Diversity, Equity, and Inclusion in General Equilibrium[†]

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Preliminary.

Abstract

This paper studies the macroeconomic effects of Diversity, Equity, and Inclusion (DEI) policies in a tractable, general equilibrium framework with agent heterogeneity. There are two agents (A and B) who are ex-ante identical in ability and preferences. Agent B is underemployed due to cultural or institutionalized race, gender, or ethnicity based inequalities of opportunity. The competitive equilibrium is characterized by a persistent wage gap in favor of A and is suboptimal because the types are complementary. We study DEI initiatives that subsidize B's employment but do not change the root cause of inequity. Our analysis introduces the notion of a "DEI multiplier", defined as the general equilibrium elasticity of aggregate output to a DEI subsidy that increases employment of B's. Our general finding is that the DEI multiplier is always positive. It is positive if the subsidy is financed by deficits or taxes, if the two types have the same or realistically heterogeneous elasticity of labor supply, and whether the objective is to increase B's employment by just 1% or to achieve an equal 50/50 employment split.

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We will all profit from a more diverse, inclusive society, understanding, accommodating, even celebrating our differences, while pulling together for the common good. (Ginsburg, 2009)

1 Introduction

U.S. President Biden signed an Executive Order to advance diversity, equity, inclusion, and accessibility in the Federal workforce in 2021[1]. A quarter of all Fortune 500 companies have explicit, written commitments to corporate diversity[2]. Diversity, equity, and inclusion (DEI) staff make up an average 3.4 positions for every 100 tenured faculty (Greene and James, 2021). DEI efforts are increasingly more valuable for workers when choosing which companies to work for (Edmans et al., 2023). On the other hand, U.S. Supreme Court decided to end race conscious admissions in 2023 (Anderson, 2023). There are questions over whether DEI initiatives should be financed by the taxpayer (Butcher, 2023). The state of Texas banned DEI offices at publicly-funded college campuses (Dey, 2023). While DEI seems to be one of the more widely discussed topics in both industry and policy circles, research in this direction is lacking. This paper does not take an ethical or ideological stance on whether DEI initiatives are inherently desirable or not. Instead, we quantify the aggregate gains or losses from DEI using basic tools from modern macroeconomics.

We begin with a simple model that allows for systemic inequality of opportunity. Labor is the sole factor of production. There are two complementary types of workers: A and B. The share of each is 50% of the total population. For now, there are no ex-ante differences in preferences or ability across types. The first-best allocation is an equal 50/50 employment split. Now, suppose that agent B is structurally under-employed for un-modelled reasons that can be due to culture or various forms of institutionalized barriers to entry, unequal access to education and training, or discrimination. The degree of under-employment of As can be readily quantified with, for example, relative employment ratios.

The competitive equilibrium with systemic inequality is sub-optimal. There is an equilibrium wage gap in favor of agent A. The economy can do better, if only agent B was more utilized. However, suppose that this is impossible, at least in the short run. We can consider an alternative short-run policy: a targeted type-specific employment subsidy, which we use to proxy real-world DEI efforts. The subsidy is directed towards agent B and stimulates their employment, although the structural demand for agent A is still higher. In other words, the root cause of inequity is not addressed but perhaps welfare gains might still be attainable in

[1]See the press release from the White House here.
[2]See the article here.

a "second-best" situation.

We introduce the notion of a "DEI multiplier", defined as the general equilibrium elasticity of aggregate output to a 1% increase in the DEI subsidy that increases employment of B's. We show that the DEI multiplier depends on at least two aspects. First, the difference in the elasticity of labor supply (ELS) across types. The bigger this gap is, the greater the aggregate benefits from DEI can become. Suppose, for the sake of an applied illustration, that workers A and B are men and women, respectively. This is done for the reason of plentiful availability of ELS estimates for men and women in the empirical labor literature. Recent microeconomic studies converge towards two facts: (a) male ELS (around 0.3) is typically lower than female (around 1); (b) the gap has been slowly shrinking over time. On the basis of these two facts, our structural model therefore predicts that (a) DEI can be in principle welfare enhancing today; (b) everything else equal, if the ELS convergence trend continues, DEI was more effective in the past and is likely to be less effective in the future. Second, and perhaps more importantly, it matters how DEI subsidies get financed in equilibrium. We will consider two basic alternatives: lump sum-taxes and government borrowing. Deficit-financed DEI subsidies generally produce greater DEI multipliers.

