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On the Heterogeneous Effects of Tax Policy on Labor Market Outcomes

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Abstract

Many recent studies have documented the heterogeneous effects of government spending shocks on major macroeconomic variables, particularly on output. We delve deeper into the heterogeneous effects of fiscal policy innovations, but focus on the tax policy innovations and their impact on the labor market, while accounting for gender, race, ethnicity, and the business cycle. Using micro-level data from the U.S., we find that: (i) Tax shocks have varying employment effects depending on gender, race, and the stage of the business cycle; (ii) Sector, industry, and occupational segregation in labor markets by gender, race, and ethnicity can explain most of the variation in response to fiscal policy shocks.

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1 Introduction

The severe financial crisis that beset the world economy in 2008-09 and the unequal and faltering recovery that followed has had a very noticeable impact on the evolution of unemployment since. More recently, following the Covid-19 pandemic, more than 30 million Americans filed for unemployment benefits. In such an environment, taking necessary measures to prevent persistently high unemployment rates from causing long-term damage to the growth and development prospects of their economies is one of the most urgent imperatives facing governments. Macroeconomic policies play a significant role in dampening unemployment rates, and thus reducing the risk of hysteresis during times of crises. For instance, where insufficient aggregate demand threatens to inflame hysteresis, expansionary demand-side policies through the adoption of expansionary fiscal policy can play a vital role in the recovery process (DeLong & Summers, 2012). This paper provides novel insights into the unintended effects of tax policy shocks, where the data reveal that some groups are consistently favored over others.

To properly evaluate the effectiveness of expansionary fiscal policy in inducing long-run economic growth or in alleviating crises, it is vital to identify and quantify its impact on labor market outcomes. However, researchers face a number of challenges when aiming to understand the effects of fiscal shocks on major macroeconomic variables. First, identifying fiscal policy innovations is not easy since there is a gap between the announcement of fiscal policy changes and their implementation. A number of previous studies (Mertens & Ravn, 2012; Ramey, 2011; C. D. Romer & Romer, 2009, 2010) remedied this problem by identifying fiscal shocks using a narrative approach, an identification approach that relies on extracting the exogenous component of the policy shock from the historical records in official policy documents ("narrative records").

A second potential complication for researchers is that many studies argue that fiscal policy has heterogeneous effects. Heterogeneity may be revealed through the state of the economy (i.e. the business cycle) and/or through group characteristics (e.g. income and indebtedness).

Regarding the business cycle, Auerbach and Gorodnichenko (2012), Fazzari et al. (2015), and Arin et al. (2015) show that government spending multipliers are larger during recessions and low growth periods. Similarly, Sims and Wolff (2018) and Arin et al. (2015) contend that tax multipliers are larger during expansions and high growth periods. These asymmetric effects were also found for fiscal adjustment episodes: Jordà and Taylor (2016) contend that 1 percent of GDP fiscal consolidation translates into a loss of 3.5 percent of real GDP over five years when implemented in a slump, rather than just 1.8 percent in a boom. Fazzari et al. (2021), using a VAR with sign restrictions, on the other hand, show that tax increases are highly contractionary and largely self-defeating in reducing the debt-to-GDP ratio when the economy is in a deep recession.

We should also note that the accompanying monetary policy (which depends on the state of the business cycle) also has an effect on fiscal multipliers. Ramey (2019) argues that for multipliers

on general government purchases, the evidence from developed countries suggests they lie in an unexpected range of 0.6 to 1. However, there is evidence for higher government spending multipliers during periods in which monetary policy is very accommodating, such as zero lower bound periods. Ramey and Zubairy (2018) estimate multipliers for the U.S. and Japan higher than 1.5 during these times. The reason for the amplified multipliers at the zero lower bound is that an increase in government spending provides extra stimulus by increasing expected inflation, which lowers the real interest rate, and therefore decreases the crowding-out (Ramey, 2019). Estimated tax multipliers, on the other hand, range from -2 to -3 on average. Empirical evidence also suggests that tax multipliers are larger at the zero lower bound (Ramey, 2019).

Finally, only recently, Barnichon and Matthes (2021) showed that the contractionary multiplier (the multiplier associated with a negative shock to government spending), is always greater than 1 and, consistent with previous studies, largest during recessions. In contrast, the expansionary multiplier -the multiplier associated with a positive shock– is substantially below 1 regardless of the state of the cycle. In a similar vein, Fazzari et al. (2021) find that contractionary shocks have larger effects than expansionary shocks across the business cycle, but this is much more pronounced during deep recessions and sluggish recoveries than in robust expansions. In sum, there seems to be a consensus regarding a number of asymmetries of fiscal policy over the business cycle: (i) government spending shocks being more effective during recessions, (ii) contractionary government spending shocks being larger in magnitude compared to expansionary government spending shocks, (iii) tax shocks being larger during expansions, and, finally, (iv) fiscal multipliers being larger with expansionary monetary policy, particularly at the zero lower bound.

In an effort to understand how differences across groups matter, several recent studies show that economic agents with lower income are more sensitive to fiscal policy innovations. Ma (2019) examines differences by income level and finds that consumption increases for the poor and decreases for the rich in response to a rise in government expenditure. This is somewhat consistent with E. Anderson et al. (2016), who show that consumption responses to a positive government shock are consistent with Real Business Cycle (RBC) models for rich consumers and Non-Ricardian/Keynesian models for poor consumers. In the same spirit, Cloyne and Surico (2017) show that households with mortgage debt exhibit large and significant consumption responses to tax changes while homeowners who have paid off their debts do not. This result is further supported by Misra and Surico (2014), who show that only 20% of American families, those in the bottom deciles, adjusted their consumption spending in response to two historical fiscal stimulus programs. Finally, Ferriere and Navarro (2018) document that historical spending multipliers in the U.S. are only positive if spending is financed by progressive taxation and if the burden falls more heavily on the rich. Guner et al. (2011) estimate that when a tax reform that allows married couples to file their taxes separately (by splitting children and/or dependent relatives) is implemented, the female labor force participation rate increases

substantially for married women and even more so for married mothers. [1]. This is also consistent with Giavazzi and McMahon (2012), who investigate the effects of shifts in military spending across U.S. states and find that hours worked and wages increase more for households with female heads. Some other studies suggest that fiscal policy favors female employment, such as Bredemeier et al. (2020), who document that fiscal expansions stimulate primarily female employment in the U.S. Likewise, Akitoby et al. (2019) find that increases in government expenditure benefit female employment during recessions in G-7 countries. Lastly, another strand of literature has shown that fiscal policy also has asymmetric effects on occupational employment dynamics. Bredemeier et al. (2020) argue that in response to an expansionary spending shock, employment rises most strongly in service, sales, and office ("pink-collar") occupations, but not in blue-collar occupations. In a similar vein, Mumtaz and Sunder-Plassmann (2021) use state-level data to estimate the effect of government spending shocks during expansions and recessions and argue that the degree of non-linearity in the effect of spending shocks is larger in states that are subject to a higher degree of financial frictions. In contrast, states with a prevalence of manufacturing, mining, and agricultural industries tend to have multipliers that are more similar across business cycle phases. Finally, Hayo and Uhl (2015) suggest that each state's size and composition of their respective tax bases may explain the cross-state variation in tax multipliers. Their multiplier calculations from a VAR with tax shocks identified with narrative approach range between –0.2 in Utah and –3.7 in Hawaii.

In a nutshell, a large number of studies document the asymmetric and heterogeneous effects of fiscal policy over the business cycle, across income groups, gender, and occupational status. However, almost the entirety of these studies focus on government spending shocks. To our knowledge, this is the first paper that incorporates tax policy innovations into these different strands of literature. Using micro-level data, the primary aim of this paper is to quantify the effects of fiscal policy shocks, i.e. changes in both defense spending and in taxes on the likelihood of unemployment, but by controlling for all sources of heterogeneity suggested by the literature. While doing so, we tackle both of the aforementioned challenges. To correctly identify tax policy innovations, we follow in the footsteps of C. D. Romer and Romer (2009), who identify the magnitude and direction of a tax change and determine the motivation underlying major tax legislation by examining corresponding economic reports and government-related documents. We extend their methodology to argue that there were no exogenous tax changes for the years 2008-2012. The government spending measure also relies on the narrative approach (Ramey, 2011). These two fiscal policy instruments, combined

[1] There is a broad strand of literature which looks into group level heterogeneity in labor supply elasticities. Among men and single women, substitution elasticities range from 0.1 to 0.3. Income elasticities still appear to be smaller in absolute value than substitution elasticities and remain in the range of -0.1 to zero (McClelland & Mok, 2012). The substitution elasticity of married women appears to range from 0.2 to 0.4, and their income elasticity appears to range from -0.1 to zero. For married women, Schultz (1975) finds that labor supply elasticities are slightly higher for white women compared to Blacks. This is somewhat surprising given Domeij and Floden (2006) argue that if young (relatively low-wage) individuals are credit constrained, they may work more than they otherwise would. As a result, labor supply elasticities for these workers do not map directly into preference parameters. On the other hand cross-country variation in labor supply elasticities seem to be very small (Bargain et al., 2011)

with the monthly waves of the CPS micro-level data from 1976-2012, allow us to measure the effect of fiscal shocks on the likelihood of unemployment for various subgroups of the U.S. population. We also control for asymmetric business cycle effects by looking at expansions and recessions separately in addition to controlling for a number of demographic factors by taking full advantage of the micro-level data.

