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21 October 2016

Online at <https://mpra.ub.uni-muenchen.de/74682/>  
MPRA Paper No. 74682, posted 22 Oct 2016 07:46 UTC

# Income Unfairness and Occupational Choice

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October 21, 2016

## Abstract

In this paper, we reassessed labor-market adjustment by using an indicator of occupational income unfairness (OIU) which shows whether workers are paid equal to what is warranted by their effort. Although an empirically derived unfairness indicator does not necessarily reflect workers' perceived unfairness, OIU in some occupations indicates the existence of a labor-market adjustment mechanism. However, unfairness remains in some occupations, perhaps because it is caused by structural development problems.

**JEL classification:** D63; J24; J31

**Keywords:** Income Inequality; Unfair Inequality; Occupational Choice

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# 1 Introduction

There is a large literature documenting rising income inequality in most developed countries since the 1980s. The main explanation for this phenomenon is that the demand for skills has outgrown the supply of high-skilled workers to increase the skills premium (surveyed by Katz and Autor (1999)). Although, according to classical economic theory, the labor market adjusts to reduce such income inequality in the long run, this mechanism does not seem to be working. On the demand side, the skills-biased technical change (SBTC) hypothesis helps to explain the failure of this adjustment mechanism (surveyed by Acemoglu and Autor (2011)). The question on the supply side is why has growth in the supply of high-skilled labor been so slow?

We reassess the adjustment mechanism of the labor market. We investigate whether workers' occupational choices are based on trading off rewards against effort requirements. Clearly, because high-income occupations require much effort in the form of high education, training, or long hours, some workers may avoid such occupations. These criteria for occupational choice relate to a strand of modern political philosophy known as responsibility-sensitive egalitarianism theory. From the point of view of this philosophy, persistent income inequality is not necessarily a problem: it arises from differences in workers' effort levels, which can be acceptable. If workers base their occupational choices on such criteria, the labor market cannot eliminate income inequality in the long run. However, the labor market may be able to reduce income inequality by another means. Occupations that pay more than what is warranted based on worker effort will attract many job applicants. Then, workers may be paid equal to what is warranted by their effort. In recent studies, empirical methods have been developed to determine fair incomes. Following the empirical method developed by Almås et al. (2011), we derive individual workers' fair incomes, and define "income unfairness" as the ratio of actual income to fair income. Then, we aggregate these levels of income unfairness by occupational group. Our interest is whether the income unfairness levels of each occupational group have strayed from zero in the long run. We use United States labor statistics from 1988 to 2015.

We find that workers in occupational groups such as professionals, sales, and production are rewarded based on income unfairness ratios. For these occupations, the ratio has hardly strayed from zero over the past 27 years. However, for other occupational groups, the adjustment of labor

supply does not work. Workers in managerial occupations have received way more than their fair income, whereas office workers and those in service occupations have received much less. We also find that workers' average educational level and average age play a central role in whether unfairness levels strayed from zero.

This paper is organized as follows. In Section 2, we describe the empirical method used to calculate a fair income and the income unfairness indicator. In Section 3, we explain the data source and present an occupational classification. In Section 4, we describe the empirical results and their implications. In Section 5, we discuss the relationship between income unfairness and recent labor-market issues such as job polarization and globalization. Section 6 concludes the paper.

## 2 Empirical Method

### 2.1 Fair Income

In this section, we show how the fair income of each worker can be calculated. We suppose that there are  $N = \{1, \dots, n\}$  workers in the economy and that worker  $i$  is characterized by a vector of response variables  $x_i^R$  and nonresponse variables  $x_i^{NR}$ . We assume that pretax income  $y_i$  is determined by the following function:

$$y_i = f(x_i^R, x_i^{NR}).$$

We estimate this income function by using cross-sectional data on workers. We use a linear model of the logarithm of labor income:

$$\ln y_i = \beta x_i^R + \gamma x_i^{NR} + \epsilon_i.$$

Thus, the income function can be rewritten as:

$$y_i = \exp(\beta x_i^R) \exp(\gamma x_i^{NR} + \epsilon_i).$$

The next step is to construct a worker's claim for redistribution. We apply the generalized proportionality principle developed by Cappelen and Tungodden (2010). The worker's claim for redistribution depends only on each worker's response factors. We define the worker's claim for redistribution as  $g(x_i^R, \cdot)$ , and calculate it as follows:

$$g(x_i^R, \cdot) = \frac{1}{n} \sum_j f(x_i^R, x_j^{NR}) = \frac{1}{n} \exp(\beta x_i^R) \sum_j \exp(\gamma x_j^{NR} + \epsilon_j).$$

