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LOCAL SEGREGATION AND WELL-BEING

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This paper deals with the quantification of the well-being loss/gain of a demographic group associated with its occupational segregation, an issue that has not been formally tackled in the literature. For this purpose, this paper proposes several properties to take into account when measuring this phenomenon. Building on standard assumptions of social welfare functions, it also defines and characterizes a parameterized family of indices that satisfy those properties. In particular, the indices are equal to zero when either the group has no segregation or all occupations have the same wage, and the indices increase when individuals of the group move into occupations that have higher wages than those left behind. In addition, *ceteris paribus*, the indices increase more the lower the wage is of the occupation left behind, and consider small improvements for many people to be more important than large improvements for a few.

JEL Codes: D63, J15, J16

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1. Introduction

Segregation, the mechanism by which different groups occupy different social environments, is a widespread phenomenon both historically and geographically. A good example is the different positions that women and men hold in labor markets all over the world. Differences by race, ethnicity, and immigrant status in the distribution of people across organizational units (e.g., occupations, sectors, neighborhoods, and schools) are also evident. The analysis of segregation in the labor market (e.g., workplace segregation, occupational segregation, and industrial segregation) and segregation in space (e.g., residential segregation and school segregation) have played an important role in studies conducted over decades by sociologists and economists concerned about the consequences that a low level of integration in society have for the demographic groups that suffer it.

With respect to occupational segregation, the literature has traditionally focused on segregation by gender and more recently has turned its attention to race and ethnicity, especially in the U.S. There are several reasons why researchers and policy-makers care about this matter (Anker, 1998; Kaufman, 2010). A large part

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of the salary differences between women and men is due to occupational segregation by sex. In the case of the U.S., Hegewisch *et al*. (2010) documents that median earnings in male-dominated occupations are still higher than they are in female-dominated occupations even after one has controlled for the skills these occupations require. Segregation also explains salary differences by race/ethnicity (Huffman, 2004). Furthermore, it often involves worse working conditions in occupations dominated by women or minorities.

The tendency of these groups to concentrate in low-pay/low-status jobs also has an adverse impact on how others see them, and also on how they see themselves. This effect reinforces stereotypes and fosters poverty, with important consequences for both female-headed households and minorities. In addition, the tendency to segregate has an adverse effect on the education of future generations, particularly regarding the fields of study that boys and girls opt to enter. By another line of reasoning, excluding women and minorities from certain occupations leads to a waste of human resources; the results of which are extremely inefficient when these are highly skilled people. Moreover, segregation imposes important rigidities, and thus reduces the ability of the market to respond to labor changes, which is a problem in a global economy concerned with efficiency and competitiveness.

Since the pioneer work of Duncan and Duncan (1955), various scholars have developed measures aimed at quantifying segregation, some of them paying increasing attention to the challenges that arise when more than two social groups are involved. Thus, thanks to works by Silber (1992), Boisso *et al*. (1994), Reardon and Firebaugh (2002), and Frankel and Volij (2011), several tools can be used now to quantify overall segregation in a multigroup context, i.e., to measure the extent to which the distributions of the various demographic groups simultaneously depart from one another.

To explore the situation of one (or several) demographic groups in a multigroup context, usually scholars have to deal with the matter of choosing a group against which to compare the group under consideration. Thus, for example, in studies on occupational segregation by gender and race, the distribution of African American women across occupations is traditionally contrasted with that of White women, White men, African American men, and, more recently, with that of Hispanic women as well (King, 1992; Reskin, 1999; Kaufman, 2010; Mintz and Krymkowski, 2011; Gradín, 2013). Alternatively, Alonso-Villar and Del Río (2010) propose to compare the distribution of the target group with the occupational structure of the economy so that the group is said to be segregated so long as it is overrepresented in some occupations and underrepresented in others, whether the latter are filled by White men, White women, or any minority. This segregation measurement makes it possible to obtain a summary value of the segregation of the group, which seems particularly helpful in analyses in which not all pair-wise comparisons move in the same direction. Moreover, the segregation of a group according to these measures, labeled local segregation measures, is consistent with overall segregation measures proposed in the literature, since the latter can be obtained as the weighted average of the segregation of the mutually exclusive groups into which the population can be partitioned, with weights equal to the demographic share of each group.

However, segregation measures do not quantify either the well-being loss that disadvantaged groups have for being concentrated in low-paid (or low status) occupations or the well-being gains of those being in the highly paid. When one is concerned with this matter (i.e., with the consequences of segregation), one should not only determine how uneven the distribution of a group across occupations is with respect to others but also identify the "quality" of the occupations that the group tend to fill or, on the contrary, not to fill. This paper aims at quantifying the well-being loss/gain of a demographic group associated with its occupational segregation, an issue that has not been formally dealt with in the literature. It is true that a few studies have included the status of occupations in their segregation measurement (Hutchens, 2006, 2009; Reardon, 2009; Del Río and Alonso-Villar, 2012) but they measure that particular phenomenon: the uneven distribution of groups across occupations (accounting for status). None of them quantify, however, the well-being loss/gain of a group associated with its segregation, which is the focus of this paper.

The disadvantaged position of a group in the labor market has been measured in the literature in various ways. One may just determine the share of total earnings that the target group has and compare it with the population share of the group, or deal with the wage discrimination faced by that group. This paper approaches the problem from a different perspective. The aim of this paper is to assess the consequences of a group's occupational segregation in terms of well-being (ill-being). Thus, of all salary disadvantages (advantages) that a group may face, this paper focuses on the penalty (advantage) that arises from being concentrated in low-paid (high-paid) occupations at a higher extent than in the highly (low-) paid, and so wage disparities within occupations are overlooked.

To quantify the well-being loss/gain of a group derived from its segregation, this paper proposes a family of indices parameterized by a positive inequality aversion parameter. This family is characterized in terms of standard assumptions of social welfare functions. This paper also introduces several reasonable properties to take into account when measuring this phenomenon and proves that our indices hold all of them. Thus, our indices are equal to zero when either the group has no segregation or all occupations have the same wage. Our indices increase when individuals of the group move into occupations that have higher wages than those left behind. Therefore, our indices are positive when the group tends to fill high-paid occupations and negative when the opposite holds. Moreover, our indices are sensitive to movements across occupations in the sense that, *ceteris paribus*, they give greater emphasis to movements taking place lower down in the distribution of occupations (ranked by wages). In other words, they increase more the lower the wage is of the occupation left behind. In addition, our indices consider small improvements for many people to be more important than large improvements for a few. Consequently, our measures will permit researchers to rank different demographic groups in a given year (and also explore a group's evolution over time) using distributive value judgments that are in line with those conducted in the literature on economic inequality.

This distributive approach differs from that followed by Del Río and Alonso-Villar (2015) (DR-AV hereafter). These authors offer a very intuitive index that measures the monetary loss/gain experienced by a group by being segregated.