Finally, we also investigate whether different types of taxes (personal versus corporate taxes) have different employment effects, once again, once heterogeneity over the business cycle is controlled for. This is particularly important as the previous literature document that different taxes do not affect major macroeconomic variables in a uniform manner. For instance, Lee and Gordon (2005) contend that corporate taxes are harmful for economic growth, while personal (labor) taxes are not. On the contrary, Mertens and Ravn (2013) show that personal tax shocks have a much more significant effect on labor market variables (unemployment, hours worked) compared to corporate tax shocks. These results lead to the question whether different segments of society react differently to the two types of tax policy innovations.

Our results are striking. First, we show that the negative effects of tax hikes are completely driven by recessionary periods. Furthermore, we find substantive differences in the impact of exogenous fiscal policy instruments on the likelihood of unemployment across race and ethnicity. Second, we demonstrate using both macro and micro empirical strategies, that exogenous changes in tax policy have no effect on Blacks' employment outcomes after two years, but have a considerable effect on those of non-Hispanic whites. Meanwhile, Hispanic whites is the group most affected by changes in tax policy but only during recessionary periods. These findings raise several concerns about the implementation and design of fiscal policy instruments. Most importantly, what are the mechanisms underlying the variation in employment responses to changes in fiscal policy? We show that the uneven allocation of jobs, according to sector, industry, and occupational status, across gender, racial, and ethnic group plays a major role in producing the general result that fiscal policy shocks have heterogeneous effects by gender/racial/ethnic subgroup.

It is intriguing that these demographic variables have been mostly overlooked by the previous literature. Thus, our findings highlight the importance of using micro-level data to examine the relationship between labor market variables and fiscal policy. On the other hand, our results are consistent with a subset of the recent empirical literature. For example, if tax cuts cause economic growth through stimulating private investment, as argued by C. D. Romer and Romer (2010), then our results that Blacks are the least responsive to tax changes are consistent with the over-representation of Blacks in the public sector. Furthermore, in line with Mertens and Ravn (2013), who demonstrate the importance of distinguishing between corporate and personal income tax rates, we show suggestive evidence that Blacks are highly responsive to changes in corporate tax rates during expansionary periods. We use our parameter estimates to predict changes in the unemployment rate for all groups using changes in corporate tax rates after the implementation of

the Tax Cuts and Jobs Act of 2017 and compare our model estimates with the actual changes in the unemployment rate by subgroup between 2018 and 2020.

The remainder of the paper is organized as follows: Section II reviews the strands of literature that are related to this paper. Section III provides a closer look at the data used and sheds light on key descriptive statistics for both macro-level and micro-level data. Section IV presents the empirical strategy employed in the paper. Section V displays the results for each state of the business cycle and provides a subgroup analysis. Section VI considers a few extensions to our approach and Section VII concludes.

2 Related Literature

The contribution of this paper lies at the intersection of labor economics and macroeconomics. The first strand of literature is concerned with the prevalence of segregated labor markets across gender, race, ethnicity, and gender, and the consequences of such segregation for labor market outcomes. Burbridge (1994b) has argued that the rapid expansion of healthcare, education, and social services, especially between 1950 and 1970, has led to a rise in occupational segregation by gender. However, such segregation has led to a wage penalty that is associated with female-intensive occupations (England, 1982; Goldin, 2014). Moreover, some have shown, using the index of occupational dissimilarity, that between 1940 and 1980, Black men and women were underrepresented in prestigious high-paid occupations, despite the tremendous progress made since 1940 (Cunningham & Zalokar, 1992). In particular, the period 1950 to 1990 saw a dramatic rise in the proportion of employed Blacks, especially Black women, working in the public sector, relative to their white counterparts (Burbridge, 1994b; 1994a). As was the case with gender, such occupational segregation by race was associated with labor market penalties. Indeed, related studies have demonstrated that a substantial portion of the racial wage gap can be attributed to occupational segregation, 65% of which cannot be explained by racial differences in human capital or other observable characteristics (D. Anderson & Shapiro, 1996; Gill, 1994).

Most studies on segregated labor markets and their consequences do not provide a framework to model labor market outcomes at various stages of the business cycle. One exception is Blanchard and Diamond (1990), who find that as an economy recovers from recession and businesses rehire, they select individuals who have the strongest labor market attachment. Motivated by different cyclical trends across age and gender groups, their model categorizes workers into primary and secondary, where the latter are perceived to have lower attachment, either due to high turnover or inadequate search during periods of low activity. Related empirical studies were then conducted to investigate how business cycle fluctuations shape the labor market outcomes of minorities. For example, Borjas (2006) finds that the wage rates of racial/ethnic minority groups, especially men, are relatively more sensitive to business cycle fluctuations. Likewise, Couch and Fairlie (2010) show

that Black men are more likely to experience immediate job loss as economic activity declines, which is consistent with the widening of the racial unemployment gap that occurs during recessions (Cajner et al., 2017). Other studies show that women experience longer periods of unemployment duration, although there are signs that women's employment outcomes are converging with those of men (Abraham & Shimer, 2001). However, none of these studies examined the heterogeneous effects of deploying particular fiscal policy instruments, the use of which is likely to vary within and across business cycles, on the employment outcomes of various minority groups.

On the macroeconomic side, fiscal policy is often put forward as an effective 'fine-tuning' tool for policy makers: insufficient aggregate demand can inflame hysteresis, which could be discouraged by expansionary fiscal policy (DeLong & Summers, 2012). A recent study by Yagan (2019) uses U.S. local areas as a laboratory to test for long-term impacts of the Great Recession and estimates that exposure to a 1 percentage point larger local unemployment shock in 2007-9 reduced working-age employment rates by over 0.3 percentage points in 2015 and those impacts were larger among older and lower-earning individuals. If hysteresis affects various subgroups differently, it is reasonable to expect heterogeneous effects of fiscal policy as well. Surprisingly, only a few empirical papers examine the distributional effects of fiscal policy with respect to race and ethnicity (Abell, 1990, 1991) and there is even less guidance from the theoretical literature. To our knowledge, ours is the first paper to investigate the employment effects of fiscal policy separately for the three major racial/ethnic subgroups: non-Hispanic whites, Hispanic whites and Blacks/African Americans. [2] while controlling for business cycle effects as well as other individual level characteristics such as gender, industry affiliation and occupational status.

The majority of the studies investigate the timing and magnitude of fiscal policy shocks by using macroeconomic data and through the use of vector autoregressive (VAR) models. We should also note that with a few exceptions, the focus of research in this area has been primarily on estimating the effects of fiscal policy on output, consumption, and real wages, with limited attention paid to estimating responses in terms of changes in employment outcomes: unemployment, labor force participation or part-time work. Kato and Miyamoto (2013) and Pappa et al. (2015) have confirmed the favorable effects of fiscal expansions on unemployment for Japan and 26 European countries, respectively, also by using the VAR approach. In line with the Keynesian model, Bates et al. (2007), Galí et al. (2007), Perotti et al. (2007), and Mountford and Uhlig (2009) find that a positive spending shock leads to a rise in hours worked, consumption, and real wages. Monacelli et al. (2010) have documented that the unemployment multiplier ranges between 0.4 and 0.6 at its peak (in year 2) for the U.S.

The main issue within the VAR framework is the identification of fiscal shocks, or fiscal policy innovations. Two strands of literature have emerged in terms of the identification problem. The first

[2]Thereafter, we will refer to this group as "Black" since some members of this group may identify as Black but not as African American, due to the unique historical experiences of the latter group.

group produces fiscal shocks endogenously by identifying them using recursive orderings or restrictions on the model's dynamics (Blanchard & Perotti, 2002; Ravn & Simonelli, 2007). Meanwhile, in the second group, spending shocks are determined exogenously using direct observations acquired through the narrative approach (Mertens & Ravn, 2012; Ramey & Shapiro, 1998; C. D. Romer & Romer, 2009).

The first approach is criticized on the grounds that if the fiscal shocks identified are in fact anticipated by economic agents prior to implementation, then the impulse responses thereby obtained will be biased. The narrative approach, which handles the aforementioned fiscal foresight critique, has increasingly become a welcome alternative. With this approach, exogenous fiscal shocks are identified by a narrative-based dummy, where Ramey and Shapiro (1998) construct a defense news measure using media outlets and C. D. Romer and Romer (2010) use information from presidential speeches and Congressional reports to identify and quantify exogenous tax changes.[3].

