupations departs from that of the whole population. This component captures the local segregation of each group. Likewise, overall segregation also increases with the

[1] This index has been used to quantify segregation in the United States (Alonso-Villar et al. 2012, 2013).
[2] For studies applying these measures to explore occupational segregation by race/ethnicity and/or gender in the United States, see Watts (1995) and Gradín et al. (2015).

population shares of those groups whose distributions lie further away from that of the whole population.

Assessing Segregation: Our Proposal

Segregation alone does not permit us to assess the position of a group in the labor market because it depends not only on whether the group has access to any type of occupation but also the "quality" of occupations that the group tends to fill or not to fill. Thus, for example, Hegewisch et al. (2010) documented that U.S. median earnings in 2009 were higher for male-dominated than for female-dominated occupations in low-, medium-, or high-skilled occupations.

To address this issue, we propose using a simple index, Γ, that measures the monetary loss or gain that a group experiences as a consequence of its underrepresentation in some occupations and its overrepresentation in others. In other words, this index assesses the segregation of the group according to occupational wages. To build this index, we first compare the share of the group in each occupation, c_j^g / C^g, with the employment share of that occupation, t_j / T, which represents the share the group would have if there were no segregation. If this difference is positive, the group is overrepresented there; otherwise, it is underrepresented. Next, we quantify how much in earnings the group gains (respectively, loses) for being overrepresented (respectively, underrepresented) in that occupation. For that purpose, we take into account the (average) wage of that occupation, w_j. Because the index is aimed at assessing the occupational segregation of a group, it accounts only for wage disparities that arise from differences across occupations, while salary differences within occupations are disregarded.

After we aggregate the losses and gains for all occupations and express them as a proportion of the average wage of occupations, $\overline{w} = \sum_j \frac{t_j}{T} w_j$, we have a summary statistic of the position of the group. Namely,

$$\Gamma = \sum_j \left(\frac{c_j^g}{C^g} - \frac{t_j}{T} \right) \frac{w_j}{\overline{w}}. \tag{4}$$

To explain why this index is useful to rank various demographic groups or a group across time, note that $\sum_j C^g \left(\frac{c_j^g}{C^g} - \frac{t_j}{T} \right) w_j = \sum_j \left(c_j^g - C^g \frac{t_j}{T} \right) w_j$ can be thought of as the total sum of the gains and losses that the group has as a consequence of its underrepresentation in some occupations ($c_j^g < C^g(t_j / T)$) and overrepresentation in others ($c_j^g > C^g(t_j / T)$). Therefore, $\sum_j \left(\frac{c_j^g}{C^g} - \frac{t_j}{T} \right) w_j$ represents the (per capita) loss/gain of each member of the group derived from the occupational segregation of the group. This expression would allow making comparisons among groups of different sizes in a given year but would not be suitable to compare either groups among economies that differ in their occupational wages or a group across time. However, by dividing this expression by the average

wage of occupations, $\overline{w}$, we can obtain the loss/gain of each member of the group as a proportion of that average wage.[3]

The interpretation of this index is very intuitive. A value of .1 means that the group has a per capita gain of 10 % of the average wage of the economy because of its uneven distribution across occupations. On the contrary, a value of –.1 implies that the consequences of segregation are negative for the group because it has a per capita loss of 10 % of the average wage of the economy. Note that the losses/gains of all mutually exclusive groups into which the economy can be partitioned, when weighted by the demographic shares of the groups, add to 0 because the advantages of some groups with respect to the average wage must exactly offset the disadvantages of the others. For exposition, in our empirical implementation, the values of the index are given multiplied by 100.

This index satisfies several good properties. It is equal to 0 when either the group has no segregation or all occupations have the same wage. In other words, given that this index aims to quantify the consequences of segregation, if all occupations offer the same wage or if the group is evenly distributed across occupations, the index should reflect that there are no penalties or advantages for the group. In addition, the index increases when some individuals of the group move from one occupation to another that has a higher wage, and it decreases if the opposite holds. Moreover, the index is unaffected by the size of the group; thus, for example, the index does not change if the group doubles in each occupation. This property makes it suitable for comparing different demographic groups. Likewise, the index is unaffected by the number of total workers in the economy (so long as the occupational structure of the economy does not change) or the monetary units in which wages are measured, which makes it appropriate to compare a group across time or across countries. This index does not take distributive issues into account, however. It is not responsive to where the changes occur but instead to the magnitude of losses/gains. Moving into an occupation that has an additional wage of $1 has the same effect on the index, regardless of whether the occupation left behind was low-paying or high-paying.

As mentioned earlier, our index does not measure the whole earning gap of a group because it neglects wage inequalities that exist within occupations. However, we can determine the share of the earning gap that our index does take into account. Note that the whole earning gap of the group, as a consequence of both its uneven distribution across occupations and its within-occupation wage discrepancy with respect to other groups, can be written as $C^g\sum_j \frac{c_j^g}{C^g} w_j^g - C^g\sum_j \frac{t_j}{T} w_j$, where w_j^g is the average wage that the group receives in occupation j (which can differ from the average wage of that occupation, denoted by w_j). By writing this earning gap as a proportion of the total wage revenues that the group would have if there were no segregation and no within-occupation wage disparities with respect to other groups—that is, as a

[3] This average wage actually coincides with the average wage of the economy because the wage of each occupation is determined by the average wage of the individuals working there.

proportion $C^g\overline{w}$—we can determine the per capita earning gap ratio of the group (denoted by *EGap*):[4]

$$\begin{aligned} EGap &= \left(C^g \sum_j \frac{c_j^g}{C^g} w_j^g - C^g \sum_j \frac{t_j}{T} w_j \right) \frac{1}{C^g \overline{w}} \\ &= \left(C^g \sum_j \frac{c_j^g}{C^g} w_j^g - C^g \sum_j \frac{c_j^g}{C^g} w_j + C^g \sum_j \frac{c_j^g}{C^g} w_j - C^g \sum_j \frac{t_j}{T} w_j \right) \frac{1}{C^g \overline{w}} \\ &= \underbrace{\left[\sum_j c_j^g \left(w_j^g - w_j \right) \right] \frac{1}{C^g \overline{w}}}_{\Delta} + \underbrace{\sum_j \left(\frac{c_j^g}{C^g} - \frac{t_j}{T} \right) \frac{w_j}{\overline{w}}}_{\Gamma}. \end{aligned} \tag{5}$$

This per capita earning gap ratio can be decomposed in two terms: one associated with the occupational segregation of the group, represented by Γ; and the other associated with within-occupation wage disparities with respect to other groups, denoted by Δ. Therefore, by dividing Γ by *EGap*, we can calculate the contribution of segregation to the earning gap ratio of the group.