Then, we derive the fair income of each worker by sharing the total pretax income in the economy by using the worker's claim for redistribution. Letting  $z_i$  be the fair income of worker  $i$  and letting  $Y$  be total pretax income in the economy means that  $z_i$  can be calculated as:

$$z_i = \frac{g(x_i^R, \cdot)}{\sum_j g(x_j^R, \cdot)} Y.$$

## 2.2 Income Inequality and Income Unfairness

In this section, we define two types of income deviation indicators: income inequality and income unfairness. Income inequality is defined as  $e_i = y_i/\bar{y} - 1$ , where  $\bar{y}$  is average aggregate income. It measures the percentage deviation of worker  $i$ 's income from the average income. For example,  $e_i = 0.2$  means that worker  $i$  receives 20% more than the average income. Income unfairness is defined as  $u_i = y_i/z_i - 1$ . It measures the percentage deviation of worker  $i$ 's income from his or her fair income.  $u_i = -0.1$  means that worker  $i$  receives 10 % less than his or her fair income.

We also define two types of aggregate income deviation indicator for each occupational group: occupational income inequality (OII) and occupational income unfairness (OIU). The former is defined as the average of each worker's income inequality  $e_i$  conditional on their occupational group. It simply measures the percentage deviation of an occupational average income from average aggregate income. Similarly, OIU is defined as the average of each worker's income unfairness  $u_i$  conditional on their occupational group. In this paper, OIU is an important indicator because it measures how attractive the occupation is. In an occupation with a high OIU, payment is disproportionately high based on workers' effort.

## 3 Data

### 3.1 Data Source

The data used for our research are from the March samples of the Current Population Survey (CPS) for 1988 to 2015. The dependent variable is the log of individual earnings, and the independent variables are gender, age, race, educational level, work hours, and dummy variables for public-sector employment and metropolitan residence. We include in the sample only persons aged 20 to 60 with an annual income of between 10,000 and 1,000,000 dollars, who worked from 20 to 99 hours per week for between and 30 and 52 weeks per year, and had at least nine years of education.

### 3.2 Occupational Classification

We classify the occupations into six groups: management, professional, service, sales, office work, and production. Because the occupational classification of the CPS changed occasionally over the period under study, we carefully categorize the occupations to minimize the impact of these changes. The occupational classification used in this paper is shown below.<sup>1</sup>

	1990 Occupational groups
Management	Executive, administrative, and managerial
Professional	Professional specialty Technicians and related support
Service	Service occupations
Sales	Sales occupations
Office	Administrative support, including clerical
Production	Precision production, craft, and repair Handlers, equipment cleaners, helpers, and laborers Machine operators, assemblers, and inspectors

Table 1: Occupational Classification (1988–2001)

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<sup>1</sup>We also defined an occupational group for workers in transportation, but because this category had few workers, we omitted it from the paper.

	2002 Occupational groups
Management	Management, business, and financial operations
Professional	Professional and related occupations
Service	Service occupations
Sales	Sales and related occupations
Office	Office and administrative support occupations
Production	Construction and extraction occupations Installation, maintenance, and repair occupations Production occupations

Table 2: Occupational Classification (2002–2015)

## 4 Results

### 4.1 The Evolution of Income Inequality and Income Unfairness

In this section, we report the empirical results, focusing on the evolution of OII and OIU for each occupational group. Figure 1 shows the evolution of OII for each occupational group from 1988 to 2015. Management occupations have the highest average income, followed, in order, by professional occupations, sales occupations, production occupations, office occupations, and service occupations. Workers in management occupations receive 30% more than the average income, whereas those in production occupations receive 20% less and office workers and those in service occupations both receive 30% less than the average income. The time-series data show that income inequality has increased over the past 27 years. In fact, OII in management occupations increased by 10 percentage points (pp). By contrast, in the other occupations, except for professionals, it decreased by between 10 and 20 pp. In 1988, OII differed by 50 pp between the highest- and lowest-ranked occupational groups, but by 2015, this difference had increased to 80 pp.