Studies using the narrative approach usually analyze the effects of a positive shock in defense spending, (vs overall government spending), on macroeconomic outcomes and, although they find a positive effect on hours worked, their results reveal a negative effect on consumption and real wages (Burnside et al., 2004; Mertens & Ravn, 2012; Ramey & Shapiro, 1998; Yuan & Li, 2000). These results have been explained by intertemporal models where households expect a tax hike following a positive spending shock to satisfy the government's intertemporal budget constraint. Through this negative wealth effect, households make optimal decisions by reducing consumption and by raising hours worked, thereby reducing real wages. Similarly, C. D. Romer and Romer (2010) find contractionary output effects in response to exogenous tax increases and identify the most sizeable decline in the investment component of GDP.

In this paper, we also identify fiscal policy shocks using the narrative approach. We start our analysis with VAR estimations, which provide us with impulse response functions (IRFs) for different ethnic racial groups. To make use of the micro-level data and given the binary nature of our labor market outcome variables, we opt for a more traditional regression framework (a linear probability model and/or logit model), which also allows us to differentiate between expansions and recessions. Our results suggest that macro and micro approaches are compatible, yielding similar findings, but the use of micro-level data can allow the researcher to investigate the channels by which unemployment responds to fiscal policy instruments. To ensure that our results are robust to selection-bias, we compute upper and lower bound estimates for our parameters of interest using the method in (Oster, 2019).

Recently, a number of studies have investigated the effects of fiscal policy (E. Anderson et al., 2016; Bredemeier et al., 2020; Cloyne & Surico, 2017; Misra & Surico, 2014) using micro-level data, and have provided evidence that economic agents react differently to fiscal shocks, based on their income

[3]Specifically, Ramey and Shapiro (1998) utilize large exogenous increases in defense spending, such as the Vietnam War, the Korean War, and the Carter-Reagan military build-up, to identify shocks to fiscal policy.

and borrowing constraints as well as their occupational status. Cloyne and Surico (2017) show that in the U.K., households with mortgage debt exhibit large and significant consumption responses to tax changes. Similarly, Misra and Surico (2014) show that consumption patterns change in response to a fiscal stimulus only for low income and likely to rent individuals. Bredemeier et al. (2020), on the other hand, contend that in response to a government spending shock, employment rises mostly in service, sales, and office occupations. Following Misra and Surico (2014) and Cloyne and Surico (2017), we extend their framework to analyze the importance of individual level characteristics in understanding the effects of fiscal policy on labor market outcomes, since different subgroups are known to vary in their labor market trajectories.

Finally, Mertens and Ravn (2013) differentiate between changes in corporate and personal income tax rates, after excluding all legislation with implementation lags that exceeded 90 days. They find that cuts in personal income tax rates reduce unemployment and raise hours worked, while there are no effects of corporate taxes. We also incorporate their data to analyze how corporate vs personal taxes affect employment at the individual level. This is partly motivated by Zidar (2019), who finds that the positive relationship between tax cuts and employment growth can be primarily explained by tax cuts for low-income groups.

3 Data

3.1 Macroeconomic data

Our macroeconomic data set covers the period 1976:I–2014:IV, or a total of 156 observations. We should also note that our sample includes three wars during which defense spending increased considerably: the Cold War and the first and second Gulf Wars. Our data sample also includes large exogenous tax changes such as the largest tax cut since World War II, Reagan's Economic Recovery Tax Act of 1981, and Bush's Economic Growth Tax Relief Reconciliation Act of 2001; examples of deficit reduction tax increases in our analysis include Clinton's Omnibus Budget Reconciliation Act of 1993, one of the most significant tax increases in recent history. Finally, our data set allows the years following the Great Recession (2007-08) to be included in our analysis.

The (independent) fiscal variables of interest include exogenous measures of changes in defense spending and changes in tax policy. The government spending measure (D_t) is the nominal present discounted value of expected change in defense spending and total population, including armed forces overseas are from Ramey (2011), although our results remain essentially the same if we use one quarter ahead forecast error based on the survey of professional forecasters (Ramey, 2016). Tax policy innovations, from 1976 to 2007, are identified through the change in real exogenous tax liabilities (T_t) as estimated in C. D. Romer and Romer (2009, 2010). To cover recent changes in tax policy, during the period 2008-2011, we examine the Economic Report of the President (ERP) for

each year between 2009 and 2012, which provides detailed information on the motivation underlying all acts of tax legislation in the previous year.

We argue that all tax legislation that occurred between 2008 and 2011 fell into at least one of two categories: either the legislation was created to dampen the effect of the 2007-2008 Financial Crisis or it was simply an extension of a previous tax policy (see Appendix A for more details). In the former case, it is clear that such tax legislation cannot be considered exogenous to output or employment since the intention of policymakers was to produce a counter-cyclical response to dire economic conditions. Furthermore, following C. D. Romer and Romer (2009), allowing extensions of tax policies, unlike that of tax expirations, is not considered a tax policy innovation. Thus, none of the changes in tax liabilities collected between 2008 and 2011 are considered exogenous tax changes, which means that for these years $T_t = 0$. In fact, we believe that the tax cuts of 2018 represent the first exogenous tax change after 2007. However, since the language in the Economic Reports of the President became more ambiguous over the years, we choose to conduct our main analyses using tax measures only until 2011. In some specifications, we utilize disaggregated tax policy innovations by Mertens and Ravn (2012) to investigate the labor market effects of personal and corporate taxes separately. For all empirical specifications, we employ both fiscal variables in order to control for the budget equation, since failing to do so results in biased estimates of the parameters of interest (Kneller et al., 1999). As previously discussed, previous studies also show the importance of investigating personal and coporate taxes separately. Later, we replace our aggregate tax measure from C. D. Romer and Romer (2010) with disaggregated measures for personal and corporate taxes from Mertens and Ravn (2013). Following their lead, tax policy shocks were identified by using average marginal rates for both types of taxes.

Additionally, monetary policy shocks were identified through the (S_t), squared government bond spread as an indicator of monetary credit conditions, following Barro and Redlick (2011). Figure 1 reports plots of the fiscal policy variables. A visual inspection would confirm that defense spending increased in the late 1970s (the Cold War), early in 1990 (Iraq War), and at the beginning of this century (2nd Iraq War). Tax rates show rather volatile behavior, primarily due to changes in political party orientation and other changes at the congressional and executive levels.

3.2 Microeconomic Data (CPS)

The micro-level data used in this paper combines all monthly household-level CPS data from 1976-2012, and uses the unique identifier to form a panel data set at the individual level. In order to take full advantage of the longitudinal design of the data, only the years 1976-2012 are studied in the micro analysis, although our period of interest starts in 1973 after variables on race and ethnicity were available.[4] The CPS is a monthly survey with a rotation design that visits households

[4]That said, inclusion of 1973-1975, using only annual (ACES) data, does not alter the qualitative nature of the results.

for four consecutive months, and after an eight month hiatus, revisits the same households for four more consecutive months. Approximately 50,000 households are sampled every month on detailed demographic and social characteristics as well as labor force and employment outcomes. Our full sample includes about 39 million individual observations in the age range of 18-64 that were interviewed during the period 1976-2012.[5]

The coding of some variables was changed over time in order to provide researchers with more information about the survey sample, and thus most variables over this long period were not consistent. To ensure uniformity across years, we re-coded these variables in accordance with a broader definition of responses. For example, the coding of marital status changed in 1989 to include the additional status of "separated", but also to distinguish between divorced and widowed individuals, who were previously in the same category. In our paper, we use the coding prior to 1989 for marital status in order to achieve uniformity across years, and this procedure is followed with respect to other variables whose codes changed over time, such as educational attainment, race, and ethnicity.

To determine whether a year is included during a recessionary or expansionary period, we first estimate the (weighted) average national unemployment rate according to the CPS data by year. Recessionary periods are defined as those where the unemployment rate is rising, as in the years 1980-83, 1990-1992, 2000-2003, and 2008-2010, covering over one third of all observations–14.9 million total and 11.5 million in the labor force–in the full sample. On the other hand, when the unemployment rate is falling, as in 1976-1979, 1984-1989, 1993-1999, 2004-2006, and 2011-2012, these periods are considered expansionary periods, for which there are over 25 million observations in the full sample and 19 million in the labor force. This categorization is relevant as one of the primary questions of interest is to infer whether the effects of fiscal policy shocks vary at different states of the business cycle. This way of categorizing recessions and expansions largely overlaps with the NBER peak to trough and trough to peak dates, which we use to validate our results.