When calibrating the model to the case of the United States, we reach three basic quantitative results. First, conditional on an empirically realistic cross-type difference in the ELS, the baseline DEI multiplier is 0.48% and 1.13% if the subsidy is fully tax or deficit financed, respectively. The required deficit is 1.27% of GDP. Second, if the two types had an identical ELS then the multiplier would amount to 0.19% and 0.83% if tax or deficit financed, respectively. Third, a parity-restoring, deficit-financed subsidy that achieves an equal 50/50 employment split yields a multiplier of 19.44% and requires a deficit of 19.69% of GDP.

Thus, the general finding of our paper is that the DEI multiplier is positive. It is positive if the subsidy is financed by deficits or taxes, if the two types have the same or realistically heterogeneous elasticity of labor supply, and whether the target is to increase B's employment only by 1% or to achieve an equal 50/50 employment split.

There are several caveats to our framework and conclusions. First, a crucial assumption is that DEI subsidies actually work as intended. Increasingly, there are studies that show that while the number of DEI officers at firms or universities grows, the translation into actual diversity is not necessarily there (Edmans et al., 2023). This biases our theoretical result upwards. Second, we assume that the cost of DEI policies is only material. It is possible that agents A (men, in our applied example) become "discouraged" and develop a greater disutility from work or experience a persistent negative productivity shock. There is evidence to suggest that men's participation in the labor market is dropping and boys are increasingly falling behind the educational system. This could be the product of an DEI-driven "anti sub-

sidy", although there is no causal evidence thereof (Reeves, 2022). This also biases our result upwards. Third, our model does not allow for household formation across types. In other words, if agents A and B were allowed to pool resources, then B-targeted subsidies could be potentially beneficial also for A. This biases our result downwards. Fourth, our model abstracts from possible substitutability or competition across the types and instead assumes complementarity. In practice, cross-type competition may create an additional equilibrium dampening force and thus bias our results upwards. Finally, we do not assume any further differences in skills or preferences across types. In practice, work is a continuum of tasks and specializations. If types have persistently different interests and skills, then measured task-level under-employment could be an efficient outcome of preference heterogeneity. Our framework can not speak on that.

Literature. This paper contributes to the literature on diversity (Adams and Ferreira, 2009; Ahern and Dittmar, 2012; Matsa and Miller, 2013). In a seminal contribution, Ahern and Dittmar (2012) study the 2003 mandatory gender-based quotas that affected 40% of Norwegian firms' directors. This system is very similar to the reduced-form DEI subsidy policy that we study in our paper. Ahern and Dittmar (2012) demonstrate that the Norwegian quota system was associated with a drop in the stock price and a large decline in growth opportunities over time.

In a recent study, Edmans et al. (2023) focus explicitly on DEI efforts and focus on survey questions that are used to determine the best companies to work for. They find that a non-trivial share of the questions is related to DEI policies, which they then use to construct a novel DEI intensity measure. The paper shows that the DEI measure has low correlation with actual diversity in the boardroom and in senior management but is correlated with higher future accounting performance, valuation ratios, and earnings surprises. The contribution of our paper is that our analysis is entirely theoretical and quantitative while essentially every paper in the literature on diversity is purely empirical. With a general equilibrium model, we are able to analyze channels that the existing literature cannot.

Our paper is also related to several other prominent literature strands. First, this paper contributes to the macro-labor literature with a particular emphasis on inequality (Katz and Murphy, 1992; Katz and Autor, 1999; Autor et al., 2008). Second, we relate to the literature on gender differences and inequality, particularly when calibrating our baseline model to the example of women and men (Goldin, 1990, 2006; Doepke and Tertilt, 2009, 2019). Third, our treatment of DEI subsidies is related to the macro-public-finance literature and specifically linear labor income taxation (Sheshinski, 1972; Piketty and Saez, 2013). Fourth, our treatment of the labor market draws knowledge and empirical estimates from

the micro-labor literature on the elasticity of labor supply (Attanasio et al., 2018; Kumar and Liang, 2016). Fifth, our paper contributes to the literature on socio-demographic biases and inequities in employment outcomes (Goldin and Rouse, 2000). Finally, our model is conceptually related to the influential two-agent New Keynesian literature, particularly in terms of our focus on the tractable two-agent structure, and although we completely abstract from nominal rigidities (Galí et al., 2007; Bilbiie, 2008).