Data

Our data set comes from the Integrated Public Use Microdata Series (IPUMS) samples covering 1940–2010 (Ruggles et al. 2010). This data set offers harmonized information assigning uniform codes to variables, which makes long-term comparisons possible. These data are based on the decennial censuses for the 1940–2000, as well as the 2005–2007 and 2008–2010 American Community Surveys (ACS) for the 2000s. We use the 2005–2007 and 2008–2010 samples separately to take into account the Great Recession.

The U.S. Census Bureau has reorganized its occupational classification system several times, but IPUMS brings two consistent long-term classifications: the 1950 classification, available for the whole period; and a modified version of the 1990 classification, available from 1950 onward. For the period 1940–1980, we calculate segregation using the codes of the 1950 classification system, which accounts for 269 occupations. For the period 1980–2010, we instead use the 1990-based classification, which accounts for 389 occupations because although the 1950 classification is available for the whole period, the Minnesota Population Center recommends using the 1990-based classification from 1980 onward.[5] For 1980, we use the two classifications, which makes it possible to assess the break in the series.

This article considers six mutually exclusive groups of workers composed of the four major single-race groups that do not have a Hispanic origin, plus Hispanics of any race and others: whites, African Americans or blacks, Asians (Chinese, Japanese, and other Asians or Pacific Islanders), Native Americans (American Indians and Alaskan natives), Hispanics, and "other race" (those non-Hispanics reporting some other race or

[4] This per capita earning gap ratio is the difference between the average wage of the group and the average wage of the economy, expressed as a proportion of the latter.

[5] See https://usa.ipums.org/usa-action/variables/OCC1950#comparability_section.

more than one race).[6] Given that occupational segregation is a gendered phenomenon, this article crosses these groups with sex to obtain 12 mutually exclusive groups.

For 1990, 2000, 2005–2007, and 2008–2010, we proxied the wage of each occupation by the average wage per hour (calculated from the information provided by the IPUMS).[7] Because of data limitations, we instead use the average wage per week for 1940, 1960, and 1970. For 1980, we use both wages per week and wages per hour to make the time series consistent with either previous or subsequent years. The average wage of each occupation was not available for 1950.

Segregation Trends

Overall Segregation Trends by Gender and/or Race/Ethnicity

Figure 1 displays overall segregation trends for 1940–2010 according to the *M* index. One of the time series corresponds to the analysis of segregation by gender (2 groups), another refers to segregation by race/ethnicity (6 groups), and the remaining are results from the combination of both dimensions (12 groups).

Segregation by Gender

Segregation by gender increased up to 1960, decreased during the next four decades, and experienced only a very small reduction during the 2000s. This trend is consistent with that found in previous works for shorter periods of time using the index of dissimilarity (Blau and Hendricks 1979; Blau et al. 2013).[8]

Segregation by Race/Ethnicity

The evolution of overall segregation by race/ethnicity is different from that of gender: it fell from 1940 to 1980 and has increased ever since. In this case, comparisons with previous works are more difficult. On the one hand, because they are based on pairwise comparisons, they do not offer summary statistics of total segregation. On the other hand, they do not consider the wide range of races used here because most scholars have traditionally examined employment segregation between blacks and whites, only recently including Hispanics and/or Asians in their analyses (Mintz and Krymkowski 2011; Queneau 2009; Tomaskovic-Devey and Stainback 2007).

[6] The residual category "other race" is different each year. In particular, multiple-race responses were allowed since 2000. Regarding Hispanic origin, there is a break between 1970 and 1980; before 1980, the origin was imputed by IPUMS.

[7] We have trimmed the tails of the hourly wage distribution to prevent data contamination from outliers. Thus, we computed the trimmed average in each occupation eliminating all workers whose wage is either 0 or situated below the first or above the ninety-ninth percentile of positive values in that occupation.

[8] Hegewisch et al. (2010) found a similar evolution when analyzing whites, blacks, and Hispanics separately, although in this case, no further progress is observed between mid-1990s and 2009. Asians, however, do improve at the beginning of the 2000s.

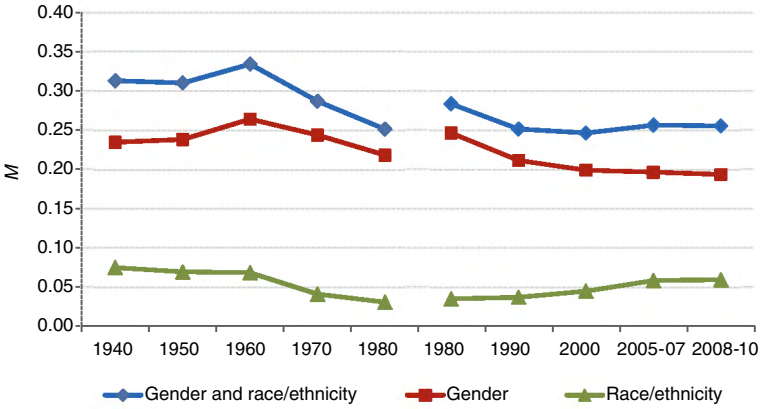

Fig. 1 Overall segregation by gender, race/ethnicity, and gender and race/ethnicity (index *M*), 1940–2010

Segregation by Gender and Race/Ethnicity

Our analysis shows that when crossing gender and race/ethnicity, overall segregation peaked in 1960, slid until 2000, and increased slightly from 2000 to 2007, remaining stable afterward.[9] The evolution of this time series resembles that of gender more than that of race/ethnicity. In any case, the reductions observed from 1960 to 1980 occurred along both gender and race/ethnicity lines. The reduction from 1980 to 1990 seems to have been due exclusively to gender integration, whereas the slight rise observed in the early 2000s seems to be the consequence of growing differences among racial/ethnic groups.