Table 1 provides descriptive statistics during the sample period (1976-2012) for each racial/ethnic subgroup by gender on the unemployment rate and three types of job characteristics: sector (public, private, and self employment), one digit industry affiliation, and one digit occupational status.[6] The summary statistics highlight the different ways in which the labor market is segmented. For example, almost 30% of women are employed in jobs related to education and health, in which fewer than 10% of men work. Moreover, Black men and, especially, Black women are over-represented

[5]If we assume the average household over the period of interest has 1.8 working-age adults between the ages of 18 and 64, and given that fewer households were sampled in recent years, an average of 48,000 households were sampled monthly, then we have a total of 48,000 households*1.8 individuals/household*12 months*31 years=32 million individuals.

[6]Industries include: Agriculture, Mining, Construction, Manufacturing, Wholesale, Transportation, Information, Financial Activity, Professional/Business Services, Education/Health, Hospitality, Other Services and Public Administration. Occupational categories include: Managers, Academics, Professionals, Associates/Technicians, Clerical Workers, Sales/Services, Agriculture, Craft/Trades, Machine Operator, and Elementary Occupations.

in the public sector while their Hispanic counterparts are overwhelmingly employed in the private sector. Meanwhile, non-Hispanic white men are disproportionately higher among the self-employed. Categorizing workers by occupation and racial/ethnic subgroup reveals that non-Hispanic white men are more than 2.5 times more likely to hold prestigious jobs (managerial/academic) than their Black and Hispanic counterparts.

4 Empirical Strategy

4.1 Macro-level Preliminary Analysis

We start our empirical investigation with the analysis of the macro data within a Vector Autoregressive (VAR) framwork. We should note that this is just a preliminary analysis that will provide the background for more in-depth and solid microeconomic analysis. We estimate an unrestricted VAR model with 4 variables. Each model comprises the following variables: Unemployment Rate (U), Spread (S), which controls for monetary policy shocks, Government spending shocks (G), and Tax Policy shocks (T). For the unemployment rates, we use various data, all of which were obtained from the labor force statistics database of the Current Population Survey (CPS) provided by the Bureau of Labor Statistics (LBS). Our specifications include the unemployment rate (for people 16 years old and over), disaggregated by race (white, Black or African American, and Hispanic or Latinx ethnicity).

Let Z_t denote the set of following variables: Unemployment$_t$, Monetary policy$_t$, Defense spending$_t$, and Taxes$_t$. The estimated Vector Autoregressive model has the following form:

$$Z_t = A_0 + A_{0d} + \sum_{i=1}^{k} A_i Z_{t-i} + \varepsilon_t, \tag{1}$$

where A_0 is a $4x1$ vector of constants, A_{0d} is a vector of dummies controlling for recession periods, A_i is the matrix $(4x4)$ of coefficients, and ε_t is a vector of residuals. Following C. D. Romer and Romer (2009, 2010), a lag length (k) of 12 was chosen for all variables. A quantitative characterization of the response of unemployment to a shock in taxes is provided by impulse response functions (Figures 2-3). We examine the effect of an unanticipated shock in taxes at time t on unemployment between quarters $t+1$ and $t+20$. One standard deviation confidence intervals are obtained from 10,000 Monte Carlo draws.

We also use a Cholesky ordering for the variance-covariance matrix, in addition to utilizing fiscal shocks identified through a narrative approach, as mentioned earlier. In a Cholesky ordering, variables higher in the ordering are assumed to affect variables lower in the ordering contemporaneously, whereas variables lower in the ordering can only affect variables higher in the ordering, only with a lag. For this particular exercise, we tried two Cholesky orderings: U, S, G, T and S, T, G, U.

For both orderings, the results were essentially the same. The empirical results for the former ordering are presented below. For space constraints, only the impulse response functions (IRFs) to a one-standard deviation tax shock are presented. The recessionary periods are controlled for with an exogenous dummy variable.

Figure 2 reports the impulse response function of total unemployment to a one standard deviation shock to taxes. The response of unemployment to changes in the tax structure is insignificant for the first 7 quarters, but becomes positive and significant between the 8th and 10th quarters. To explore differences across race and ethnicity, Figure 3 reports the IRFs of unemployment by race/ethnic subgroup to a one standard deviation shock to taxes. We observe a statistically significant and positive response to a tax increase between the 8th and 10th quarters for Hispanic and non-Hispanic whites, though the magnitude of the response varies across quarters and is consistently greater for Hispanic whites. Both the magnitude and the significance of the response is lower for Blacks; in fact, the IRF never becomes significant. These results suggest that the employment outcomes of Blacks are not as affected by tax policy innovations as can be predicted by the national average, while the employment outcomes of Hispanic whites are more likely to be shaped by tax policy innovations. The main analysis will show that these results only hold under certain conditions.

Table A1 in the Appendix shows that increases in tax liabilities are unfavorable during recessionary periods but not expansionary periods. In columns(4)-(6), the recessionary and expansionary periods are substituted by the NBER dates and the qualitative nature of the results is not altered. In the remainder of the paper, the empirical analysis displays all regressions separately by the state of the business cycle to first investigate the validity of these results and then scrutinize the hidden fabric by isolating its causes through the use of micro-level data.

4.2 Empirical Strategy for the Micro-level Analysis

The micro analysis allows for an extensive set of controls using a large sample size and, therefore, we use it as our baseline results. To analyze the effect of exogenous fiscal policy shocks on the likelihood of becoming unemployed between 1976 and 2012, we estimate a linear probability model:

$$\begin{aligned} I(Unemp)_{i,s,t} = \sum_{j=0}^{8} \beta_j D_{t-j} + \sum_{j=0}^{8} \theta_j T_{t-j} + \sum_{j=0}^{8} \lambda_j M_{t-j} + \\ \zeta I(MS)_{i,s,t,} + \sum_{j=0}^{8} \beta_j' D_{t-j} I(MS)_{i,s,t} + \sum_{j=0}^{8} \theta_j' T_{t-j} I(MS)_{i,s,t} + \\ \sum_{j=0}^{8} \lambda_j' S_{t-j} I(MS)_{i,s,t} + \delta X_{i,s,t} + \varepsilon_{i,s,t} \end{aligned} \quad (2)$$

where the dependent variable is a dummy variable that takes the value 1 if an individual, i, is unemployed in state s during quarter t and 0 otherwise; j represents the number of quarters ($j = 0, 4$ or $j = 8$) that the variables of interest are lagged. The dependent variable is regressed on the two following variables of interest: the expected changes in defense spending (D_t) are from Ramey (2011) and the changes in exogenous tax liabilities (T_t) are from C. D. Romer and Romer (2010). In some specifications, this variable was replaced with changes in average corporate income tax rates (ACITR) and average personal income tax rates (APITR) following Mertens and Ravn (2013). The spread variable (S_t) is included as a proxy for monetary policy shocks.

Since a major contribution of this paper is to examine the differential effects of fiscal shocks on the employment outcomes of racial/ethnic-sub-groups, two dummy variables are included to control for race (Black/White) and ethnicity (Hispanic/non-Hispanic), where non-Hispanic whites are the reference group. For brevity, MS in equation (1) represents the minority status–racial and ethnic–of an individual and, thus, the indicator variable $I(MS)_{i,s,t}$ consists of both dummy variables. Interaction terms between race, ethnicity, and changes in fiscal policy are included to capture whether different subgroups of the population are uniformly affected by changes in policy. In addition to their current value, fiscal policy variables and the federal funds rate are also lagged two years and are interacted with race and ethnicity. Following the descriptive analysis above, all regressions are estimated separately during recessions and expansions.

To relate our results to the literature, we are especially interested in quantifying the effects of changes in fiscal policy shocks on employment after two years. Thus, the main parameter of interest for non-Hispanic whites is θ_8. However, the corresponding parameters of interest for minority groups must also include the interaction terms: $\theta_8 + \theta'_8 * Black$ for Blacks, and $\theta_8 + \theta'_8 * Hispanics$ for Hispanics. We also provide the cumulative effects of changes in tax policy, which involves summing the parameters of interest for up to two years before the tax change, separately for each group. For example, for non-Hispanic whites, this would accrue to $\theta_0 + \theta_4 + \theta_8$, but for Blacks and Hispanics, the corresponding estimates are $\theta'_0 * Black + \theta'_4 * Black + \theta'_8 * Black$ and $\theta'_0 * Hispanic + \theta'_4 * Hispanic + \theta'_8 * Hispanic$.