2 A Model of Systemic Inequity

Time is infinite. The world is populated with two households, type A and type B, a representative perfectly competitive firm, and a fiscal authority. The fundamental share in the population of A's is λ. Throughout the paper we will assume that $\lambda = 0.5$. Agents have the same preference form and productivity.

2.1 Preferences

Let C_{it} and N_{it} represent type-specific consumption and working hours. Preferences are defined by the discount factor $\beta \in (0, 1)$ and the period utility that features non-separability between consumption and labor as in Greenwood et al. (1988):

$$U(C_{it}, N_{it}) \equiv \ln\left(C_{it} - \theta \frac{N_{it}^{1+\chi}}{1+\chi}\right) \tag{1}$$

where θ is the labor disutility parameter and $\chi \geq 0$ is the inverse elasticity of labor supply. The optimality condition for agent A's labor supply is:

$$W_{at} = \theta N_{at}^{\chi} \tag{2}$$

where W_a is the type-specific wage rate. Similarly, for type B:

$$(1 - \tau_t) W_{bt} = \theta N_{bt}^{\chi} \tag{3}$$

where τ_t is a possible tax or subsidy on B's labor supply, which represents the DEI subsidy that we discuss below. Budget constraints of the two types can be summarized as follows:

$$C_{at} \leq W_{at} N_{at} + \frac{1}{2}\gamma T \tag{4}$$

$$C_{bt} \leq (1 - \tau_t) W_{bt} N_{bt} + \frac{1}{2}\gamma T \tag{5}$$

where T is the expenditure on DEI policies. Parameter $0 \leq \gamma \leq 1$ governs the extent to which the subsidy is financed by the taxpayer.

2.2 Technology

There is a continuum of mass one of competitive firms. Labor is the only input of production. Final output is produced with the following function:

$$Y_t = \left(\frac{N_{at}}{\alpha}\right)^{\alpha} \left(\frac{N_{bt}}{1-\alpha}\right)^{1-\alpha} \tag{6}$$

where α is a key parameter that governs the relative importance of the two types of labor in production. The wage schedules for the two types are determined competitively:

$$W_{at} = \left(\frac{N_{at}}{N_{bt}} \frac{1-\alpha}{\alpha}\right)^{\alpha-1} \tag{7}$$

$$W_{bt} = \left(\frac{N_{at}}{N_{bt}} \frac{1-\alpha}{\alpha}\right)^{\alpha} \tag{8}$$

2.3 Competitive Equilibrium

Total expenditure on DEI policies, T, equals:

$$T_t = \tau_t W_{bt} N_{bt} \tag{9}$$

Recall that a fraction γ of T is financed by the taxpayer. The remaining fraction $(1-\gamma)$ of T is financed by government borrowing:

$$R_t^{-1} B_{t+1} + (1-\gamma) T_t = B_t \tag{10}$$

where R_t is the risk free-rate that is pinned down by the discount factor β and B_t is the volume of bonds. For simplicity we abstract from sovereign default considerations and other complications. Aggregate consumption is the weighted average of type-specific consumption:

$$C_t \equiv \lambda C_{at} + (1-\lambda) C_{bt} \tag{11}$$

Finally, the goods market clears:

$$Y_t = C_t \tag{12}$$

2.4 Systemic Inequity and DEI Policy

The competitive allocation is clearly optimized whenever $\alpha = 0.5$. Conditional on the complementarity of the two types, the optimal share of labor inputs in production is the equal 50/50 split. We assume throughout the paper a scenario in which this can not hold. The source of systemic inequality in our economy is the following condition:

$$0.5 < \alpha < 1 \tag{13}$$

In words, for some un-modelled reasons, agent B is underutilized in production. This could represent barriers to entry, discrimination such as gender or racial bias, etc. Suppose that this friction is structural and impossible to alter.