These results are consistent with research claiming that civil rights legislation was behind the progress of minorities during the 1960s and 1970s (Conrad 2005; Kurtulus 2012; Tomaskovic-Devey and Stainback 2007). After political pressures for racial equality weakened, segregation by race/ethnicity was augmented. The only progress came from the sex desegregation that occurred perhaps as a consequence of entry to the workforce of new cohorts of women with higher educational achievements than their predecessors (Blau et al. 2013) and as result of political pressure for gender equality, "... which did not start effectively until the 1970s, continued through the 1990s" (Tomaskovic-Devey et al. 2006:585). This reduction in gender segregation may have somehow offset the increase in racial segregation, leading to a decline in gender–race/ethnicity segregation in the 1980s. To the extent that gender desegregation stalled in the 2000s and segregation by race/ethnicity continuously rose beginning in 1990, no further reductions in overall segregation by gender and race/ethnicity occurred afterward. In fact, it has slightly increased in 2000–2010.

When comparing the aforementioned series, it is hardly surprising to see that segregation by gender is higher than segregation by race/ethnicity: several works based on pairwise comparisons have already documented this fact using estimates of black-white segregation within sex groups and sex segregation within racial groups (Blau et al. 2001; Kaufman 2010; King 1992). The most startling result here is the extent of those

[9] This evolution is in line with that obtained by Watts (1995) for the period 1983–1992 using the I_p index proposed by Silber (1992) and considering 6 rather than 12 groups.

differences, something that can be easily determined in our multigroup approach. Thus, when adding the gender dimension to the racial/ethnic analysis, the segregation index rises by more than 317 %; comparatively, when adding race/ethnicity to the gender analysis, segregation increases by 33 % at most: that is, most of the differences that we observe in the distribution of our 12 groups across occupations arise from gender. However, as mentioned earlier, gender does not affect all races equally. If these intersections were not considered in the analysis, the real experience of the groups would not be properly quantified; therefore, overall segregation would be underestimated. In subsequent sections, we explore the distinctive segregation of the groups.

Linking Overall Segregation and Local Segregation

As mentioned earlier, overall segregation depends on two factors: the segregation levels of the groups and their demographic weights. In this subsection, we first analyze the evolution of the segregation of the groups and then explore whether the trend in overall segregation is mainly driven by this evolution or instead by the demographic changes of the groups.

Local Segregation

Figure 2 shows the segregation of the largest racial/ethnic groups (see Table 1 in the appendix for all groups). Between 1940 and 1980, segregation strongly decreased for all groups of women (especially for black women) and increased for white men (although not for other men).[10] From 1980 onward, segregation decreased only slightly for female groups, and this integration process came to a halt in 2000.[11] The evolution of occupational segregation for black men was similar to that of their female counterparts;[12] the evolution of Hispanic men departed from that of Hispanic women, given that the segregation of men has been increasing steadily for several decades, making them the group with the highest segregation at present.

In the 2000s, white men were still more evenly distributed across occupations than the remaining groups, while white women had a segregation level similar to that of black men but below those of minority women and men. The segregation of Asian men is between that of Hispanic and black men, while the segregation of Asian women is quite close to that of other minority women. Despite the high segregation of Asian women and men, in the next section we will show that, as opposed to other minorities, these groups are advantaged when considering the wages of the occupations they tend to fill.

The analysis also suggests that in the 2000s, differences in segregation along racial/ethnic lines were more marked among men, while there were barely differences among minority women. This finding is in line with those obtained in other studies for earlier periods (Alonso-Villar et al. 2012; Reskin et al. 2004; Spriggs and Williams 1996).

[10] The rise in segregation by gender between 1940 and 1960—as documented by Blau and Hendricks (1979) for 1950–1960 and shown in Fig. 1—seems to be mainly due to a rise in the segregation of white men—who accounted for more than 60 % of workers—and also of black men because the segregation of white women—who accounted for almost 30 % of workers—and that of other minority women and men actually fell during this period.

[11] The evolution of the segregation of black women reported in Fig. 2 was previously shown by Alonso-Villar and Del Río (2013), who undertook an in-depth analysis of this particular group.

[12] Queneau (2009) also documented a decrease in the segregation between blacks and nonblacks between 1983 and 2002, although this study did not distinguish between women and men.