In that index, the extra wages earned by being overrepresented in some occupations are exactly offset by losses of the same magnitude derived from being underrepresented in others. This is not the case with our proposal, which does show inequality aversion. Our indices take into account not only the mean wage growth derived from changes in the distribution of the group across occupations but also where those changes occur, assigning a higher value to those changes which involve a reduction in the share of the group in lower-paid occupations. This paper shows that the DR-AV index can be obtained as a limit case of our family when inequality neutrality is assumed. By showing inequality aversion, our indices offer a complementary point of view to DR-AV's proposal.

In addition, this paper shows that one member of this family can be built through local and status-sensitive local segregation measures (Alonso-Villar and Del Río, 2010; Del Río and Alonso-Villar, 2012) but departs from them by measuring a different concept—well-being rather than segregation—which involves satisfying different properties. Finally, this article proposes indices with which to measure the total well-being loss/gain of a group derived from both occupational segregation and within-occupation wage disparities with respect to other groups.

Section 2 describes the framework and proposes a set of reasonable properties for indices measuring the well-being loss/gain of a group associated with its segregation. Building on standard assumptions of social welfare functions, Section 3 defines a family of such indices that satisfies all the properties proposed in Section 2. The relationship between one member of this family and local and status-sensitive (local) segregation measures is also shown. In addition, this section explains how to build the total well-being gain/loss of a group derived from both segregation and within-occupation disparities. The usefuness of our proposal is illustrated in Section 4 using U.S. data for the period 1980–2010 to explore the situation of several gender-racial/ethnic groups. The differences and similarities between our indices and the one proposed by DR-AV are also shown. Filnally, Section 5 offers the main conclusions.

2. Measuring the Well-Being Loss/Gain of a Group Associated with its Segregation: Framework and Properties

So far, the literature on segregation has focused on quantifying the extent of segregation while its consequences in terms of well-being have received little consideration. There are a few proposals that include cardinally the status of occupations to measure either overall segregation in a two-group context (Hutchens, 2006, 2009) or the segregation of a group in a multigroup context (Del Río and Alonso-Villar, 2012).[1] These measures, which penalize the concentration of a group in low-status occupations, cannot be used, however, to rank demographic groups according to the well-being loss/gain associated with their segregation because they measure the extent of segregation but not the well-being associated with this phenomenon, which implies satisfying a different set of properties.

[1]Reardon (2009) offers ordinal overall measures in a multigroup context. A different ordinal approach is followed by Meng *et al.* (2006).

As pointed out by Cowell (1995, p. 36) "An obvious way of introducing social values concerning inequality is to use a social welfare function (SWF) which simply ranks all the possible states of society in the order of (society's) preference." These social states can be a function of anything that can be considered relevant. We follow this idea here to define the well-being of a group derived from its employment distribution across occupations. Then, we define the well-being loss/gain of the group associated with its segregation as the difference between the well-being the group actually derives from its distribution across occupations and the well-being it would have if it had no segregation.

2.1 *The Framework*

Let us denote by $t \equiv (t_1, t_2, \ldots, t_J)$ the distribution of total employment across J occupations, by $c \equiv (c_1, c_2, \ldots, c_J)$ the distribution of the target group across these occupations (where $c_j \leq t_j \; \forall j$), and by $w \equiv (w_1, \ldots, w_J)$ the occupational wage distribution. $T = \sum_j t_j$ is the total number of workers in the economy and $C = \sum_j c_j$ is the total number of workers in the target group.

First, we define the social welfare associated with state (c; t; w) as the social welfare corresponding to an artificial "income" distribution consisting of C individuals, each of them having an "income" equal to the relative wage of the occupation in which that individual works, given by $\frac{w_j}{\bar{w}}$ in occupation j, where $\bar{w} = \sum_j \frac{t_j}{T} w_j$.[2] In other words, this "income" distribution takes into account not only the extent to which occupations differ in wages but also how many individuals of the group work in each of them. Next, we define the well-being of the group associated with state (c; t; w) as the *per capita* social welfare that corresponds to that "income" distribution. By dividing the social welfare by the number of individuals of the group, the well-being of the group does not depend on its demographic size, which allows comparisons among different groups.

The well-being loss/gain of the group associated with its occupational segregation is defined as the gap that exists between the well-being of the group associated with state (c; t; w) and the well-being it would have in the case of no segregation $\left(\text{i.e., if } c_j = \frac{C}{T} t_j \; \forall j \text{ or, equivalently, if the state were } \left(\frac{C}{T} t; t; w\right)\right)$. This idea, which is reminiscent of what happens with normative inequality measures (Cowell, 1995; Goerlich and Villar, 2009), is also behind recent indices of the United Nations Development Program, as is the case of the inequality-adjusted human development index and the gender inequality index (Foster *et al.*, 2005; Seth, 2009). Note, however, that in our case the egalitarian situation is that in which the proportion of jobs in each occupation filled by the group is equal to the share of the group in the economy $\left(\text{i.e., } \frac{c_j}{t_j} = \frac{C}{T}\right)$ because occupations do not necessarily have the same size. If the group represents, for example, 20 percent of

[2]If occupations' wages, w_j, are measured by their average wages, $\bar{w}$ will be equal to the average wage of the economy.

total workers in the economy $\left(\frac{C}{T}=0.2\right)$, the egalitarian distribution will be that in which the group accounts for 20 percent of each occupation's employment ($c_j = 0.2t_j\ \forall j$).

Therefore, the well-being loss/gain associated with segregation, denoted by $\Psi(c; t; w)$, takes this general form:

$$\Psi(c;t;w)=\frac{1}{C}\left[W(c;t;w)-W\left(\frac{C}{T}t;t;w\right)\right], \tag{1}$$

where $W(.)$ denotes the social welfare function (SWF henceforth).

2.2 *Some Properties*

To know if a measure works to quantify the well-being loss/gain of a group associated with its segregation, one should think about the properties that such an index should verify. In what follows, we introduce these properties, both mathematically and intuitively. These properties are important because they will permit us to give shape to a concept that has not been previously delimited in the literature. In what follows, n always denotes an integer.

Property 1. Monotonicity Regarding Increasing-Wage Movements*: Let $(c'; t; w)$ be a vector obtained from vector $(c; t; w)$ in such a way that $c'_i = c_i - n$, $c'_k = c_k + n\ (0 < n \leq \min\{c_i, t_k - c_k\})$, and $c'_j = c_j\ \forall j \neq i, k$. If occupations i and k satisfy that $w_i < w_k$ (respectively, $w_i > w_k$), then $\Psi(c'; t; w) > \Psi(c; t; w)$ (respectively, $\Psi(c'; t; w) < \Psi(c; t; w)$).*

In other words, index Ψ rises (respectively, diminishes) when individuals of the target group move from an occupation to another with a higher (respectively, lower) wage. This seems a suitable property because the index is intended to measure a target group's well-being loss/ gain and not its change in segregation. Thus, if the group's segregation increases in consequence of a higher concentration in highly paid occupations, we want the index to reflect this change as an improvement for the group.