We consider a class of policy interventions that can potentially improve upon the market allocation. These policies are the subsidy instruments τ which are directed towards agent B. That is, we consider situations where τ are strictly negative and represent negative taxes, i.e. employment subsidies. These subsidies - in real life - could represent policies such as demographic-based quotas. They are financed either through taxes or government borrowing. If tax-financed, we assume that both types pay an equal share of the total amount. Recall that the extent of tax-based financing is governed by γ.

3 Quantitative Analysis of DEI Policies

3.1 Parametrization

While our setup is fairly simple and general, we will calibrate it to (a) the case of the United States and (b) the situation where agent A represents men and agent B represents women. This is done due to the existence of a number of empirical estimates that we can leverage to calibrate the model.

We begin with the more simple parameter choices. As mentioned before, we assume that $\lambda = 0.5$. In the data, the share of men and women is roughly equal. We set the labor disutility parameter θ to 1, which is the same for the two types. The discount factor β is set to 0.99.

The first key parameter choice is the elasticity of labor supply (ELS), χ. We now allow χ_i to differ across the two types. Existing micro estimates of the ELS suggest that χ_b is around 1 for women and χ_a is about 0.3 for men (Attanasio et al., 2018). There is also evidence that the gap has been shrinking over time (Kumar and Liang, 2016). These numbers will be used for our baseline case only. In general, we will consider a wide range for $\chi_b \in [0.3, 1]$. That is, we will study the macroeconomic impact of DEI policies conditional on a wide range of

Table 1: Competitive Allocation without DEI Subsidies

	$\alpha = 0.5$	$\alpha = 0.58$
Consumption, Type A	1	1.1452
Consumption, Type B	1	0.8293
Aggregate Output	1	0.9872
Wage Rate, Type A	1	1.1099
Wage Rate, Type B	1	0.8659
Employment, Type A	1	1.0318
Employment, Type B	1	0.9577
Aggregate Employment	2	1.9895

Notes: The first column shows allocations in the equal-split counterfactual economy. The second column shows allocations for the baseline economy with systemic inequity but no DEI policies.

possible gaps in the ELS across types.

The second key parameter choice involves the share of men in production, i.e. α. We set $\alpha = 0.58$ which is consistent with the female to male labor force participation rate according to the World Bank in 2022. We will also generally allow α to take any value on the grid of $[0.5, 0.58]$. This will allow us to quantify the macroeconomic effect of DEI policies conditional on the actual and the hypothetical equal-split economies.

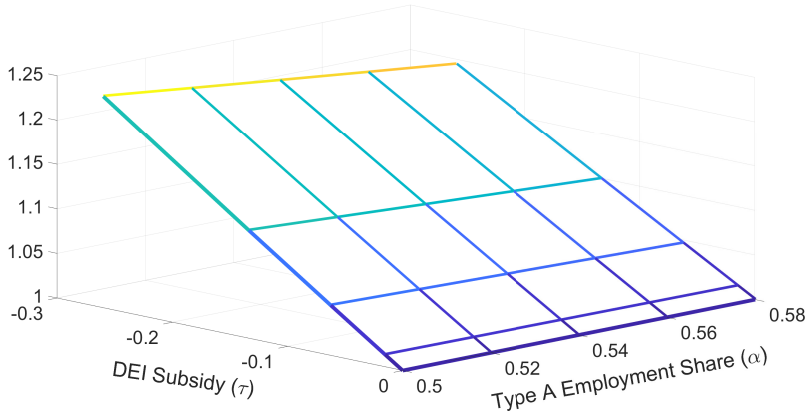
Finally, it is important to choose the extent of deficit financing of DEI policies γ. Due to the difficulty associated with finding the correct empirical counterpart for γ, we consider the agnostic full range of possibilities, i.e. $\gamma \in [0, 1]$.

In practice, we consider five possible values for each of $\{\alpha, \chi, \tau, \gamma\}$. We therefore solve the same model 625 times for different combinations of parameter values. We are primarily interested in analyzing the differences in steady state values, i.e. transition dynamics are not yet entertained. Finally, our analysis is for now entirely positive and abstracts from normative considerations and the question of optimal DEI policy.