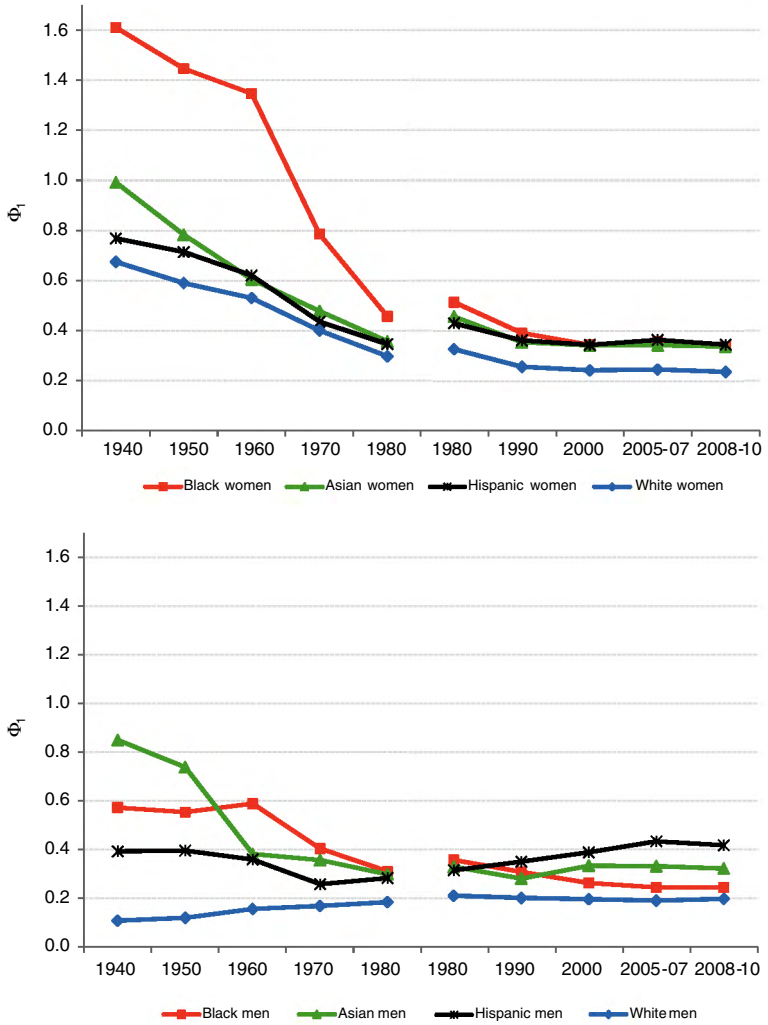

Fig. 2 Segregation of the largest gender–racial/ethnic groups (Φ_1^g), 1940–2010

Changes in Local Segregation Versus Changes in Population Shares

Figure 3 shows (1) how overall segregation would have evolved across the period if the demographic composition of the groups had remained unchanged but their segregation levels changed as they really did (*M-Demog*), and (2) how overall segregation would have changed if segregation had remained unaltered while the demographic composition evolved as it did (*M-Seg*).[13] To calculate *M-Demog* (respectively, *M-Seg*) in the period 1940–1980, we use the demographic shares (respectively, segregation values) of 1940; in the period 1980–2010, the year of reference is 1980.

The chart reveals that if the population composition had not changed, overall segregation would have been lower (*M-Demog* is always below *M*) but with a similar

[13] The demographic weights are given in Table 2 in the appendix.

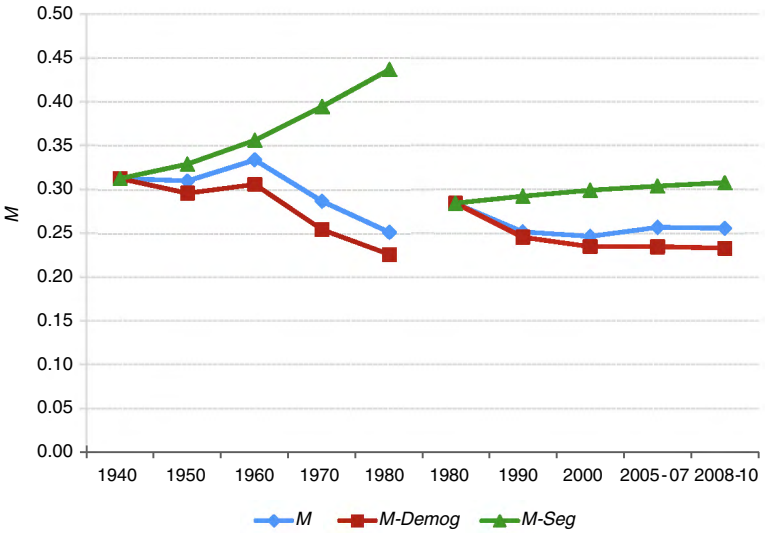

Fig. 3 Overall segregation (*M*), overall segregation while keeping the demographic shares of the groups unchanged (*M-Demog*), and overall segregation while keeping the segregation levels of the groups unaltered (*M-Seg*), 1940–2010

evolution. On the contrary, if the segregation of the groups had not changed, overall segregation would have been higher (compare *M-Seg* and *M*) and increasing throughout the whole period. These findings suggest that the decline in overall segregation observed between 1960 and 2000 was the result of a reduction in the segregation of some groups given that the main demographic changes occurred in the opposite direction: the population share of groups with high segregation—as is the case of black, Asian, Hispanic, and white women—actually increased throughout this period, and this coincided with a decrease in the share of white men, who had low segregation. The drop in overall segregation was mainly due to a decrease in the (local) segregation of women of any race/ethnicity, especially black women, as well as black men. See earlier Fig. 2 and also Table 1 in the appendix.

Assessing Segregation: Occupational Attainment

So far, we have documented overall segregation and the segregation level of each group over time. Now we assess the consequences of segregation for each group according to index Γ and show how important occupational sorting is to explain their earning gaps.