Property 2. Sensitivity Against Increasing-Wage Movements*: Let $(c'; t; w)$ a vector obtained from vector $(c; t; w)$ such that $c'_i = c_i - n$, $c'_k = c_k + n$, where occupations i and k satisfy that $w_k = w_i + x\ (x > 0)$, and $c'_j = c_j\ \forall j \neq i, k$. Let $(c''; t; w)$ be another vector obtained from vector $(c; t; w)$ such that $c''_h = c_h - n$, $c''_l = c_l + n$, where occupations l and h satisfy that $w_l = w_h + x$ and also $w_i < w_h$, and $c''_j = c_j\ \forall j \neq h, l\ (0 < n \leq \min\{c_i, c_h, t_k - c_k, t_l - c_l\})$. Then, the following condition should hold: $\Psi(c'; t; w) - \Psi(c; t; w) > \Psi(c''; t; w) - \Psi(c; t; w) > 0$.*

This means that, when some individuals of the target group move into an occupation that has, for example, an extra wage of ten monetary units, then the lower is the wage of the occupation being left behind, the higher the rise in the index. In other words, we want our index to care more for the individuals who work in the least paid occupations.

Property 3. Preference for Egalitarian Improvements*: Let* $(c'; t; w)$ *be a vector obtained from vector* $(c; t; w)$ *where* $c'_i = c_i - n$, $c'_k = c_k + n\,(0 < n \leq \min\{c_i, t_k - c_k\})$, $c'_j = c_j\ \forall j \neq i, k$, *and occupations i and k satisfy that* $w_k = w_i + x\ (x > 0)$. *Let* $(c''; t; w)$ *be a vector obtained from vector* $(c; t; w)$ *such that* $c''_i = c_i - 1$, $c''_h = c_h + 1$, *and* $c'_j = c_j\ \forall j \neq i, h$, *where* $w_h = w_i + nx$. *Then, the following condition should hold:* $\Psi(c'; t; w) - \Psi(c; t; w) > \Psi(c''; t; w) - \Psi(c; t; w) > 0$.

When *n* target individuals move from an occupation to another which has an extra wage of *x* monetary units, the index should increase more than it would do if only one individual had moved from an occupation to another having an extra wage of *nx* monetary units. This means that the index considers small improvements in many people to be more important than large improvements in a few individuals.

Property 4. Path-Independence*: Let* $(c'; t; w)$ *be a vector obtained from vector* $(c; t; w)$ *such that* $c'_i = c_i - 1$, $c'_k = c_k + 1$, *and* $c'_j = c_j\ \forall j \neq i, k$, *where occupations i and k satisfy that* $w_k = w_i + x\ (x > 0)$. *Let* $(c''; t; w)$ *be a vector obtained from vector* $(c; t; w)$ *such that* $c''_i = c_i - 1$, $c''_h = c_h + 1$, *and* $c''_j = c_j\ \forall j \neq i, h$ *while* $(c'''; t; w)$ *is obtained from* $(c''; t; w)$ *in such a way that* $c'''_h = c''_h - 1$, $c'''_k = c''_k + 1$, *and* $c'''_j = c''_j\ \forall j \neq h, k$, *where* $w_h = w_i + x_1$, $w_k = w_h + x_2$, *and* $x = x_1 + x_2\ (x_1, x_2 > 0)$. *Then,* $\Psi(c'; t; w) - \Psi(c; t; w) = \Psi(c''; t; w) - \Psi(c; t; w) + \Psi(c'''; t; w) - \Psi(c''; t; w)$.

This property is a kind *of path-independence* property (Moulin, 1987; Zoli, 2003). It means that the change in the index is the same whether an individual moves from an occupation to another which has an extra wage of *x* monetary units or moves gradually to better occupations that account for a total wage increase of *x* units.

Property 5. Normalization*: If either the group has no segregation or all occupations have the same wage,* $\Psi(c; t; w) = 0$.

In other words, if the group has no segregation or if all occupations are equally good, the group has no advantages or disadvantages.

Because of properties 1 and 5, beginning with a situation in which the target group has zero segregation, if some of its members move from an occupation to another with a higher wage, our index will become positive, whereas it will become negative if individuals move toward an occupation with a lower wage. Therefore, when several movements occur, the index will be positive if the upgrading movements are more valued than the downgrading; otherwise, it will be negative.[3]

[3]Some of the upgrading movements may involve changes in the index that exactly offset those in the other direction, leading to an index value equal to zero. However, for this to be the case, the upgrading movements have to be large enough to balance the downgrading ones since, because of property 2, the well-being derived from a monetary increase involving a highly paid occupation is not exactly offset by a monetary decrease of the same magnitude involving a low-paid occupation.

Property 6. Scale Invariance*: If α and β are two positive scalars such that $\alpha c_j \leq \beta t_j$ for any occupation j, then $\Psi(\alpha c; \beta t; w) = \Psi(c; t; w)$.*

This property means that the index does not change when the total number of jobs in the economy and/or the total number of target individuals vary, so long as their respective shares in each occupation remain unaltered. In other words, only employment shares matter, not employment levels.

When $\alpha = \beta$, the above property becomes the s*ize invariance* or *replication invariance* property. It means that, if we have an economy in which c and t are obtained by the replication of initial distributions, the well-being loss/gain of the target group does not change, as we state in the next property.

Property 7. Replication Invariance: *If α is a positive scalar, then $\Psi(\alpha c; \alpha t; w) = \Psi(c; t; w)$.*

Property 8. Symmetry in Occupations*: If $(\Pi(1), \ldots, \Pi(J))$ represents a permutation of occupations $(1, \ldots, J)$, then $\Psi(c\Pi; t\Pi; w\Pi) = \Psi(c; t; w)$, where $c\Pi = (c_{\Pi(1)}, \ldots, c_{\Pi(J)})$, $t\Pi = (t_{\Pi(1)}, \ldots, t_{\Pi(J)})$, and $w\Pi = (w_{\Pi(1)}, \ldots, w_{\Pi(J)})$.*

This property means that the "occupation's name" is irrelevant, so that, if we enumerate occupations in a different order, the group's well-being loss/gain remains unchanged.

Property 9. Insensitivity to Proportional Divisions: *If vector $(c'; t'; w')$ is obtained from vector $(c; t; w)$ such that $c'_j = c_j$, $t'_j = t_j$, $w'_j = w_j$ for any $j = 1, \ldots, J-1$ and $c'_j = c_J/M$, $t'_j = t_J/M$, and $w'_j = w_J$ for any $j = J, \ldots, J+M-1$, then $\Psi(c'; t'; w') = \Psi(c; t; w)$.*

This property says that subdividing an occupation into several categories of equal size (both in terms of total employment and in terms of target individuals) and equal wage does not affect the group's well-being loss/gain.

3. A Family of Indices Measuring the Well-Being Loss/Gain Associated with Segregation

In this section, we develop the procedure presented in the above section to build indices with which to quantify the well-being loss/gain of a target group derived from its segregation and propose a family of such indices. This family, which is characterized in terms of standard assumptions on social welfare functions, is later shown to satisfy all the properties defined in Section 2. The members of this family can be used to rank demographic groups according to the consequences of segregation for each of them, as we display in our empirical illustration (Section 4).