While the variables of interest are exogenous, endogeneity concerns remain. For one, individuals who face limited options in the labor market, i.e. low-skilled, members of minority groups, and young people, may be underrepresented in the labor force during quarters where major changes in federal policy actually took place. In addition to race and ethnicity, we control for six educational attainment dummies, a fourth polynomial in age, marital status, and whether or not the individual was unemployed during the last visit ($X_{i,s,t}$). A second issue is that there is a great deal of variation across states with respect to tax policies and defense spending, some of which will coincide with changes in federal policies, but other changes in state policies may be a direct response to it. For example, if the federal government increases federal taxes and some states respond by reducing state taxes in order to appease the public, the effect of changes in federal tax policy on employment

outcomes may be muted in those states. Thus, to the extent that state policies offset or complement federal ones, the parameters of interest are biased downward or upward respectively. Similarly, changes in power dynamics concerning political parties and policymakers across states may alter how some states react to federal policies over time.

Accordingly, changes in employment outcomes that cannot be accounted for by individual characteristics or changes in federal policies are included in the error term and can be decomposed into the following:

$$\varepsilon_{i,s,t} = \mu_s + \tau + \sigma_{s\tau} + \tilde{\alpha}_{it} \tag{3}$$

where μ_s represents the inclusion of state fixed effects, τ is a yearly time trend, and $\sigma_{s\tau}$ is the interaction of state-year interaction terms . In the first specification of the linear probability model, the parameters are unbiased as long as idiosyncratic changes across individuals ($\tilde{\alpha}_{it}$), beyond those included in $X_{i,s,t}$, are uncorrelated with changes in federal policies. In our second specification, a slight variant of this model is introduced so that the error term is split in the following way:

$$\varepsilon_{i,s,t} = \mu_s + \tau + \sigma_{s\tau} + \tilde{\alpha}'_{it} + \alpha_i \tag{4}$$

In other words, in this specification, time-invariant individual fixed effects (α_i) are incorporated to account for time-invariant observable and unobservable characteristics. This allows us to capture the effect of changes in federal policies on employment outcomes among individuals. Additionally, survey weights are used and standard errors are clustered at the state level.

5 Empirical Analysis

5.1 The Labor Market Outcomes of Aggregated Tax Shocks by Ethnicity

Table 2 displays the baseline results for equation (1) where the main independent variable of interest is Romer and Romer's measure for changes in tax liabilities. Columns (1)-(3) display point estimates during recessionary periods: 1980-1983, 1990-1992, 2000-2003, and 2008-2010. The point estimate in column (1) implies that a 1% exogenous increase in tax liabilities, two years prior to a recession, raises the likelihood of being currently unemployed by approximately 1.1 percentage points for the reference group, non-Hispanic whites. This finding is somewhat consistent with Okun's law (when unemployment falls by one point, output rises by 2 points) in view of the result in C. D. Romer and Romer (2010) that a 1% increase in taxes leads to a 3% decline in output. The point estimates of the interaction terms show that during recessionary periods, Blacks' employment outcomes are not shaped by changes in taxes (consistent with our macroeconomic analysis) while those of Hispanics are the most affected. Moreover, the p-value associated with the effect of taxes for Blacks is 0.53

while the corresponding value for Hispanics is 0.00.[7]

One question that arises is whether these findings are, to some extent, mechanical. Consider the possibility that as non-market participants enter the labor market during a recession, some enter after a tax cut and subsequently gain employment, while less skilled individuals participate in the labor market after a tax hike and experience unemployment. Under these conditions, tax cuts increase employment rates due to the composition of workers that enter the labor market. Hence, to examine whether our results are driven by those who are observed as always unemployed or always employed during the survey period, in column (2), the sample is limited to individuals whose employment status has changed during the period interviewed. The inflated point estimates in column (2) imply that our main result is in fact driven by individuals who experienced both employment and unemployment at least once such that individuals are more likely to become unemployed (employed) following an increase (decrease) in taxes during recessionary periods; the p-values show that point estimates for all groups are statistically significant. Moreover, these findings are robust to the inclusion of unobserved time-invariant characteristics (e.g. motivation, job search intensity), as shown in column (3), so that among individuals, employment outcomes are highly sensitive to tax changes. We also check for persistence in the dependent variable. [8]

Columns (4)-(6) display point estimates during expansionary periods: 1976-1979, 1984-1989, 1993-1999, 2004-2006, and 2011-2012. The findings show that tax hikes lead to increases in employment but the effect is smaller for both Blacks and Hispanics. [9] Note that for all specifications, the point estimates for the cumulative effect are similar in magnitude and direction as that for the lagged 2 year effects.

The main results of Table 2 are summarized in Figures A1 and A2, which display binscatter plots of unemployment versus changes in tax liabilities during recessions and expansions separately. The results in Table 2 are replicated in Table A2 using the NBER dates. We find that, especially during recessions, the magnitude of the point estimates are highly inflated, implying that employment is particularly responsive to tax shocks during NBER recession dates . We interpret this to suggest that our estimates in this paper represent a lower bound estimate for the effect of fiscal policy shock on employment outcomes. To examine these trends further, we now turn to the role of gender, industry affiliation, and occupational status.

[7]For Blacks and Hispanics, using a Wald test, the p-values are computed for the sum of the coefficients $\beta_8+\beta'_8, \theta_8+\theta'_8$. See the empirical strategy section for more details on the parameters of interest.

[8]To check whether persistence in the dependent variable partially drives these results, we also checked whether controlling for lagged unemployment in the previous visit affected the results using GMM instrumentation as discussed in Arellano and Bond (1991) and Roodman(2009). We find that our results for recessionary periods are quite robust while those for expansionary periods are sensitive to changes in specification and frequently differ from our main results. The main issue lies in the assumption that further lags of the dependent variable may still be correlated with individual fixed effects during expansionary periods, which means that GMM instruments are invalid.

[9]Column(4) shows that Blacks are more responsive to taxes than other groups but this is contrary to the corresponding estimates in columns(5) and (6). This implies that Blacks who experienced employment gains (losses) following a tax hike (cut) during expansionary periods are either new labor market entrants or they re-entered the labor market after a long unemployment spell because they were not previously observed as unemployed.

5.2 Heterogeneity and Subgroup Analysis: Recessions

Table 3 reports the results for a linear probability model (LPM) during recessionary periods by gender, first without job-related controls, then by sectoral and industry affiliation in their most recent job, and finally by occupational status (excluding the self-employed) in their most recent job; the sample is limited to those whose employment status has changed during the sixteen quarters interviewed. The coefficients for each industry and occupation control are reported in Appendix Tables A3 and A4.

A comparison of columns (1)-(2) shows that when sector and industry controls are included, a tax hike has an adverse effect during recessions on all groups of women two years later, but the estimates are inflated and more uniform when self-employment status, sector affiliation, and industry controls are included. This is likely due to a combination of trends that partly offset each each other. Specifically, the point estimates are inflated since self-employed individuals are by far the least affected by tax policy changes during recessions. Meanwhile, the point estimates are more uniform because Black women are more likely to be employed in the public sector (see Table 1) as well as industries that are the least responsive to changes in tax policy, such as Public Administration and Education/Health (see Appendix Table A3). With the inclusion of occupational status controls in column (3), the point estimates are attenuated and noisier than those in column (1). This is because Hispanic women are over-represented in occupations that are sensitive to tax changes such as Sales and Services and Elementary occupations (see Table 1 and Appendix Table A4). These findings suggest that Black (Hispanic) women are the least (most) responsive to changes in tax policy during recessions due to job-related characteristics.

Columns 4-6 display the point estimates for men during recessionary periods. Relative to column (1), the magnitude of the point estimates in column (4) demonstrate that changes in tax liabilities are much larger and more uniform for men than for women. That said, the point estimates follow a similar pattern to that of the female sub-sample where the inclusion of self-employment status, industry controls, and sector affiliations inflate the tax policy parameter while occupation controls attenuate the effect of tax changes. [10] Occupation controls have a considerable effect on explaining how tax changes influence employment outcomes. The results are driven by men in elementary occupations, whose employment status is the most vulnerable to policy changes (see Table A4). During the sample period, nearly 40% of minority men and 28.6% of non-Hispanic white men held jobs in elementary occupations (see Table 1).

In summary, we find that men's employment outcomes are highly influenced by tax-policy changes during recessions, but racial/ethnic differences in employment responses to tax shocks is primarily driven by women. That said, job-related characteristics, more notably occupational status and sector affiliation (public, private, self-employed) can explain most of the variation in employment

[10] Specifically, Black men are over-represented in Education and Health, and Public Administration and the public sector in general, which are among the least likely to be affected by tax changes (see Table A3).

outcomes. We now turn to a brief discussion on how fiscal policies inadvertently favored various groups during expansionary periods.

5.3 Heterogeneity and Subgroup Analysis: Expansions

Table 4 reports the corresponding point estimates for Table 3 during expansionary periods. In the event of an exogenous tax hike, all women experienced favorable employment outcomes. However, the general result (in Table 2) that minority groups are less responsive to tax policy changes during expansions is driven by men (unlike the earlier result for recessions, which was driven by women). However, in the presence of occupational controls, the effect of a change in tax on the likelihood of being unemployed was no longer statistically significant for all men. For Black and non-Hispanic white women, tax shocks continue to play a vital role on employment, suggesting that future research may need to investigate factors other than job-related characteristics. Since a larger percentage of Hispanic women are concentrated in elementary occupations, controlling for occupation status strongly dampens the effect of tax shocks.