Figure 4 displays the decomposition of the per capita earning gap ratio of the four largest racial/ethnic groups during 2008–2010 (the corresponding values for the 12 groups are given in Table 3 in the appendix). This chart shows that segregation explains the majority of the per capita earning gap ratio for African American, Asian, and Hispanic women and men. However, 74 % of the negative earning gap for white women is associated with the salary disadvantage that this group faces within

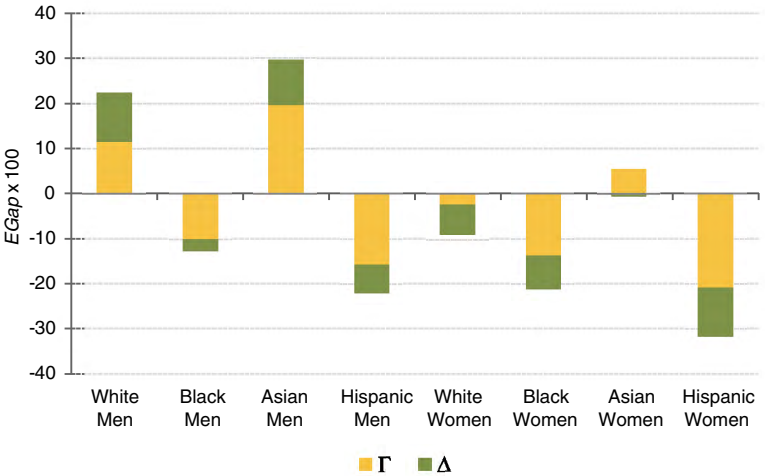

Fig. 4 Decomposition of the per capita earning gap ratio (*EGap* × 100) for the largest groups in terms of segregation (Γ × 100) and within-occupation wage disparities (Δ × 100), 2008–2010

occupations,[14] whereas the positive earning gap for white men arises from occupational segregation and within-occupation wage advantages in equal shares.

The Consequences of Segregation for Men

Figure 5 documents the evolution of Γ for the largest groups (the values of this index for the 12 groups are given in Table 4 in the appendix). This chart reveals improvements for all groups of men between 1940 and 1980 in terms of occupational attainment. Asian men caught up with white men in 1980, where both groups had a value around 11, which means that their uneven distributions across occupations brought them an 11 % gain above the average hourly wage of the economy. Black and Hispanic men also caught up with each other in 1980 but at a negative value (around –3), which gives evidence of their disadvantaged positions.

From 1990 onward, important divergences appear among male groups. Asian men increasingly improved (reaching an advantage of 20 % during 2008–2010), surpassing even white men (12 %), who no longer made up the most-advantaged group (this group's index has barely changed since 1980). By contrast, the indexes of black men and especially Hispanic men have markedly decreased (reaching –10 and –16, respectively, during 2008–2010), which suggests a worsening for these two groups.

Exploring the effects of affirmative action on the occupational advancement of minorities, Kurtulus (2012) found that black men benefited from it, which may explain why integration fell for this group when enforcement of affirmative action weakened in the 1980s. By contrast, Kurtulus did not find evidence that Hispanic men benefited from affirmative action. As we explain later in the article, the recent evolution of segregation for Hispanic men may be affected by the group's immigration profile.

[14] This percentage had been increasing since 1980 (when it was 54 %) because the reduction in the earning gap of white women due to segregation has been larger than the reduction in their salary disadvantage within occupations. Petersen and Morgan (1995) documented the important role of occupational segregation in explaining the wage gap of women in the early 1980s, although they did not distinguish women by race.

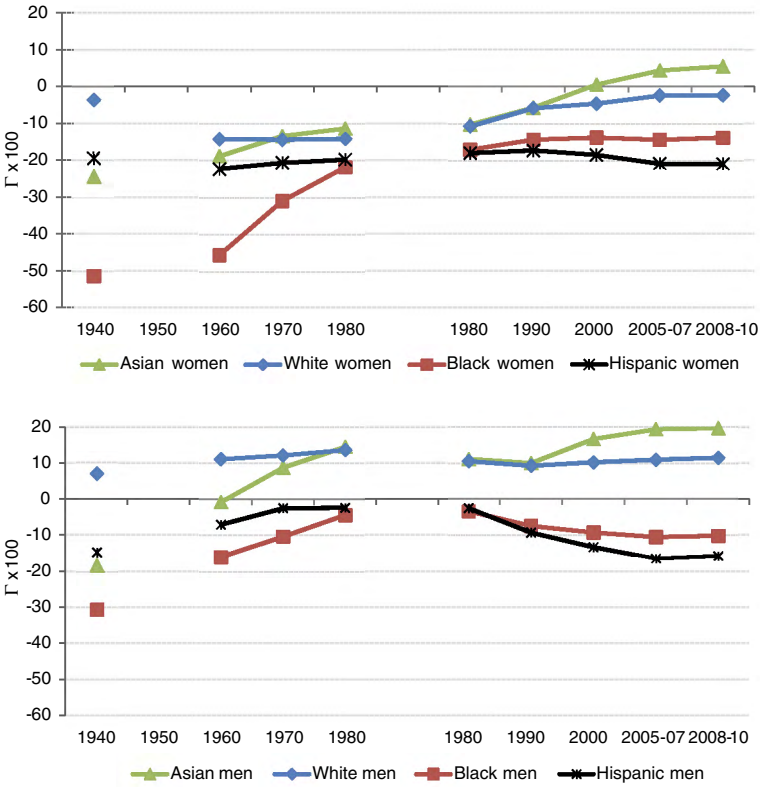

Fig. 5 Gains/losses of the largest gender–racial/ethnic groups (Γ × 100), 1940–2010

The Consequences of Segregation for Women

Figure 5 also reveals that occupational segregation improved for all groups of women from 1960 until 1990, which is consistent with the progress along gender lines mentioned in the previous section. Apart from the rise in education (Blau et al. 2013), civil rights legislation may have been behind these advances. Kurtulus (2012) claimed that affirmative action legislation played an important role in the advancement of black, Hispanic, and white women into management, professional, and technical occupations during the 1970s and early 1980s, but the impact was smaller in the 1990s.

Since 1990, only Asian and white women have improved in terms of occupational attainment; this is especially true for the former, perhaps because of their educational advantage. A central finding of this article is that the index has been positive for Asian women since 2000. During 2008–2010, they had a per capita gain of 5 % of the average wage of the economy. This advantage is, however, lower than that of either white men (12 %) or Asian men (20 %).