3.1 *Our Proposal*

Building on expression (1) and imposing several conditions on the social welfare function, we now derive our family of indices. To start with, we assume

some standard properties: our SWF is individualistic, strictly increasing, symmetric, and additive (see *inter alia* Lambert, 1993; Cowell, 1995). Individualistic means that our SWF depends on individuals' utilities and on nothing else.[4] Given that our SWF is strictly increasing, the social welfare increases when, *ceteris paribus*, any individual's income rises. Our SWF is symmetric and, therefore, any permutation of individuals does not change the social welfare (i.e., individuals play identical roles). Additivity implies that our SWF can be expressed as the summation of individuals' utilities, each individual having her own utility function, which only depends on her income.

As a consequence of these properties, our SWF can be written as the summation of individuals' utilities using an increasing social utility function, $U(.)$, which is shared by all of them and only depends on individuals' own income (Cowell, 1995). Given that in our artificial income distribution all individuals working in the same occupation have the same "income," then our SWF takes the form:

$$W(c;t;w)=\sum_j c_j\, U\left(\frac{w_j}{\overline{w}}\right). \tag{2}$$

To fully characterize our indices Ψ, we need to impose two additional conditions on $U(.)$. First, we assume that $U(.)$ is strictly concave—which is also a standard condition—so that the social marginal utility, U', decreases with income. In other words, an increase in an individual's income, all else equal, entails a larger change in U (and, therefore, in W) the lower the initial income of that individual is.

How much does U' decrease as income rises? This leads us to the second condition. We assume that U' has constant elasticity, given by the parameter ε, so that if an individual's income increases by 1 percent, then U' drops by ε percent no matter her initial income level. As discussed by Lambert (1993), the parameter ε reflects how sharply curved function U is and, therefore, it can be interpreted as a (relative) inequality aversion. The assumption of constant (relative) inequality aversion is often used in the literature on income inequality. Thus, for example, it is required to warrant that Atkinson's inequality index is scale invariant. Although this condition is not necessary to define a reasonable $\Psi(.)$, we impose it to restrict the class of possible measures to a family parameterized by an inequality aversion parameter, which seems especially appealing given its intuitive interpretation.

This brings us to the following family of social utility functions (see Lambert, 1993):

$$U_\varepsilon\left(\frac{w_j}{\overline{w}}\right)=\begin{cases} a_1+b_1\dfrac{\left(\dfrac{w_j}{\overline{w}}\right)^{1-\varepsilon}}{1-\varepsilon} & \varepsilon\neq 1 \\ a_2+b_2\ln\dfrac{w_j}{\overline{w}} & \varepsilon=1 \end{cases}$$

where the inequality aversion parameter, ε, is a positive number (a_1, a_2, $b_1>0$, and $b_2>0$ are constants). Given that a_1, a_2, b_1, and b_2 can be changed without altering

[4]Individuals' preferences are also assumed to be individualistic. Therefore, the utility level of each individual only depends on her own income (Lambert, 1993). This implies that there are no externalities.

substantial properties of $U(.)$, we use a common normalization of those parameters that leads us to this family of social utility functions (Cowell, 1995):

$$U_\varepsilon\left(\frac{w_j}{\bar{w}}\right)=\begin{cases}\dfrac{\left(\dfrac{w_j}{\bar{w}}\right)^{1-\varepsilon}-1}{1-\varepsilon} & \varepsilon\neq 1\\ \ln\dfrac{w_j}{\bar{w}} & \varepsilon=1\end{cases} \tag{3}$$

By using expressions (1) to (3), the family of indices with which to measure the well-being loss/gain of a group associated with its occupational segregation is:

$$\Psi_\varepsilon(c;t;w)=\begin{cases}\displaystyle\sum_j\left(\frac{c_j}{C}-\frac{t_j}{T}\right)\frac{\left(\dfrac{w_j}{\bar{w}}\right)^{1-\varepsilon}-1}{1-\varepsilon} & \varepsilon\neq 1\\ \displaystyle\sum_j\left(\frac{c_j}{C}-\frac{t_j}{T}\right)\ln\frac{w_j}{\bar{w}} & \varepsilon=1\end{cases} \tag{4}$$

where $\varepsilon>0$ is the inequality aversion parameter.[5] Note that the contribution to $\Psi_\varepsilon(c;\ t;\ w)$ of any occupation in which the group is overrepresented is positive if and only if that occupation's wage is higher than the average wage of the economy. Likewise, the contribution of any occupation in which the group is underrepresented is negative if and only if it offers a wage above the average. This is so because when $\varepsilon=1$ and $c_j>C\frac{t_j}{T}$, the sign of $\Psi_\varepsilon(c;\ t;\ w)$ coincides with that of $\ln\left(\frac{w_j}{\bar{w}}\right)$, which is positive if and only if $\frac{w_j}{\bar{w}}>1$. Analogously, when $\varepsilon\neq 1$ and $c_j>C\frac{t_j}{T}$, the sign of $\Psi_\varepsilon(c;\ t;\ w)$ coincides with that of $\frac{\left(\frac{w_j}{\bar{w}}\right)^{1-\varepsilon}-1}{1-\varepsilon}$, which is positive if and only if $\frac{w_j}{\bar{w}}>1$. Therefore, underrepresentation in an occupation only penalizes the index when it occurs in highly paid occupations while overrepresentation does so when it takes place in the lower-paid jobs.

The properties that we have imposed on our SWF are consistent with the properties we want our family of indices $\Psi_\varepsilon(c;\ t;\ w)$ to satisfy, which were defined in Section 2. In fact, it is easy to prove that our family holds all of them (see Appendix C).[6]

Note that in the limit case where $\varepsilon=0,\ \Psi_0(c;t;w)=\sum_j\left(\frac{c_j}{C}-\frac{t_j}{T}\right)\frac{w_j}{\bar{w}}$ is actually the Γ index defined by DR-AV to measure the monetary—rather than the

[5]Index Ψ_1 can be interpreted in terms of wage inequality (see Appendix A). This index can also be obtained following another line of reasoning based on status-sensitive segregation measures (see Appendix B).

[6]Note that our family of indices is characterized in terms of basic properties of social welfare functions and not in terms of the properties listed in Section 2. This means that other indices satisfying those properties could be defined. In particular, indices associated with welfare functions that do not have constant inequality aversion.

well-being—loss/gain of a group associated with its segregation. We will come back to this issue later on when we discuss the implications of assuming inequality neutrality (i.e., $\varepsilon = 0$) rather than inequality aversion (i.e., $\varepsilon > 0$) in Section 3.3.

Finally, it is important to keep in mind that, although our family of indices is interpreted in this paper in the case of occupational segregation, it can also be used to quantify the consequences of other types of segregation phenomena so long as the status of organizational units (schools, neighborhoods, etc.) can be measured cardinally (which in our case was measured by $\frac{w_j}{\bar{w}}$).

