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PHD THESIS SUMMARY: Unfair Inequality: From Measurement to Causal Drivers

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Giving people equal opportunities is a principle of justice that is built on two fundamental ideas. On the one hand, outcome differences across individuals are unacceptable if they are rooted in factors that are beyond individual control. Examples of such *circumstance* characteristics are the biological sex, race, and socio-economic status of one's parents. On the other hand, if individual outcomes were the result of *effort*, proponents of an equal-opportunity ethic would accept outcome differences across individuals as fair.

These principles are a core reference point in the philosophical discourse on distributive justice (Cohen 1989; Roemer 1998; Arneson 1989) and they are widely referenced by public and political actors when discussing inequality in various domains of life including health, education, and income.

In this thesis I advance the economic literature on equality of opportunity in three dimensions: i) the construction of measures, ii) the estimation of measures, and iii) the identification of causal drivers.

Chapter 1 is dedicated to the development of inequality measures that combine opportunity-egalitarian principles with other principles of fairness in joint indicators of unfair inequality. It is motivated by empirical evidence showing that people do not judge inequality as problematic per se but that they take the underlying sources of income differences into account (Adriaans et al. 2020). In contrast to this evidence, standard measures of inequality do not adequately reflect these normative preferences. Yet, it is important to take account of these normative preferences if we want to address the widespread perception of unfairness that has stimulated social tension and weakened support for existing economic systems in many countries around the world.

In this chapter, which is based on Hufe, Kanbur, and Peichl (forthcoming), we propose an alternative way of measuring inequality that corresponds more strongly to general principles of justice and the normative

preferences upheld by the larger public. In particular, the proposed measures acknowledge that equality of opportunity is important but individually insufficient to define a fair distribution of resources. For example, many people would subscribe to the moral imperative of addressing extreme outcomes like hunger, homelessness, and material deprivation regardless of how these outcomes came about (Konow and Schwettmann 2016; Cappelen et al. 2013). However, such a preference stands in contrast to the opportunity-egalitarian doctrine according to which we should accept outcomes if they were the result of individual responsibility and effort exertion. In response, we propose the first family of measures for unfair inequality that incorporate the principles of equality of opportunity and freedom from poverty in a co-equal fashion. We, therefore, take seriously the idea that equity is not represented by the absence of any inequality in outcomes, but that it requires life success to be determined by factors outside of an individual's control and that everybody should have enough to make ends meet.

Furthermore, we provide two empirical applications of our measure that yield important insights for the inequality debate and the design of appropriate policy responses. These empirical applications use data from the Panel Study of Income Dynamics (PSID) and the European Union Statistics on Income and Living Conditions (EU-SILC). Both data sources are household surveys that contain the necessary information to construct our measures of unfair inequality: individual incomes and personal background characteristics that qualify as circumstance characteristics. In particular, we use the following set of circumstances: race and migration background, parental occupation, parental education, and biological sex. First, we analyze the development of inequality in the US over the period 1969–2014 from a normative perspective. Our results show that the US trend in unfair inequality has mirrored the marked increase in total inequality since the beginning of the 1980s. However, beginning with the 1990s, unfair inequality followed a steeper growth curve than total inequality. We illustrate that this trend is mainly driven by a less equal distribution of opportunities across people that face different circumstances beyond their control. Second, we provide a corresponding international comparison between the US and 31 European countries in 2010. We find that unfairness in the US shows a remarkably different structure than in societies with comparable levels of unfairness in Europe. Our evidence suggests that inequality in the most unfair European societies is largely driven by poverty increases that followed the financial crisis of 2008. On

the contrary, unfairness in the US is driven by marked decreases in social mobility.