Regarding white women, the decline of the index in the period 1940–1960 and its stagnation between 1960 and 1980 is startling, especially if we take into account the strong reduction in segregation that this group experienced (Fig. 2). The intensification of their disadvantage during the first period (index Γ falls

from –3 to –14) was due to both a decrease in the relative weight of this group in some occupations with wages above or near the average wage (teachers, operatives, and forepersons) and a drop in the relative wage of occupations in which white women were highly represented (bookkeepers, secretaries, and other clerical workers). This pattern is also observed during 1960–1980, although it was offset by a higher representation of white women in occupations with above-average wages (accountants and auditors; professional and technical workers; and managers, officials, and proprietors). Since 1980, the index has been closer and closer to 0. During 2008–2010, the index shows a disadvantage of 2 % of the average wage. Therefore, this group has a better position in terms of occupational attainment than black men but worse than white men and either Asian men or women. The situation is much worse for black women and especially Hispanic women, whose positions have worsened in 2000–2010 (their values during 2008–2010 were –14 and –21, respectively), despite the dramatic advances for black women until 1980.[15]

Consequently, the slight reduction in gender segregation seen in the 2000s has not equally affected all racial/ethnic groups of women. The progress of women in 2000–2010 was mainly concentrated among Asians and whites. Our results for previous decades are consistent with the findings on relative earnings shown by Cotter et al. (1999), who documented stagnation for white women's earnings as a proportion of white male earnings in the 1960s and 1970s and improvements in the 1980s; strong improvements for black women in the late 1960s and 1970s; and larger increases for white women than for black and Hispanic women between 1980 and 1995.

Further Discussion

Our analysis shows that despite segregation being higher for Asian men than for black men during 2008–2010 (Fig. 2), the assessment of that segregation seems to be positive for Asians but negative for blacks. Something similar happens to Asian women, whose level of segregation during 2008–2010 was similar to that of other minority women, although the assessment of that segregation is positive for them and negative for the other minorities. In addition, despite Hispanic men having a higher level of segregation than Hispanic women, the situation of women seems to be worse.

The high value of index Γ for Asian women and men could be the result of their high educational achievements. Notwithstanding important differences in education among Asian subgroups,[16] the proportion of Asians holding a bachelor's degree is significantly higher than that of non-Asians. As Xie and Goyette (2004) documented, this educational advantage may have facilitated

[15] As we mention earlier, this index responds only to those wage disparities that arise from working in different occupations, ignoring wage disparities or discrimination within occupations. In fact, as Fig. 4 shows, the situation of black and Hispanic women is worse when these wage disparities are taken into account (their per capita earning gap ratios are –21 and –32, respectively). Conrad (2005) documented the widening wage gap for black women with respect to white women between 1980 and 2000 derived from the persistent discrimination as well as the racial gap in education that still remains.

[16] The proportion of Asian Indians who have a bachelor's degree or higher education is more than twice as much as that of Vietnamese (Allard 2011). Kim and Mar (2007) also documented wide differences among Asian groups in terms of poverty and unemployment rates.

their access to high-skilled occupations, such as scientific, medical, and engineering jobs, from 1960 to 2000. Other scholars have also documented the occupational advantage of particular Asian subgroups. Woo et al. (2012) found occupational advantages for second-generation South Asian women and men when comparing them with their white counterparts because of not only the high educational level of this group but also its concentration on science, technology, engineering, and medical studies.

A repetition of the analysis shown in Fig. 4 stratifying by educational attainment—that is, exploring individuals of each educational level separately—reveals new findings. See Table 3 (in the appendix), which considers four levels: less than high school, high school diploma, some college, and bachelor's degree. See also Fig. 6, which depicts the gains and losses of those having a bachelor's degree as a proportion of their education-specific average wage.

The occupational gains of Asian women disappear when comparing them with their educational peers: Γ is always negative, although close to 0 for those with a bachelor's degree. Therefore, the good position of the whole group of Asian women appears to be driven mainly by their largest proportion of bachelor's degrees. The case of Asian men is a bit different; the index for those with university degrees is positive and high, around 11, although lower than the one shown before for the whole group of Asian men (almost 20). Consequently, the occupational gains of Asian men seem to be the result of both their educational achievements and their intense concentration in some of the highest paid jobs.

The low value of Γ for Hispanics could also be the result of their (lower) educational achievements (and their immigration profile). As Duncan et al. (2006) documented, when years of schooling and English proficiency are controlled for, Hispanics barely lag behind whites in terms of employment and earnings. Alonso-Villar et al. (2012) and Gradín (2013) also pointed out that these factors are an important source of occupational segregation for Hispanics. Our analysis by educational level shows that this is the case for Hispanic men: Γ substantially increases when comparing them with their peers in education (it is either positive or less negative). On the contrary, Γ is negative and high for Hispanic women at all educational levels.

The pattern for Hispanic women is shared by black and white women, although to a different extent. The occupational sorting of these groups seems to disadvantage them at each educational level, whereas (as shown earlier) segregation appears not to be a problem for Asian women having a bachelor's degree (perhaps because of their concentration in some types of study).[17] Regarding male groups, segregation brings important advantages for white men at all educational levels. Only in the case of individuals having a bachelor's degree is the advantage slightly surpassed by that of Asian men. As opposed to Hispanic men, the low occupational attainments of black men do not seem to be a consequence of their educational achievements. An interesting

[17] The earnings gap for this subgroup is mainly explained by the within component (Fig. 6), which suggests that although they are not particularly concentrated in bad occupations, they are penalized within them.