3.2 *Total Well-being Advantage/Disadvantage of a Group*

Apart from quantifying the well-being gain/loss of a group associated with its segregation, one may also be interested in quantifying the total well-being advantage/disadvantage (WAD) that the group faces in the labor market, as consequence of both occupational segregation and within-occupation wage disparities with respect to other groups. Following the line of reasoning of Section 2.1, this total well-being can be measured by the following index:

$$\mathrm{WAD}_\varepsilon = \sum_j \frac{c_j}{C} U_\varepsilon\left(\frac{w'_j}{\bar{w}}\right) - \sum_j \frac{t_j}{T} U_\varepsilon\left(\frac{w_j}{\bar{w}}\right),$$

where w'_j denotes the average wage that the group has within occupation j (unlike w_j, which is the average wage in that occupation) and U_ε is given by expression (3). In other words, *WAD* is the difference between the well-being the group really has and the well-being it would have if there were no segregation $\left(c_j = C\frac{t_j}{T}\right)$ and in each occupation the group received its average wage $\left(w'_j = w_j\right)$.

By adding and subtracting the term $\sum_j \frac{c_j}{C} U_\varepsilon\left(\frac{w_j}{\bar{w}}\right)$, we get

$$\mathrm{WAD}_\varepsilon = \Psi_\varepsilon(c;t;w) + \underbrace{\sum_j \frac{c_j}{C}\left[U_\varepsilon\left(\frac{w'_j}{\bar{w}}\right) - U_\varepsilon\left(\frac{w_j}{\bar{w}}\right)\right]}_{\Omega_\varepsilon},$$

where the second term, Ω_ε, represents the welfare gain/loss of the group derived from the salary discrepancy of the group, within each occupation, with respect to other groups. By using this decomposition, one can determine the proportion of the total well-being advantage/disadvantage of the group that is due to occupational segregation and the proportion due to within-occupation wage disparities with respect to other groups. In other words, one can find out whether segregation is an important component of the total well-being advantage/disadvantage of the group.

3.3 *Differences with Respect to DR-AV*

As mentioned above, to measure the monetary gain/loss of a target group associated with its occupational segregation, DR-AV have recently proposed an index, Γ, that can be obtained as a limit case of our family of indices when $\varepsilon = 0$,

$\Psi_0(c;t;w) = \sum_j \left(\frac{c_j}{C} - \frac{t_j}{T}\right)\frac{w_j}{\bar{w}} = \Gamma$. This index has a clear economic interpretation: it measures the *per capita* monetary loss or gain of a group derived from its overrepresentation in some occupations and underrepresentation in others. To see this, first, note that $\sum_j C\left(\frac{c_j}{C} - \frac{t_j}{T}\right)w_j$ can be thought of as the monetary gain or loss that the target group has as a consequence of its uneven distribution across occupations. This expression takes into account only wage disparities that arise from differences across occupations, while ignoring salary differences within occupations. Second, dividing the above expression by C, we obtain $\sum_j \left(\frac{c_j}{C} - \frac{t_j}{T}\right)w_j$, which measures the *per capita* loss/gain of each member of the group in monetary terms. This expression would enable comparisons among groups that differed in their size, but it would not be suitable for comparing groups in economies with different occupational wages. However, by dividing this expression by the average wage of occupations, $\bar{w}$, we obtain the loss/gain of each member of the group as a proportion of that average wage, which makes it possible to compare not only the monetary losses/gains of different groups in an economy but also the monetary gains/losses of groups in different economies. This expression is precisely $\Psi_0(c; t; w)$.

Despite its intuitive interpretation, index $\Psi_0(c; t; w)$ does not show inequality aversion and, therefore, does not capture distributive issues, which makes it to violate some of the basic properties established in Section 2. Thus, note for example that, if n target individuals move from occupation i to occupation k, the change in the index will be equal to $\Psi_0(c';t;w) - \Psi_0(c;t;w) = \frac{n}{C}\frac{w_k - w_i}{\bar{w}}$. This means that, according to $\Psi_0(c; t; w)$, the effect of moving toward an occupation that has a higher wage does not depend on the starting point. An increase of 100 monetary units has the same effect whether the occupation left behind was high- or low-paid. Consider, for example, an economy with four occupations, each of them having 100 jobs, where wages are 10, 3, 2, and 1, respectively. Namely, $t \equiv (100,100,100,100)$ and $w \equiv (10,3,2,1)$. Assume that the distribution of our target group across occupations is initially $c \equiv (10,20,30,40)$. In this case, $\Psi_0 = -0.350$ and $\Psi_1 = -0.366$. Suppose now that 2 individuals of the target group move from occupation 2 to occupation 3 while 2 individuals of the target group working in occupation 4 move into occupation 3 (individuals from other groups move the other way around so that each occupation still accounts for 100 jobs). In other words, the distribution of the target group is now $c \equiv (10,18,34,38)$. According to index Ψ_0, there is no change in the well-being of the group because the salary advantage of those individuals who moved from occupation 4 to occupation 3 is of the same magnitude as the salary disadvantage of the two individuals who left occupation 2. However, according to index Ψ_1, the well-being of the group actually increases, now being equal to –0.360, because the salary advantage of the two individuals who left occupation 4 is considered to be more important than the salary fall involving the two individuals who initially worked in occupation 2.

On the other hand, the effect of an individual's moving to an occupation with an extra wage of 100 monetary units has the same effect as 10 individuals moving

into an occupation with an additional 10 units paid. Therefore, $\Psi_0(c; t; w)$ index does not satisfy properties 2 and 3. On the contrary, it is easy to see that properties 1 and 4 through 9 do hold.

Consequently, index $\Psi_0(c; t; w)$ measures the monetary loss/gain of a target group associated with its occupational segregation while the family Ψ_ε with $\varepsilon > 0$ quantifies the well-being loss/gain of the group assuming that there is inequality aversion, which is the standard assumption in the literature on economic inequality. We consider that both types of indices can be used to assess the position of a group associated with its occupational segregation bringing complementary points of view.

4. The Consequences of Segregation: An Illustration

To illustrate the usefulness of our family of indices, this section assesses the occupational segregation of women and men of two large minorities in the U.S.—Hispanics and Asians—together with Whites.

The U.S. is a racially and ethnically diverse country, which makes it an interesting case of study. In this multiracial society, there is evidence that Hispanics and Asians are the race/ethnic groups with the highest occupational segregation while Whites are the least segregated (Alonso-Villar *et al.*, 2012). The immigrant profile of these minorities, whose foreign born population has increased along the last decades, seems to explain part of their current segregation. There are, however, important differences between these two groups. Notwithstanding differences in education among Asian subgroups (Wang, 2004), the proportion of Asians holding a bachelor's degree is significantly higher than that of non-Asians (Allard, 2011), surpassing even that of Whites.