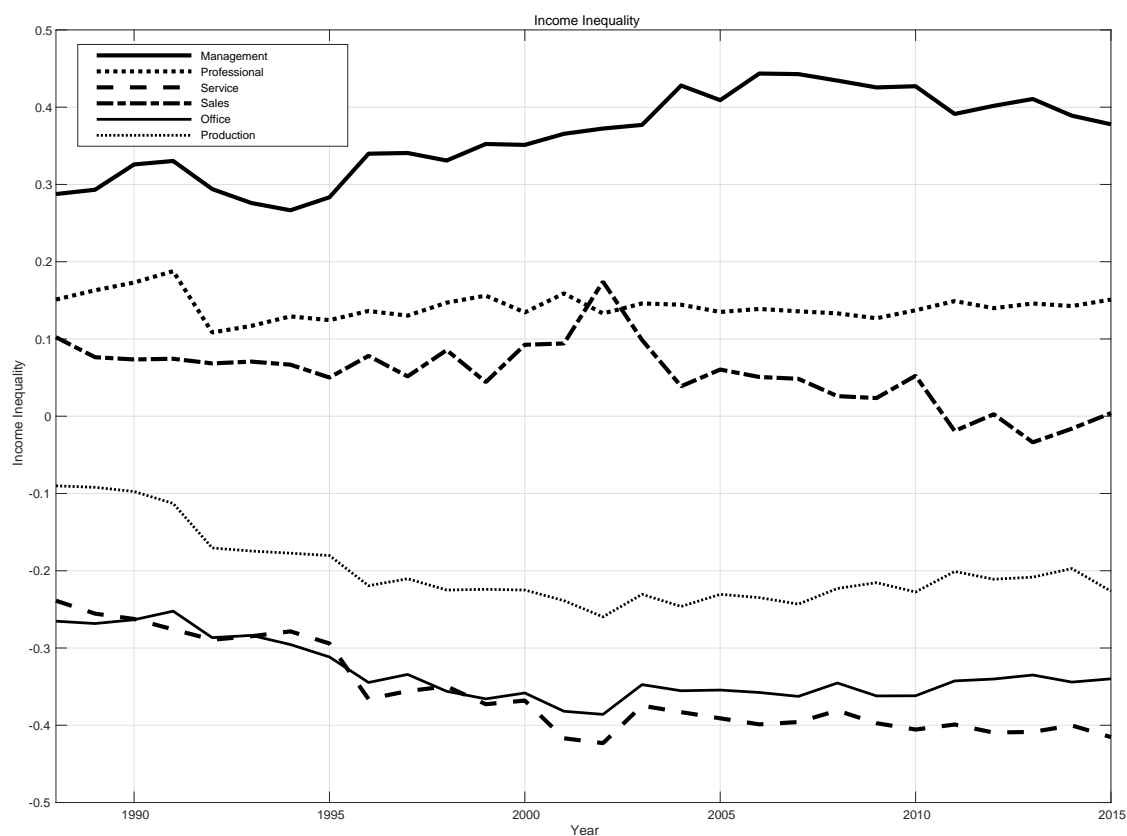


Figure 1: OII

Figure 2 shows the evolution of OIU, which differs from that of OII. Although professional, sales, and production occupations have different average incomes, their OIU values have remained around zero. Whereas the OII values for sales and production declined by at least 10 pp in the last 27 years, their OIU values hardly changed. The 15% more than their fair income that workers in management occupations received in 1988 had become 25% more by the late 2000s. Office workers and those in service occupations received 20% less than their fair income. These results suggest that OIU may influence workers' occupational choice. We consider this relationship in the next section.