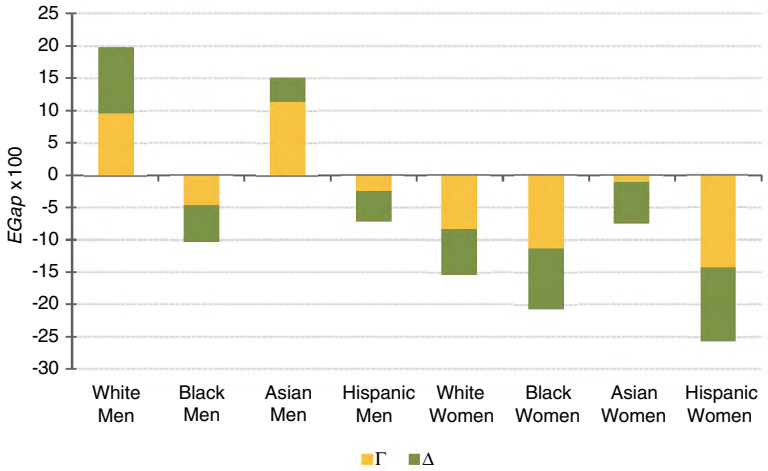

Fig. 6 Decomposition of the per capita earning gap ratio (*EGap* × 100) for the largest groups in terms of segregation (Γ ×100) and within-occupation wage disparities (Δ × 100), 2008–2010: Individuals with a bachelor's degree

finding is that when focusing on individuals having less than a high school diploma, all male groups gain from their occupational sorting while all female groups have losses.

Conclusions

This descriptive study reveals that with the addition of gender to the analysis of segregation by race/ethnicity, segregation more than triples; segregation increases by only one-third with the addition of race/ethnicity to the analysis of segregation by gender. In addition, the segregation reduction that female groups experienced between 1940 and 1990 did not allow any of them to reach a neutral position in the labor market; the consequences of segregation were negative for them. Cotter et al. (1999) found similar results for earnings.

In 2000, changes started to occur for Asian women but not for other women. Overlooking differences by ancestry (Kim and Mar 2007), in 2010, the segregation of Asian women brought them a per capita advantage of 5 % of the average wage of the economy, whereas the segregation reduction for white women allowed them to reach only a 2 % disadvantage. The situation was much worse for other female groups. The disadvantage of black and Hispanic women in 2010 was marked (14 % and 21 % of the average wage, respectively), and these groups did not improve in 2000–2010. Regarding male groups, our study reveals that the position of whites has barely changed since 1980, with their advantage in 2010 being about 12 % of the average wage. As in the case of their female counterparts, Asians have been the most advantaged male group since 2000, reaching an index value of 20 % in 2010. By contrast, the

situation for Hispanic and black men has worsened since 1980; in 2010, they had a per capita disadvantage of 16 % and 10 %, respectively. The analysis has also shown that the occupational sorting of women is still worse than that of men of the same race/ethnicity.

Although the causes of these disadvantages are beyond the aim of this article, which has mainly focused on gross differences among groups, the descriptive analysis undertaken stratifying by educational attainments suggests that the advantage of Asian women was due to their higher education achievements. Compared with their peers in education, they have a negative index, even those having a bachelor's degree (although in this case, it is close to 0). The advantage of Asian men also decreases when compared with their peers, but the index for those having a bachelor's degree is instead clearly positive. Education does not seem to explain either the negative value of the index for female groups (and black men) or the positive value for white men. Moreover, when we focus on individuals with less than a high school diploma, segregation brings positive results to all men's groups and negative results to all women's. Among those with a bachelor's degree, situations for all women except Asians are worse than those for any male group. A startling finding is that the disadvantage for white women with a bachelor's degree is larger than that for Asian women (and also larger than that for any male group). This is an issue that deserves further research attention. Introducing spatial variation in the losses/gains of the groups would also help to approach the real experience of groups (Alonso-Villar et al. 2013; Cohen and Huffman 2003; Cotter et al. 1999).

Our analysis not only shows the evolution of occupational segregation in the United States by gender, race, and ethnicity during a 70-year period (1940–2010) but also assesses it by quantifying the advantages or disadvantages of the various groups derived from their occupational sorting. For that purpose, we have developed an index that measures the per capita monetary gain/loss of a group, derived from its segregation, as a proportion of the average wage of the economy. This simple measure can be used by that increasing number of scholars who call for the necessity of exploring segregation in a multigroup context rather than in a dichotomous context. Moreover, by quantifying the monetary losses/gains of any demographic group associated with its occupational sorting, our index will allow researchers to move beyond the mere measurement of unevenness to focus on the economic consequences of that unevenness, which is where the main problem lies. This index seems, therefore, a helpful tool not only for academics but also for institutions concerned with inequalities by gender, race, ethnicity, and migration status, among others, because it makes it possible to rank different groups in an economy or a target group across time according to the type of segregation they experience.

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Appendix

Table 1 Local segregation of gender–race/ethnicity groups (Φ_1^g), 1940–2010

	1940	1950	1960	1970	1980	1980	1990	2000	2005–2007	2008–2010
White Men	0.108	0.120	0.157	0.169	0.184	0.211	0.202	0.197	0.191	0.198
Black Men	0.572	0.554	0.588	0.404	0.310	0.357	0.308	0.263	0.245	0.245
Asian Men	0.850	0.738	0.382	0.357	0.298	0.329	0.281	0.333	0.332	0.322
Native American Men	0.727	0.825	0.724	0.430	0.315	0.360	0.341	0.315	0.337	0.311
Hispanic Men	0.393	0.396	0.359	0.258	0.283	0.315	0.350	0.388	0.433	0.417
Men From Other Races		1.366	0.745	0.569	0.220	0.273	0.349	0.171	0.169	0.154
White Women	0.675	0.590	0.530	0.400	0.297	0.327	0.257	0.243	0.246	0.237
Black Women	1.612	1.447	1.347	0.786	0.456	0.514	0.391	0.344	0.357	0.338
Asian Women	0.992	0.783	0.605	0.478	0.357	0.457	0.354	0.342	0.343	0.338
Native American Women	0.918	1.561	0.951	0.583	0.313	0.368	0.285	0.268	0.292	0.281
Hispanic Women	0.768	0.714	0.620	0.435	0.346	0.430	0.362	0.344	0.364	0.345
Women From Other Races		2.133	0.847	0.869	0.352	0.424	0.382	0.242	0.254	0.233