3.2 The DEI Multiplier

Before proceeding with the quantitative analysis, we briefly define an important object that will help our investigation: the DEI multiplier. It is computed as the general equilibrium elasticity of aggregate output (GDP) changes in response to a 1% increase in the DEI subsidy that targets agent B and increases their equililibrium labor hours.

Figure 1: DEI Subsidies and the Employment Share of Type A's under Deficit Financing



Notes: This figure shows the relationship between the DEI multiplier, the DEI subsidy, and the fundamental share of type As in employment under the assumption of 100% deficit-based financing of the subsidy.

3.3 Competitive Allocation

We begin with the description of the competitive market outcome. That is, we consider the baseline case of $\alpha = 0.58$, $\chi_b = 1$, and $\chi_a = 0.3$. In this case, the DEI subsidy is set to zero and the choice of γ is thus irrelevant.

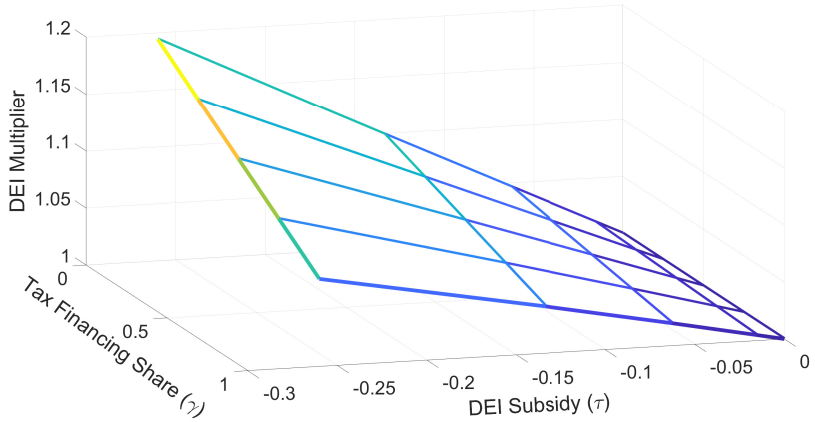
Table 1 presents the results. The first column reports macroeconomic aggregates in the first-based situation of $\alpha = 0.5$. The second column shows what happens in the baseline economy when $\alpha = 0.58$, i.e. type B is underutilized. Systemic inequity results in higher wage income and consumption of the favored type A, less wage income and consumption for the disadvantaged B's and, importantly, less aggregate output, employment, and consumption. As discussed earlier in the paper, the market allocation is inefficient in aggregate terms.

Figure 1 showcases the relationship between the DEI multiplier, the DEI subsidy τ, and the fundamental share of type A's employment α. It presents a two-dimensional plot with τ and α on the two horizontal axes and the DEI multiplier on the vertical axis. We assume 100% deficit-based financing in this case, i.e. $\gamma = 0$. This figure shows that (i) the multiplier is always positive and mildly decreasing in α and that (ii) the multiplier grows with the size of the subsidy for any given α.

3.4 Tax vs Deficit Financing of DEI

We begin the presentation of the first set of key results. We keep the parameter values for χ_a and χ_b unchanged. We introduce the DEI subsidy τ under various values for $\gamma \in [0, 1]$. For every possible combination of τ and γ we compute the DEI multiplier as defined previously.

Figure 2: DEI Subsidies and Tax vs Deficit Financing



Notes: This figure shows the relationship between the DEI multiplier, the DEI subsidy, and the share of deficit financing of the subsidy.

Figure 2 presents the results in the familiar two-dimensional space with τ and γ on the two horizontal axes and the DEI multiplier on the vertical axis. We find that (i) the multiplier is decreasing in the share of tax financing γ but is always positive and that (ii) the multiplier grows with the size of the subsidy for any given value of γ.

It is useful to emphasize that we are characterizing the general equilibrium (GE) response of *aggregate* output and consumption to changes in the subsidy. That is, this response includes both types: type A is not directly affected by the subsidy but is still impacted by the GE channel which is the fiscal rule for financing the subsidy. While the subsidy improves misallocation that is present in the market economy via partial-equilibrium effects on N_b, the choice of financing of τ can matter. The rise of taxes γT that is needed to fund the subsidy hits back at the workers, causing them to consume less, resulting in lower aggregate output and consumption. However, this channel turns out to be quantitatively small as the GE multiplier remains positive.