Our main results document an asymmetrical response to exogenous tax shocks during recessions and expansions. Moreover, we show that tax policy changes shape employment outcomes the least for Blacks and the most for Hispanics during recessions. In the subgroup analysis, we find that many of these trends are driven by various subgroups in combination with job-related characteristics. With respect to expansions, we find that minority groups are less responsive to aggregated tax policy shocks than non-Hispanic whites, and that job-related characteristics play a limited role in explaining these trends. In the next section, we investigate whether these trends are supported by a specific tax instrument.

5.4 The Labor Market Outcomes of Disaggregated Tax Shocks by Ethnicity

In Panels A and B of Table 5, we replicate the exercise in Table 2 but substitute Romer and Romer's measure for changes in tax liabilities with changes in average corporate income tax rates (ACITR) and average personal income tax rates (APITR) following Mertens and Ravn (2013). ACITR is the share of corporate profits allocated to taxes while APITR represents the share of personal taxable income allocated to personal income taxes and contributions for social insurance. Note that although average tax rates are computed using unanticipated changes in tax liabilities, changes in average rates are not considered exogenous shocks.[11] In contrast to our results in Table 2, the parameter estimates displayed in Table 5 are highly sensitive to the specification used, suggesting

[11]To be more specific, Mertens and Ravn (2013) argue the following: "There are many different sources of endogeneity in the average tax rates ranging from policy responses to macroeconomic shocks to cyclical fluctuations in the administrative definition of taxable income versus NIPA income, tax progressivity and changes in the distribution of income, cyclical variations in tax compliance and evasion, etc.("p.1221-2").

that compositional effects may play an important role. For example, columns (1)-(3) in Panel A demonstrate that Blacks (and to a lesser extent Hispanics) are highly sensitive to changes in corporate tax rates during recessions but this effect is completely reversed with the inclusion of individual fixed effects.

One possibility is that minorities are usually employed in jobs that are more susceptible to corporate tax shocks during recessionary periods. In Appendix Table A4, LPM specifications include controls for industry fixed effects, self-employment status and/or occupation fixed effects, separately by gender. The inclusion of controls related to job characteristics does not contribute to the explanation of why the employment status of Blacks (and in fact, all women) are more sensitive to corporate tax rates during recessions columns (1)-(3).[12] However, among men, the point estimates for all groups are noisy (columns 4-6). Thus, it appears that for men, differences in job characteristics such as self-employment status, industry affiliation, and occupation status (in current or last job prior to unemployment) account for differences in vulnerability to corporate tax shocks.

Our preferred specification is the fixed effects model. Note that both ACITR and APITR are statistically and economically significant during expansionary periods when accounting for employment status differences within individuals (column 6 of Table 5, Panels A and B). These specifications are especially relevant when aiming to understand the role of the Tax Cuts and Jobs Act of 2017 signed by former President Donald Trump.

5.5 Tax Cuts and Jobs Act of 2017

The Tax Cuts and Jobs Act of 2017 was one of the largest tax cuts in U.S. history. To use the model to predict the impact of this bill, we must keep a few things in mind. The implementation was almost immediate and occurred during an expansionary period. Additionally, the timing of the tax cut occurred after the end of our period of interest. Third, it is one of the largest tax changes in U.S. history. In fact, according to Mertens (2018), the average corporate (personal) income tax rate is estimated to have declined by 7.4 (0.8) percentage points in 2018. Although our results were not derived conditional on the size or time period of various tax changes, it is important to view predictions of the impact of the 2017 tax bill with caution since it was particularly large, potentially rendering our estimates an out of sample prediction.

As discussed earlier, the fixed effects model is our preferred specification and, thus, we use column (6) of Table 5A and 5B to estimate the effect of the Tax Cuts and Job Acts of 2017. In its upper panel, Table 6 displays the estimated cumulative two-year effect of ACITR and APITR for non-Hispanic whites, Blacks and Hispanics related to column 6 of Table 5A/5B. In the middle panel, the parameters associated with the cumulative two-year effect are used along with the actual changes

[12]The fact that the impact of corporate tax shocks dramatically changes with the inclusion of individual fixed effects (see column 3 of Table 5) implies that there are time-invariant characteristics (not related to job characteristics) that may explain the sensitivity of women's employment outcomes to changes in corporate tax rates.

in ACITR (7.4 pp) and APITR (0.8 pp) to predict the change in the unemployment rate, the actual change in the unemployment rate and the absolute prediction error.[13] In the lower panel, the same exercise is repeated for parameters that only predict unemployment two years after the change in the tax for completeness. Two points are worth noting. First, these predictions overestimate the actual decline in unemployment rates for all groups between January 2018 and January 2020, but at least the downward trend in unemployment is accurate. Second, the model's predictions are more accurate for minority groups (especially for Blacks) when using the cumulative effect of tax changes rather than the lagged two-year effect. Meanwhile, cumulative effect estimates result in doubling the absolute prediction error for non-Hispanic whites.

We report these results with caution for two main reasons. First, there are some endogeneity concerns related to average tax rates as noted above. Second, column (5) suggests that corporate tax cuts have adverse employment outcomes for all groups during expansionary periods, and, thus, contrasts with our preferred specification, which predicts a decrease in unemployment following an increase in ACITR only after controlling for time-invariant unobservable characteristics. In other words, by including fixed effects, the parameter estimates were driven by those whose employment status switched following a change in ACITR.

For completeness, we display parameter estimates of LPM specifications that reveal the heterogeneous employment effects of (1) corporate tax rates during recessions (Table A5), (2) personal tax rates during recessions (Table A6), (3) corporate tax rates during expansions (Table A7), and (4) personal tax rates during expansions (Table A8). As mentioned above, in the case of quantifying the relevance of corporate tax shocks during recessions, the results are highly sensitive to the specification and sub-sample.

5.6 Omitted Variable Bias and Selection Bias

Since the econometrician cannot observe all the factors that influence the likelihood of employment, we account for the possibility that the above-mentioned results are driven by selection bias by computing bounded effects for our parameters of interest (at year 2) using the method delineated in Oster (2019). Thus, researchers do not have to rely on simply the movement of coefficients under various specifications to determine whether a variable has a significant impact on an outcome variable. Controlling for bias, the estimator relies on two main inputs, in addition to parameter coefficients and their corresponding R-squared terms: (1) the value of δ, which represents the degree of selection on unobservable and observable variables;[14] (2) a maximum value for the R-squared

[13] According to the Bureau of Labor Statistics (BLS), the unemployment rate declined by 1.4 percentage points for Blacks (from 7.5% to 6.1%), 0.6 percentage points for Hispanics (from 4.9% to 4.3%), and 0.5 percentage points (3.5% to 3.0%) for whites.

[14] δ is the ratio of the effect of unobservables on the treatment divided by the effect of observables on the treatment. We use the default value of 1 for δ.

term.[15]

Panels A and B of Table 7 display the findings corresponding to the specifications in Tables 3 and 4 respectively. As was the case with the main results, tax hikes have strong adverse employment effects during recessionary periods while having mild beneficial effects during expansionary periods. Moreover, Hispanic whites are the most influenced while Blacks are the least impacted during recessionary periods. A striking departure from our main analysis is that the employment effects of Blacks are completely reversed (rather than have no effect) according to these estimates, relative to those of Hispanic and non-Hispanic whites, during recessionary periods. During expansionary periods, non-Hispanic whites' employment outcomes are shaped by tax policy while the same does not hold true for minority groups, which is consistent with our main results. Additionally, the magnitude of the bounded estimates are attenuated when controls are included (in columns 2, 3, 5, and 6 of Table 7). Overall, the bounded estimates support our main findings that there are asymmetric effects of tax shocks on racial/ethnic minority groups, depending on the state of the business cycle, and that some of these trends may be explained by differences in job characteristics across subgroups.

6 Conclusion

Fiscal policy is often put forward by academics and policy makers alike as a fine-tuning tool. Nevertheless, there is hardly any consensus on the effects of fiscal policy on major macroeconomic variables, particularly because there is substantial cross-country variation in both the magnitude and sign of fiscal multipliers. Previous literature suggests that the timing and identification of fiscal shocks, the components of fiscal shocks and business cycle effects may all be responsible for explaining the aforementioned cross-country as well as temporal variation associated with fiscal multipliers. In this paper, we show that policymakers should also pay attention to the responsiveness of subgroups with specific demographic attributes (gender, race, and ethnicity) or job characteristics (sector, industry affiliation, and occupational status) to mitigate the effect of negative shocks on disadvantaged groups when designing and evaluating fiscal policy.