But when it comes to analyzing labor inequalities in general and occupational segregation in particular, special attention should be given to the intersection of race/ethnicity and gender because both contribute to shaping and maintaining inequalities. In 2010, four out of five women in the U.S. working full time were employed in occupations in which at least 75 percent of their workers were women; a similar situation, i.e., a high degree of masculinization, affected five out of ten men (Hegewisch *et al.*, 2011).

As documented by Del Río and Alonso-Villar (2015), segregation by gender substantially decreased in the U.S. in the second half of the 20th century, although the process seems to have come to a halt in the 1990s (see also Blau *et al.*, 2013). On the other hand, segregation by race/ethnicity, which is less intense than segregation by gender, has steadily risen since 1980. Segregation has been particularly intense for Hispanic men since the 1990s, while the segregation of Hispanic women is currently similar to that of Asian women and slightly higher than that of Asian men (see Figure 1).

To assess the segregation of these six gender-race/ethnic groups in terms of well-being, we use the tools presented in Section 3 and show the evolution of our indices from 1980–2010. Our dataset comes from the Integrated Public Use Microdata Series (IPUMS-USA) provided by the Minnesota Population Center of the University of Minnesota (Ruggles *et al.*, 2010). The IPUMS-USA data are drawn from the U.S. decennial censuses and the American Community Surveys (ACS)—which replaced the census long form and which includes occupation

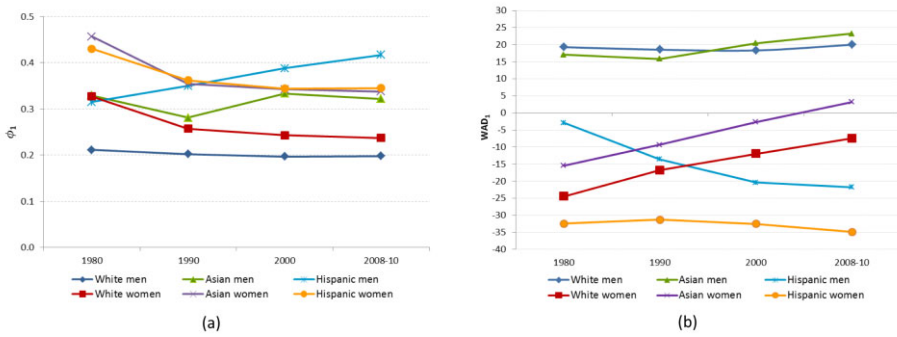

Figure 1. Local segregation index Φ_1 and index WAD_1 (multiplied by 100) for several groups, 1980–2010

Sources: Del Río and Alonso-Villar (2015) (a) and authors' calculations based on the IPUMS samples (b).

information from 2000 on—while assigning uniform codes to variables. The advantage of this dataset is precisely the harmonization of variables and codes of the different datasets, which facilitates analysis over time. In our case, the IPUMS-USA corresponds to the decennial censuses for the period 1980–2000 and the three-year sample of the ACS for 2008–10.

The Census Bureau has reorganized its occupational classification system several times, but this dataset offers a consistent long-term classification for the whole period based on the 1990 classification, which accounts for 387 occupations.[7] By studying the period 1980–2010, this paper explores segregation for the decades for which a detailed and homogenized classification of occupations is available.[8] This period is interesting in itself because, as mentioned above, it includes remarkable changes in the evolution of our gender-race/ethnicity groups.

The Well-Being Losses/Gains Associated with Segregation: Indices Ψ_ε

Figure 2 shows index Ψ_ε for several values of the inequality aversion parameter ($\varepsilon = 1$, 2, 3, and 4) for the period 1980–2010. The wage of each occupation is proxied by the average wage per hour.[9]

First of all, Ψ_1 reveals that the consequences of segregation are worse for Hispanic women than for Hispanic men (the index is always higher for men), despite men being more segregated than women (Figure 1). In any case, the index is negative for both groups for the whole period, which means that the advantage

[7]For earlier periods, the Minnesota Population Center recommends to use the 1950 classification that accounts for fewer occupations (269 titles).

[8]In any case, the harmonization process involved several adjustments, which implies that the classification has some empty employment occupations in several years. Consequently, the number of occupations with positive employment is not the same every year. The "real" number of occupations in 1980, 1990, 2000, and 2008–10 are, respectively, 382, 384, 337, and 333. Fortunately, the majority of the empty occupations have low employment in the years in which they appear.

[9]For each occupation, we trim the tails of the hourly wage distribution to prevent data contamination from outliers. Thus, we compute the trimmed average in each occupation eliminating all workers whose wage is either zero or situated below the first or above the 99th percentile of positive values in that occupation.

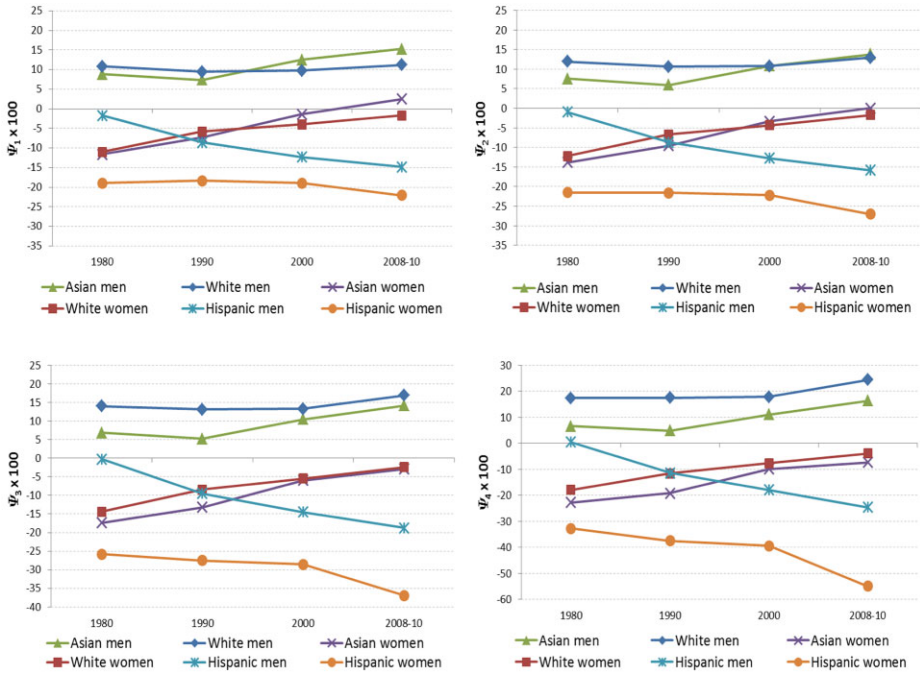

Figure 2. Indices Ψ_ε (multiplied by 100) for several demographic groups, 1980–2010
Source: Authors' calculations based on the IPUMS samples.

of those working in high-paid occupations has never offset the large disadvantage of those working in the low-paid. Moreover, both groups have worsened in the last decade. It seems that the demographic growth experienced by the Hispanic population during these years has resulted, in the case of men, in a higher concentration in low-paid occupations (construction laborers; gardeners and groundskeepers; farm workers; cooks; and janitors) some of which worsened in terms of relative wages. Hispanic women had already held some of the worst paid jobs in the economy since 1980 (housekeepers; cashiers; nursing aides, orderlies, and attendants; child care workers; waiter/waitress; waiter's assistant; food prepare workers; and textile sewing machine operators, among others).