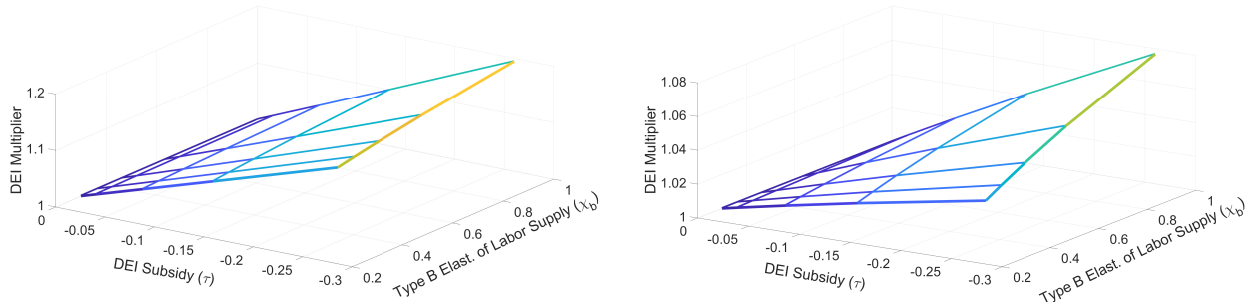
3.5 Differences in the Labor Supply Elasticity

We now present the second key set of results of the paper. We fix γ either at 0 or at 1, i.e. either fully deficit- or tax-based financing. We also fix χ_a at 1. But χ_b is allowed to take any value on the grid of $[0.3, 1]$. For each value of χ_b and each fiscal rule assumption, we compute the DEI multiplier. This quantifies the general equilibrium effect of the subsidy conditional on different labor market assumptions.

Figure 3 presents the result in a similar format with τ and χ_b on the horizontal axes and

Figure 3: DEI Subsidies and the Labor Market

(a) Deficit Financing **(b)** Tax Financing



Notes: This figure shows the relationship between the DEI multiplier, the DEI subsidy, and the elasticity of labor supply of type B's. Panel (a) assumes full deficit and panel (b) assumes full tax based financing, respectively.

the DEI multiplier on the vertical axis. The two panels present cases for $\gamma = 0$ and $\gamma = 1$, in order. We observe that (i) the multiplier is always positive and that (ii) the multiplier is generally high when the gap in the ELS between the two agents is high. In other words, as χ_b converges to 0.3, the DEI multiplier shrinks. However, even in this counter-factual situation the multiplier still turns out to be positive. As was also shown before, the multiplier is higher if the subsidy is deficit-financed.

The above analysis suggests that the case for a deficit-financed DEI initiative is stronger if the difference in the ELS between the two agents is high. Empirically, the gap in χ across - for example - women and men has been shrinking over time (Kumar and Liang, 2016). This implies that (a) the multiplier was potentially higher in the past and (b) the multiplier will be lower in the future, everything else equal.

3.6 Parity-Restoring DEI Interventions

So far, we have only worked with the multiplier concept, defined in terms of small changes in τ. How large of a subsidy is necessary to completely eradicate the employment gap between As and Bs? We can readily answer this question quantitatively by reverse-engineering the value of τ that achieves steady-state equality of N_a and N_b. This subsidy yields a general equilibrium multiplier of 19.44%, i.e. aggregate output in the parity economy is higher by 19.44% relative to the baseline with no DEI policies. The cost of this intervention requires a deficit of around 19.69% of aggregate output.

4 Conclusion

Diversity, equity, and inclusion (DEI) is one of the most widely discussed topics in recent times. However, academic literature on the macroeconomic effects of DEI is very limited. In this paper, we propose a first-pass quantitative assessment of DEI subsidies in a tractable general equilibrium framework with agent heterogeneity that is calibrated to the case of the United States. We highlight the importance of assumptions about the labor market and the extent of tax vs deficit financing in shaping the DEI multiplier. Our general finding is that the DEI multiplier is (i) positive, (ii) increasing in the share of deficit-based financing, and (iii) increasing in the elasticity of labor supply gap between types. Future iterations of this ongoing project may enhance the model in several directions. We will also consider normative considerations and study optimal linear DEI subsidies in the spirit of Piketty and Saez (2013).

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