Our main results document an heterogeneous response to exogenous tax shocks during recessions and expansions and across subgroups (see Figures A1 and A2). There is also substantial heterogeneity in the magnitude and statistical significance of the effects of deploying fiscal policy instruments across gender, industry and/or sector affiliation, self-employment status, and occupational status. For example, using both macro and micro approaches, we show that relative to non- Hispanic whites, Blacks are consistently less affected by changes in tax policy during recessionary periods, while Hispanics are the most susceptible. These results are primarily driven by women although men are the most likely to be affected by tax shocks during recessions (but in a more uniform

[15] We use the recommended value of 1.3 times the R-squared term when controls are included.

way). Heterogeneity in responses across subgroups among women can be ascribed to labor market segmentation across race and ethnicity: for example, a higher share of black women employed in the public sector (which is less responsive to tax policy) and an over-representation of Hispanic women in occupations that are more sensitive to tax policy such as Sales and Services and Elementary occupations.

Meanwhile, the finding that minority groups are less responsive to aggregated tax policy shocks than non-Hispanic whites during expansionary periods can be mainly attributed to men. Moreover, in the case of both recessions and expansions, the inclusion of occupational status controls eliminates the impact of tax policy changes for all groups, highlighting the importance of the relationship between the likelihood of unemployment and tax policy changes via occupational status.

Thus, contrary to popular belief, ethnic minorities are less reachable by fiscal policy instruments and gender plays a crucial role in exacerbating the relationship between changes in fiscal policy measures and labor supply. At the aggregate level, we show that the unemployment effect in year 2 after a 1% increase in exogenous changes in the tax structure is in the range of 0-2.6 percentage points during recessionary periods, depending on the racial/ethnic subgroup. Given the results in Romer and Romer (2009) that a 1% increase in taxes reduces output by about 3%, our estimates are fairly consistent with Okun's law. Although we do not investigate transmission channels directly, when our findings are combined with those of other studies, there is suggestive evidence that the heterogeneous employment effects of fiscal policy instruments is driven by labor market segmentation along gender, race, and ethnicity lines. To understand the aforementioned variation better, future research can extend the demographic analysis used in this paper to investigate the individual level variation in other relevant variables such as consumption and savings behavior in response to fiscal policy shocks.

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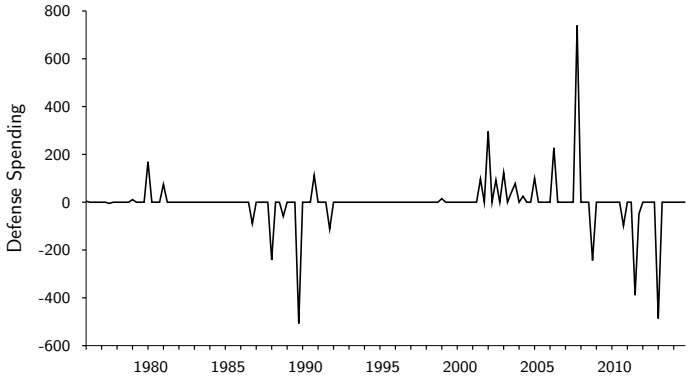
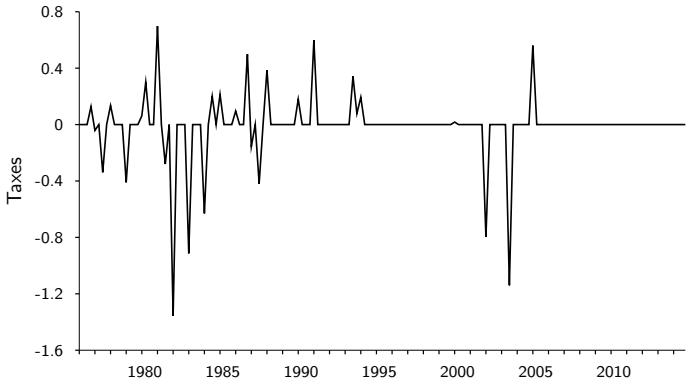


(a) Defense Spending



(b) Taxes

Figure 1: Fiscal Policy Instruments and Unemployment (1976–2014)

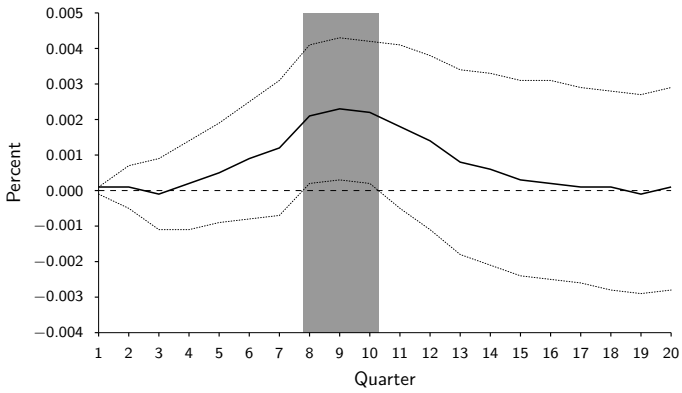
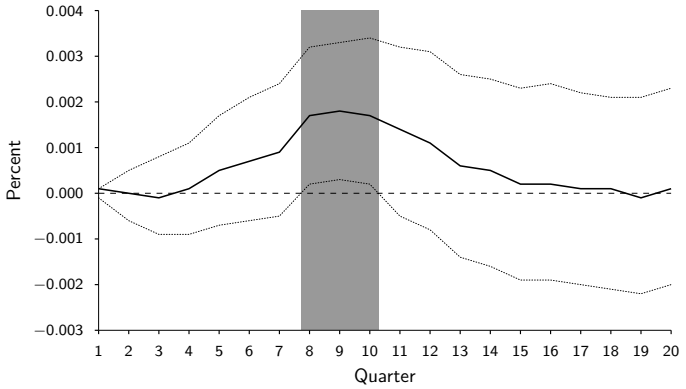
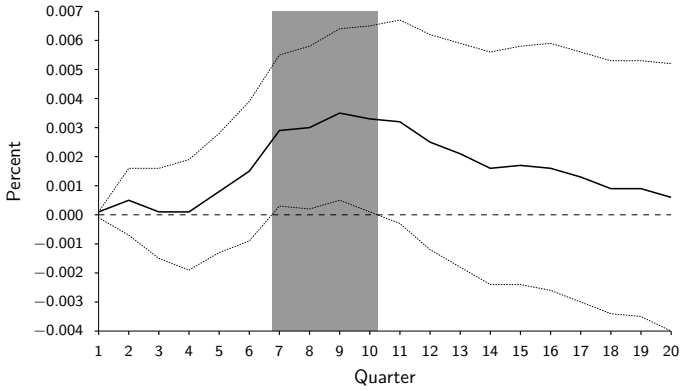


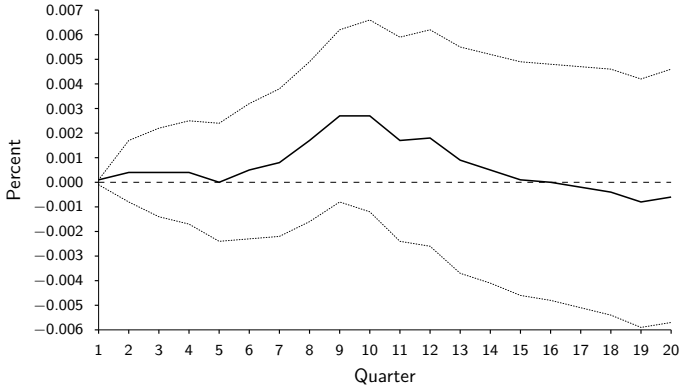
Figure 2: Impulse Response Function of Total Unemployment to Tax Shocks



(a) Non-Hispanic White



(b) Hispanic White



(c) African American

Figure 3: Impulse Response Function of Unemployment to Tax Shocks by Ethnicity

Table 1: Descriptive Statistics for Working Individuals by Gender, Race, and Ethnicity (1976–2012)