Second, the kind of segregation experienced by Hispanic women is much worse than that of Asian women despite their sharing a similar segregation level. In fact, index Ψ_1 in 2008–10 is negative for Hispanics and positive for Asians, which means that the occupational segregation of Asian women brings the group advantages whereas this is not the case for Hispanic women. In 2008–10, Asian women not only exhibited a high concentration in some of the lowest paid occupations (hairdressers and cosmetologists; nursing aides, orderlies and attendants; cashiers; and waiters/waitress), but also in some well-paid occupations such as health diagnosing occupations (physicians and dentists); pharmacists; and computer software developers.

Third, in the last decade, although White women and men have lower segregation than Asians, the consequences of segregation are better for the latter, since

they have higher values of Ψ_1 than their White counterparts. Ψ_1 also reveals that, up to 2000 no female group had positive values. In the 2000s, the occupational segregation of Asian women begun to bring the group advantages given that the index became positive. Nevertheless, the improvement experienced by White women from 1980–2010 has not allowed them to surpass the zero value. Finally, note that the value of the index is always higher for males than for females of the same race/ethnicity, which evidences the persistency of the concentration of women in lower paid occupations.

The evolution of each group across time with the remaining indices is similar. In other words, when a group improves or worsens according to Ψ_1, it also does so with the other indices. What is different among indices is the magnitude of the well-being losses/gains of the groups and also the rankings of Asian and White groups. Thus, with index Ψ_2, there were almost no differences between the well-being gains of Asian men during the 2000s and those of White men. Moreover, with a stronger inequality aversion (Ψ_3 and Ψ_4), White men had a higher well-being than Asian men (and this is so not as a consequence of the latter being much worse-off but the former being better-off). Something similar happens to Asian and White women (although in this case Asian women are the group that worsens). When the inequality aversion parameter is equal to 3 or 4, Asian women are no longer better-off than their White counterparts during the 2000s.

Bootstrap Inference

To check for the robustness of our findings, we use bootstrapping for the above indexes based on 500 replications. The bootstrap inference at a 95 percent confidence level is given in Figure 3 on Appendix D (see also Table 1 Appendix D).

Note that the confidence intervals are really small. The rankings of the groups according to these intervals are equal to those of the indices, which support our previous findings. For example, in 2008–10, Asian men were clearly better-off than White men with Ψ_1 (and only slightly better with Ψ_2), while the opposite happened with Ψ_3 and Ψ_4. Asian women were better-off than White women with Ψ_1 and Ψ_2, while the result was the reverse for Ψ_4 (with Ψ_3 the differences were not statistically significant). On the other hand, the values for Hispanic men were clearly much lower than those of other men. Likewise, the values for Hispanic women were much lower than those of any other male or female group.

Comparisons with Γ

For comparative purposes, Figure 4 (Appendix D) shows the *per capita* monetary gains/losses of these groups according to the index proposed by DR-AV (Γ) (see appendix). It is easy to see that the values of index Γ are not too different from those of index Ψ_1, and the findings given above regarding rankings of groups and evolution remain unaltered. The main differences between indices Ψ_1 and Γ involve Asian women and men. In both cases, we observe that the values of the index are lower with Ψ_1. These lower values can be a consequence of the fact that, according to index Ψ_1, the gains of the privileged cannot fully compensate the losses of the disadvantaged, while according to index Γ, the positive contributions

of upgrading movements exactly offset the negative contributions of downgrading movements of the same monetary magnitude.

This means that, when inequality aversion is assumed, the position of Asian groups is not as good as index Γ suggests. For Asian male and female groups, this matter seems to be more important than for other demographic groups. In the case of Asians this could be due to their high internal heterogeneity since they are highly overrepresented in both low-paid and highly paid occupations.[10] In consequence, the gaps between Asian groups and their White counterparts are not as large with index Ψ_1 as they are with index Γ, and Asian groups surpass their White counterparts later on (during the 1990s). The differences with respect to Γ are more evident when using Ψ_ε with $\varepsilon > 1$ because, when the inequality aversion is large enough, White men and women are never surpassed by their Asian counterparts. Another group whose well-being losses augment significantly when the inequality aversion parameter rises is that of Hispanic women because of their high concentration in low-paid occupations.

Total Well-Being Advantages/Disadvantages of the Groups: WAD Indices

As we can see from Figure 1, which shows the WAD index for $\varepsilon = 1$, the total well-being advantage/disadvantage of the groups are larger than those shown in Figure 3 (see appendix) for Ψ_1, although the rankings of the groups and evolution are similar.

White and Asian men are even more advantaged in Figure 1 (panel (b)) than they are in Figure 2 (Ψ_1). The disadvantage of the other groups is also more intense in Figure 1. All this suggests that the privileged groups tend to have advantages not only in their distribution across occupations but also within them, while the opposite happens to the disadvantaged groups. The main difference between WAD_1 and Ψ_1 involves White women, whose well-being losses substantially increase when using the former index. Within-occupation wage disparities with respect to other groups seem to be more intense for this group than it is for others. In fact, as Figure 5 reveals (see appendix D), the contribution of segregation to the total well-being gain/loss is much lower for White women than it is for other groups and it has substantially decreased since 1980.[11]

[10]In the case of Asian men, they are overrepresented in several highly paid occupations (*health diagnosing occupations* (*physicians* and *dentists*); *computer software developers*; *computer system analysts and computer scientists; engineers;* and *chief executives and public administrators*) and in a few low-paid occupations (mainly *cooks* and *taxi drivers*). As Wang (2004) points out, the heterogeneity of the Asian group involves not only education but also the occupation and sector in which different ethnicities tend to concentrate.

[11]From 1980–2000, Ψ_1 became less and less negative for Asian women (Figure 2). In 2000, it caught up with the within-occupation component (see Table 2 on Appendix D, where $\Psi_1 = -1.3$ and $\Omega_1 = -1.4$). In 2008–10, the two components were positive, the former being larger than the latter (2.5 and 0.7, respectively). Consequently, while in the first decades, Asian women got more disadvantages from segregation than from salary discrepancies within occupations, in 2008–10 the pattern was quite the opposite, the segregation component being the main factor explaining the well-being gains of this group. These changes explain the striking evolution of the contribution of segregation to the total well-being gain/loss of this group shown in Figure 5 (see appendix D).

5. Conclusions

Occupational segregation analyses have focused mainly on measuring disparities among the occupational distributions of the demographic groups into which total population is partitioned—a phenomenon that can be labeled as overall segregation. One may, however, be interested not only in this matter but also in exploring the segregation of a target group, which has been labeled as *local segregation* to distinguish it from overall or aggregated segregation. For exploring the situation of a group, the introduction of occupations' "quality" into the analysis becomes especially relevant because the situation of a group depends not only on whether it is more concentrated in some occupations than in others but also on the characteristics of those occupations in terms of status, wages, or social prestige.