Chapter 2 is dedicated to the estimation of inequality of opportunity measures. Measures of inequality of opportunity quantify the extent to which individual outcomes are predicted by circumstance characteristics. This idea is commonly operationalized by using a set of circumstances to predict an outcome of interest and calculating inequality in the distribution of predicted outcomes: the more predicted outcomes diverge, the more circumstances beyond individual control influence outcomes, and the more inequality of opportunity there is. However, in standard practice researchers are left to their own devices in specifying the prediction function, i.e., they have to decide which circumstances to include in the empirical model and they have to assume how these circumstances interact. This leads to downward biases in inequality of opportunity estimates if the prediction function is too restrictive to capture the dependence of life outcomes on circumstance characteristics. On the contrary, it leads to upward biases if an overly flexible prediction function overfits the data. Overfitting occurs if the model is too complex for a given sample size. As a consequence of overfitting, the relevant parameters are noisily estimated, i.e., they have very large standard errors which in turn inflate inequality of opportunity estimates (Brunori, Peragine, and Serlenga 2019).

In this chapter, which is based on Brunori, Hufe, and Mahler (2022), we propose the use of machine learning methods—and regression trees and forests in particular—to overcome the issue of ad-hoc model selection. Machine learning methods use algorithms to choose the best estimation models. Therefore, they let the data speak and are not subject to the discretionary choices of researchers. Furthermore, they allow for flexible models of how unequal opportunities come about while imposing statistical discipline through criteria of out-of-sample replicability. These features serve to establish inequality of opportunity estimates that are less prone to upward or downward bias.

To showcase the advantages of machine learning methods we compare them to existing estimation approaches in a cross-sectional dataset of 31 European countries. We demonstrate that current estimation approaches overfit (underfit) the data, which in turn leads to upward (downward) biased estimates of inequality of opportunity. These biases are sizable. For example, some standard methods overestimate inequality of opportunity in Scandinavian countries by close to 300%, whereas they underestimate the extent of inequality of opportunity in Germany by more

than 40%. Hence, cross-country comparisons based on standard estimation approaches yield misleading recommendations concerning the need for policy intervention in different societies.

Chapter 3 is dedicated to the identification of causal factors that drive the existence of unequal opportunities. In particular, I focus on the labor market opportunities for men and women. In many societies, gender gaps in labor market outcomes have closed significantly post-World War II. In response to changing economic incentives, heterosexual couples with children have adjusted their time-use and spending patterns, henceforth leading to marked changes in the way they invest in the skill formation of their children. These empirical trends raise the question of whether opportunity-equalization in one generation, i.e., the closing of gender gaps, has led to a dis-equalization of opportunities in the next generation, i.e., by increasing skill gaps. Skill gaps among children constitute an early indicator of unequal opportunities as they are highly predictive of important life outcomes during adulthood including income, education, and health.

In this chapter, I study how changes in the parental wage gap influence children's formation of socio-emotional skills as measured by the Big Five personality inventory. I investigate this question by constructing a sample of circa 6,000 German siblings aged 2–12 for whom I observe measures of the Big Five inventory at the same age but in different calendar years. In addition, I match this sibling sample to measures of potential wages that reflect variation in the sex- and education-specific labor demand across commuting zones in Germany. As a result, I can analyze within-family changes in time-use and monetary resources that follow from plausibly exogenous changes in the relative labor market incentives for mothers and fathers, and how these changes affect the socio-emotional development of their children. Importantly, this research design allows for a causal interpretation. First, the within-family comparison rules out all between-family differences including socioeconomic status or region of residence as confounding factors. Second, the use of potential wages addresses concerns of reverse causality that may arise if the development of children co-determined the labor market decisions of their parents.

I find that decreases in the parental wage gap lead to i) an increase in households' total financial resources, ii) an increase in financial resources controlled by mothers, and iii) an increase in the use of informal care providers. Despite these changes, I find no effect on the socio-emotional

development of children as measured by the Big Five inventory. These null effects are precise enough to exclude various effect sizes from other quasi-experimental interventions studied in the existing literature. In sum, these findings suggest that strides towards gender equality in the labor market do not necessarily come at the cost of detrimental effects on child development.

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