Table 2 Demographic weight of gender–race/ethnicity groups, 1940–2010

	1940	1950	1960	1970	1980	1990	2000	2005–2007	2008–2010
White Men	67.8	64.7	60.4	54.7	48.3	43.5	39.8	37.3	35.6
Black Men	6.6	6.2	5.4	5.2	4.9	4.7	4.6	4.9	4.8
Asian Men	0.2	0.2	0.4	0.5	0.9	1.5	2.0	2.5	2.7
Native American Men	0.1	0.1	0.1	0.1	0.3	0.3	0.3	0.3	0.3
Hispanic Men	1.0	1.3	1.9	2.4	3.4	4.6	6.0	8.1	8.4
Men From Other Races		0.0	0.1	0.0	0.1	0.0	0.9	0.7	0.8
White Women	20.7	23.6	27.2	31.2	34.3	35.5	34.1	32.3	31.9
Black Women	3.3	3.3	3.6	4.1	4.7	5.1	5.4	5.6	5.9
Asian Women	0.0	0.1	0.2	0.3	0.8	1.3	1.8	2.1	2.5
Native American Women	0.0	0.0	0.0	0.1	0.2	0.3	0.3	0.3	0.3
Hispanic Women	0.3	0.4	0.7	1.2	2.2	3.1	4.3	5.4	6.2
Women From Other Races		0.0	0.0	0.0	0.0	0.0	0.7	0.6	0.7

Table 3 Decomposition of the per capita earning gap ratio of each group (*EGap* × 100) in terms of segregation (Γ ×100) and within-occupation wage disparities (Δ × 100), 2008–2010

	Total Population			Less Than High School			High School			Some College			Bachelor's Degree		
	Γ	Δ	*EGap*	Γ	Δ	*EGap*	Γ	Δ	*EGap*	Γ	Δ	*EGap*	Γ	Δ	*EGap*
White Men	11.5	10.9	22.4	11.8	8.1	19.9	10.4	8.2	18.6	9.6	8.1	17.8	9.7	10.2	19.8
Black Men	–10.1	–2.5	–12.6	1.8	3.5	5.3	–1.8	–1.4	–3.2	–2.4	–1.1	–3.5	–4.7	–5.6	–10.3
Asian Men	19.6	9.9	29.5	1.3	9.9	11.2	–3.2	2.9	–0.2	–0.6	5.1	4.4	11.4	3.7	15.1
Native American Men	–5.4	–6.0	–11.4	11.6	–0.9	10.6	5.7	–5.9	–0.3	5.1	–2.4	2.7	–1.0	–5.7	–6.7
Hispanic Men	–15.7	–6.2	–21.9	3.9	–1.1	2.7	–0.4	–5.9	–6.3	–0.2	–2.1	–2.3	–2.5	–4.6	–7.1
Men From Other Races	1.6	–1.4	0.2	4.1	4.0	8.2	3.2	–0.4	2.8	2.5	–1.3	1.2	3.9	–3.2	0.7
White Women	–2.4	–6.6	–9.0	–9.4	–5.8	–15.2	–6.2	–4.8	–11.0	–4.2	–4.9	–9.0	–8.3	–7.0	–15.3
Black Women	–13.7	–7.5	–21.2	–11.5	–0.9	–12.3	–12.6	–4.8	–17.4	–10.4	–5.4	–15.8	–11.4	–9.2	–20.6
Asian Women	5.4	–0.6	4.8	–10.0	4.6	–5.4	–13.3	–0.9	–14.2	–9.0	1.6	–7.5	–1.1	–6.2	–7.3
Native American Women	–15.0	–13.4	–28.4	–8.6	–9.1	–17.6	–10.5	–9.6	–20.1	–10.2	–8.7	–18.8	–12.9	–16.7	–29.6
Hispanic Women	–20.9	–10.7	–31.6	–12.1	–6.3	–18.3	–13.1	–8.6	–21.7	–11.7	–7.8	–19.5	–14.3	–11.3	–25.6
Women From Other Races	–8.0	–10.0	–18.0	–11.8	–3.0	–14.9	–11.1	–5.5	–16.6	–9.5	–7.5	–17.0	–8.9	–12.6	–21.5

Table 4 Gains and losses of the gender–race/ethnicity groups ($\Gamma \times 100$), 1940–2010

	1940	1960	1970	1980	1980	1990	2000	2005–2007	2008–2010
White Men	6.95	11.09	12.13	13.61	10.58	9.35	10.30	11.00	11.52
Black Men	–30.61	–15.99	–10.31	–4.36	–3.39	–7.41	–9.19	–10.43	–10.08
Asian Men	–18.24	–0.77	8.76	14.49	11.18	10.08	16.61	19.27	19.60
Native American Men	–29.40	–13.87	–2.75	3.27	2.18	–3.45	–6.23	–7.19	–5.35
Hispanic Men	–14.82	–7.00	–2.47	–2.34	–2.55	–9.21	–13.22	–16.42	–15.72
Men From Other Races		0.72	9.28	7.11	5.60	–4.60	–0.65	–1.61	1.63
White Women	–3.48	–14.18	–14.36	–14.13	–10.70	–5.80	–4.59	–2.42	–2.37
Black Women	–51.28	–45.47	–30.84	–21.74	–16.97	–14.26	–13.70	–14.31	–13.72
Asian Women	–24.27	–18.79	–13.38	–11.33	–10.21	–5.66	0.53	4.28	5.41
Native American Women	–26.22	–32.17	–24.05	–18.80	–15.59	–14.01	–13.46	–14.29	–15.02
Hispanic Women	–19.46	–22.23	–20.60	–19.74	–17.87	–17.17	–18.38	–20.77	–20.87
Women From Other Races		–18.63	–19.02	–15.49	–12.19	–14.46	–10.32	–9.36	–7.97

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