This paper has taken a step further by linking segregation and well-being, so filling an important gap in the literature. The measures proposed here, which account for occupations' wages, will allow researchers to move beyond the mere quantification of unevenness to focus on the real problem of segregation, which is the consequence of that unevenness in terms of well-being. These indices can also be used to quantify the well-being loss/gain of a group associated with other types of segregation (e.g., residential and school segregation) considering other quality indicators (e.g., services offered in each neighborhood or expenditure per pupil).

To illustrate our proposal, this paper has calculated several of our indices for women and men of two large minorities in the U.S., namely Hispanics and Asians, along with Whites for the period 1980–2010. This has allowed us to show that the kind of segregation experienced by Hispanic workers is much worse than that of Asian workers despite their sharing of significant segregation levels. Moreover, in the last decade, although the monetary gains of White women and men associated with their segregation were lower than that of Asians, the well-being associated with that segregation was higher for the former when one assumes that inequality aversion is high enough.

References

Allard, M, "Asians in the U.S. Labor Force: Profile of a Diverse Population," *Monthly Labor Review*, November, 3–22, 2011.

Alonso-Villar, O. and C. Del Río, "Local versus Overall Segregation Measures," *Mathematical Social Sciences*, 60, 30–38, 2010.

Alonso-Villar, O., C. Del Río, and C. Gradín, "The Extent of Occupational Segregation in the United States: Differences by Race, Ethnicity, and Gender," *Industrial Relations*, 51, 179–212, 2012.

Anker, R., *Gender and Jobs*, International Labour Office, Geneva, 1998.

Blau, F., P. Brummund, and A. Liu, "Trends in Occupational Segregation by Gender 1970–2009: Adjusting for the Impact of Changes in the Occupational Coding System," *Demography*, 50, 47192, 2013.

Boisso, D., K. Hayes, J. Hirschberg, and J. Silber, "Occupational Segregation in the Multidimensional Case. Decomposition and Tests of Significance," *Journal of Econometrics*, 61, 161–71, 1994.

Cowell, F., *Measuring Inequality*, Prentice Hall, London, 1995.

Del Río, C. and O. Alonso-Villar, "Occupational Segregation Measures: A Role for Status," *Research on Economic Inequality*, 20, 37–62, 2012.

Del Río, C. and O. Alonso-Villar, "The Evolution of Occupational Segregation in the U.S., 1940–2010: The Gains and Losses of Gender-Race/Ethnic Groups," *Demography*, 52, 967–88, 2015.

Duncan, O. and B. Duncan, "A Methodological Analysis of Segregation Indexes," *American Sociological Review*, 20, 210–17, 1955.
Foster, J. E., L. F. López-Calva, and M. Szekely, "Measuring the Distribution of Human Development: Methodology and an Application to Mexico," *Journal of Human Development*, 6, 5–29, 2005.
Frankel, D. M. and O. Volij, "Measuring School Segregation," *Journal of Economic Theory*, 146, 1–38, 2011.
Goerlich, F. J. and A. Villar, *Desigualdad y Bienestar Social: De la Teoría a la Práctica*, Fundación BBVA, Bilbao, 2009.
Gradín, C., "Conditional Occupational Segregation of Minorities in the US," *Journal of Economic Inequality*, 11, 473–93, 2013.
Hegewisch, A., H. Liepmann, J. Hayes, and H. Hartmann, "Separate and Not Equal? Gender Segregation in the Labor Market and the Gender Wage Gap," Institute for Women's Policy Research Briefing Paper, Washington, D.C., 2010.
Hegewisch, A., C. Willians, and A. Henderson, "The Gender Wage Gap by Occupation," Institute for Women's Policy Research Fact Sheet, Washington, D.C., 2011.
Huffman, M., "More Pay, More Inequality? The Influence of Average Wage Levels and the Racial Composition of Jobs on the Black-White Wage Gap," *Social Science Research*, 33, 498–520, 2004.
Hutchens, R. M., "Measuring Segregation when Hierarchy Matters," Mimeo, ILR School, Cornell University, 2006.
Hutchens, R. M., "Occupational Segregation with Economic Disadvantage: An Investigation of Decomposable Indexes," *Research on Economic Inequality*, 17, 99–120, 2009.
Kaufman, R. L., *Race, Gender, and the Labor Market: Inequalities at Work*, Lynne Rienner Publishers, Boulder, Colorado, 2010.
King, M., "Occupational Segregation by Race and Sex, 1940–88," *Monthly Labor Review*, 115, 30–7, 1992.
Lambert, P., *The Distribution and Redistribution of Income. A Mathematical Analysis*, Manchester University Press, Manchester, 1993.
Meng, G., G. B. Hall, and S. Roberts, "Multi-group Segregation Indices for Measuring Ordinal Classes," *Computers, Environment and Urban Systems*, 30, 275–99, 2006.
Mintz, B. and D. Krymkowski, "The Intersection of Race/Ethnicity and Gender in Occupational Segregation," *International Journal of Sociology*, 40, 31–58, 2011.
Moulin, H., "Equal or Proportional Division of a Surplus, and other Methods," *International Journal of Game Theory*, 16, 161–86, 1987.
Reardon, S. F., "Measures of Ordinal Segregation," *Research on Economic Inequality*, 17, 129–55, 2009.
Reardon, S. F. and G. Firebaugh, "Measures of Multigroup Segregation," *Sociological Methodology*, 32, 33–76, 2002.
Reskin, B., "Occupational Segregation by Race and Ethnicity among Women Workers," in I. Browne, ed., *Latinas and African American Women at Work. Race, Gender, and Economic Inequality*, 183–204, Russell Sage Foundation, New York, 1999.
Ruggles, S., T. Alexander, K. Genadek, R. Goeken, M. Schroeder, and M. Sobek, "Integrated Public Use Microdata Series: Version 5.0" [Machine-readable database]. Minnesota Population Center, Minneapolis, 2010.
Seth, S., "Inequality, Interactions, and Human Development," *Journal of Human Development and Capabilities*, 10, 375–96, 2009.
Silber, J., "Occupational Segregation Indices in the Multidimensional Case: A Note," *The Economic Record*, 68, 276–77, 1992.
Wang, Q., "Labor Market Concentration of Asian Ethnic Groups in US Metropolitan Areas: A Disaggregated Study," *Population, Space and Place*, 10, 479–94, 2004.
Zoli, C., "Characterizing Inequality Equivalence Criteria," Mimeo, University of Nottingham, 2003.

Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

On-Line Appendix A: Interpreting Ψ_1 in terms of wage inequality
On-Line Appendix B: Obtaining Ψ_1 through Local and Status-sensitive Local Segregation Indices
On-Line Appendix C: Proving that Ψ_ε Satisfies our Basic Properties
On-Line Appendix D: Figures and Tables