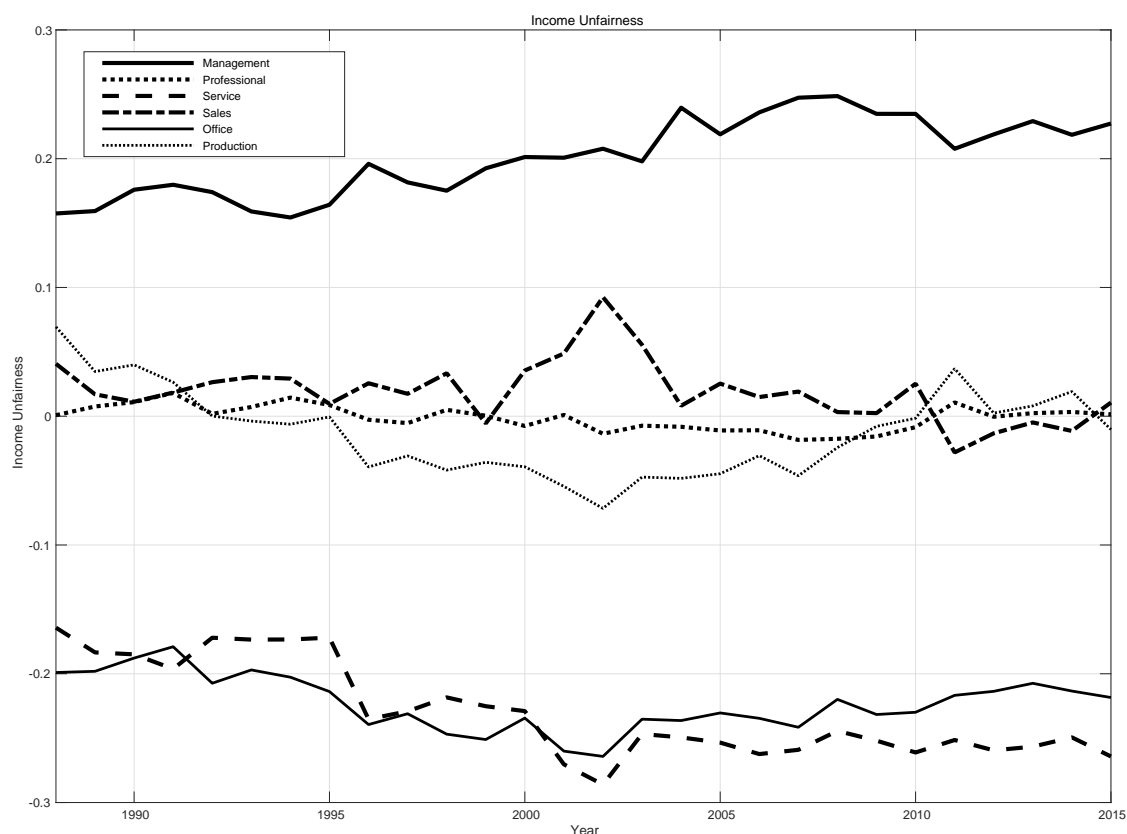


Figure 2: OIU

## 4.2 The Intuition Behind OIU

Why has OIU in some occupational groups stayed around zero in the long run? We suggest three reasons for changing the value of OIU. First, an occupational group in which average income increases, other things being equal, experiences an increase in its OIU. An example is management, in which average incomes have increased over the past 27 years.

Second, changes in occupational groups' response variables such as average educational levels and average working hours can affect their OIU. Although average incomes in sales occupations declined by 10 pp from 1988 to 2015, OIU in sales hardly decreased. This is because the average educational level of sales workers declined over the same period: in 1988, sales workers averaged 0.09 more years of education than workers overall but by 2015, they had 0.51 fewer years than workers in general.

Third, changes in occupational groups' nonresponse variables such as workers' average age and the proportion of women workers can affect their OIU. There is a technical reason for this. When we calculate the fair income of each worker, the effect of their age is distributed over the whole economy. Because older workers typically earn higher incomes, their fair income tends to be low. Therefore, occupational groups in which average age increases experience an increase in their OIU. Intuitively, young workers do not enter unattractive occupations (which have a low OIU value). As a result, the average age of workers in these occupations increases, and this raises their OIU. For example, although average incomes in production occupations changed little from 2002 to 2015, their OIU increased rapidly. This is because the average age of production workers increased during this period. In fact, between 2002 and 2015, the average age of production workers increased from being one year below the average for all workers to being 0.34 years below. This reflects the lack of new entrants in these occupations.

## 5 Discussion

In this section, we discuss the relationship between our research and recent labor-market issues. Consider first the phenomenon known as job polarization. Job polarization refers to a shift from middle-skilled occupations toward high-skilled and low-skilled occupations. Autor, Levy, and Murnane (2003) and Autor, Katz, and Kearney (2006) show that the United States has been experiencing job polarization since the 1980s. Goos and Manning (2007) and Goos, Manning, and Salomons (2009) document job polarization in Europe. In our occupational classification, the middle-skilled occupations are sales, office workers, and production occupations, and average incomes in these occupations have declined. This has led to workers aging in these occupations: according to our data, the average age of middle-skilled occupations has increased over the past 27 years. By contrast, the average age of workers in service occupations (which are low skilled) has declined sharply. Autor and Dorn (2013) point out that recently, computers have taken over the routine tasks of low-skilled workers, who have consequently transferred to service occupations. This is why OIU in service occupations remains low.

Second, we consider why OIU in management occupations remains so high. The theory of Eeckhout and Jovanovic (2012) predicts that openness raises the fraction of managerial jobs in a

high-skill economy. The theory indicates that there is a large demand for management workers in the United States and other developed countries. This may explain the evolution of OIU in management occupations.

## **6 Conclusion**

In this paper, we reassessed labor-market adjustment by using an indicator of occupational income unfairness (OIU). Although an empirically derived unfairness indicator does not necessarily reflect workers' perceived unfairness, OIU in some occupations indicates the existence of a labor-market adjustment mechanism. However, unfairness remains in some occupations, perhaps because it is caused by structural development problems.

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