	Females			*Males*		
	Hispanic	Black	Non-Hispanic	Hispanic	Black	Non-Hispanic
Unemp Rate	0.085	0.113	0.049	0.077	0.124	0.052
Public Sector	0.147	0.242	0.178	0.083	0.178	0.126
Private Sector	0.799	0.727	0.741	0.829	0.759	0.731
Self-Employment	0.054	0.031	0.081	0.088	0.063	0.143
Agriculture	0.018	0.003	0.013	0.056	0.019	0.031
Mining	0.003	0.001	0.002	0.011	0.004	0.012
Construction	0.011	0.006	0.016	0.165	0.088	0.121
Manufacturing	0.156	0.115	0.11	0.191	0.199	0.209
Wholesale	0.193	0.146	0.198	0.183	0.166	0.179
Transportation	0.025	0.035	0.026	0.067	0.112	0.074
Information	0.014	0.022	0.018	0.013	0.018	0.019
Financial Activity	0.068	0.068	0.087	0.035	0.042	0.054
Professional/Bus	0.074	0.065	0.072	0.073	0.075	0.076
Education/Health	0.247	0.349	0.305	0.059	0.115	0.089
Hospitality	0.072	0.049	0.045	0.06	0.048	0.034
Other Services	0.086	0.072	0.066	0.056	0.051	0.052
Public Admin	0.035	0.069	0.041	0.031	0.063	0.051
Managers	0.043	0.043	0.074	0.048	0.047	0.11
Academics	0.014	0.018	0.029	0.025	0.03	0.076
Professionals	0.115	0.151	0.207	0.048	0.072	0.104
Associates/Tech	0.073	0.118	0.089	0.035	0.045	0.066
Clerical Workers	0.229	0.237	0.269	0.059	0.089	0.056
Sales & Service	0.207	0.187	0.18	0.156	0.152	0.134
Agriculture	0.006	0.001	0.001	0.013	0.002	0.006
Craft/Trades	0.008	0.008	0.01	0.11	0.062	0.088
Machine Operator	0.062	0.045	0.029	0.105	0.112	0.073
Elem Occupations	0.243	0.192	0.112	0.402	0.39	0.286

Note: CPS pooled monthly data during 1976-2012; probability weights are used to compute averages for each group.

Table 2: Unemployment Outcomes of Aggregated Tax Shocks (Romer and Romer, 2010) by Business Cycle Stage

	Recessions			Expansions		
Y=1 if Unemployed	LPM	LPM	LPM/FE	LPM	LPM	LPM/FE
Y=0 if Employed	(1)	(2)	(3)	(4)	(5)	(6)
Black	0.032***	0.055***		0.050***	0.072***	
	(0.002)	(0.005)		(0.002)	(0.004)	
Hispanic	-0.005	-0.023**		0.005	-0.012**	
	(0.003)	(0.009)		(0.003)	(0.005)	
Tax (Lag 2 years)	0.011***	0.049***	0.061***	-0.007***	-0.031***	-0.027***
	(0.001)	(0.006)	(0.006)	(0.001)	(0.004)	(0.002)
Tax*Black	-0.008	-0.021	-0.022	-0.004***	0.012**	0.014***
	(0.005)	(0.015)	(0.016)	(0.001)	(0.005)	(0.004)
Tax*Hispanic	0.005	0.049***	0.004	0.001	0.015***	0.011**
	(0.003)	(0.014)	(0.019)	(0.001)	(0.004)	(0.005)
Tax Lag 2 Years for						
Blacks (p-values)	0.531	0.050	0.003	0.000	0.000	0.001
Hispanics (p-values)	0.000	0.000	0.000	0.000	0.001	0.000
Cumulative Effect (Tax +Tax lag 1 year + Tax lag 2 years) and P-values by Group						
Overall (p-values)	0.006	0.043	0.068	-0.01	-0.02	-0.004
	(0.017)	(0.00)	(0.00)	(0.001)	(0.00)	(0.174)
Blacks (p-values)	-0.025	-0.024	-0.02	-0.01	0.007	-0.001
	(0.00)	(0.32)	(0.43)	(0.039)	(0.62)	(0.862)
Hispanics (p-values)	-0.00	0.064	0.000	0.008	0.029	0.03
	(0.88)	(0.013)	(0.98)	(0.001)	(0.005)	(0.001)
Observations	11,427,868	1,471,783	1,471,783	17,663,150	1,870,392	1,870,392
R-squared	0.038	0.016	0.004	0.035	0.019	
Number of cpsidp3			375,515			516,488

Note: The source of this data consists of the monthly waves of the Current Population Survey (CPS) during recessionary periods (1980-1983, 1990-1992, 2000-2003, and 2008-2010) in columns (1)-(3) and expansionary periods (1976-1979, 1984-1989, 1993-1999, 2004-2006, and 2011-2012) in columns (4)-(6). The table displays parameter estimates of a linear probability model where the dependent variable is 1 for an individual who is unemployed and 0 for the employed. The main independent variable of interest (reported above) is the measure for the changes in tax liabilities in Romer and Romer (2010). In columns (2), (3), (5), and (6), the sample is limited to those whose employment status (employed or unemployed) has changed; in columns (3) and (6), individual fixed effects are included. All specifications include current and lagged (1 year) changes in taxes each of which is interacted with Black and Hispanic as well as changes in defense spending and the spread (current, lagged one and two years) and those variables interacted with Black and Hispanic. Additional controls include a fourth polynomial in age, a dummy for being married, and six educational attainment dummy variables. Survey weights are used for all linear probability models that do not use individual fixed effects. Standard errors are clustered at the state level and reported in parentheses with significance denoted by ***p<0.01, **p<0.05, *p<0.1

Table 3: Heterogeneous Employment Effects of Aggregated Tax Shocks during Recessions by Gender, Industry, Sector, and Occupation

All Recessions (All Romer & Romer)	Women			Men		
Y=1 if Unemployed	LPM	LPM	LPM	LPM	LPM	LPM
Y=0 if Employed	(1)	(2)	(3)	(4)	(5)	(6)
Self Employed			-0.099***			-0.139***
			(0.006)			(0.007)
Private			0.027***			-0.000
			(0.005)			(0.004)
Tax (Lag 2 years)	0.025***	0.138***	0.016	0.064***	0.203***	0.038
	(0.008)	(0.049)	(0.037)	(0.009)	(0.052)	(0.027)
Tax*Black	-0.023	-0.022	-0.028	-0.014	-0.014	-0.036
	(0.021)	(0.021)	(0.021)	(0.022)	(0.021)	(0.022)
Tax*Hispanic	0.073**	0.070**	0.072**	0.039**	0.031*	0.021
	(0.031)	(0.030)	(0.033)	(0.017)	(0.018)	(0.017)
Tax *Self Employed			-0.138***			-0.128***
			(0.042)			(0.036)
Tax*Private			-0.015			-0.054*
			(0.031)			(0.031)
Industry Fixed Effects		X			X	
Occupation Fixed Effects			X			X
Tax Lag 2 Years for:						
Blacks (p-values)	0.929	0.031	0.783	0.020	0.001	0.962
Hispanics (p-values)	0.001	0.000	0.075	0.000	0.000	0.046
Cumulative Effect (Tax +Tax lag 1 year + Tax lag 2 years) and P-values by Group						
Overall (p-values)	0.02	0.13	0.02	0.06	0.20	0.05
	(0.2)	(0.015)	(0.67)	(0.00)	(0.00)	(0.07)
Blacks (p-values)	-0.05	-0.05	-0.05	0.00	0.00	-0.02
	(0.15)	(0.14)	(0.08)	(0.93)	(0.96)	(0.52)
Hispanics (p-values)	0.06	0.06	0.07	0.077	0.07	0.058
	(0.2)	(0.21)	(0.2)	(0.00)	(0.00)	(0.04)
Observations	615,522	615,522	591,126	789,558	789,558	733,923
R-squared	0.013	0.020	0.015	0.013	0.020	0.015

Note: The source of this data consists of the monthly waves of the Current Population Survey (CPS) during recessionary periods (1980-1983, 1990-1992, 2000-2003 and 2008-2010). For all specifications, the sample is limited to those whose employment status (employed or unemployed) has changed during the survey period. The sample is divided into women in columns (1)-(3) and men in columns (4)-(6). The table displays parameter estimates of a linear probability model where the dependent variable is 1 for an individual who is unemployed and 0 for the employed. The main independent variable of interest (reported above) is the measure for the changes in tax liabilities in Romer and Romer (2010). In columns (2) and (5), controls for sector, self-employment status and industry affiliation controls are included (see Table 1 for more information). Columns (3) and (6) include controls for occupational status for those who are not self-employed. All specifications include current and lagged (1 year) changes in taxes each of which is interacted with Black and Hispanic as well as changes in defense spending and the spread (current, lagged one and two years) and those variables interacted with Black and Hispanic. Additional controls include a fourth polynomial in age, a dummy for being married, and six educational attainment dummy variables. Survey weights are used for all specifications. Standard errors are clustered at the state level and reported in parentheses with significance denoted by ***p<0.01, **p<0.05, *p<0.1.

Table 4: Heterogeneous Employment Effects of Aggregated Tax Shocks during Expansions by Gender, Industry, Sector, and Occupation

All Expansions (All Romer & Romer)		Women			Men	
Y=1 if Unemployed	(1)	(2)	(3)	(4)	(5)	(6)
Y=0 if Employed	unemp	unemp	unemp	unemp	unemp	unemp
Self Employed			-0.095***			-0.137***
			(0.006)			(0.006)
Private			0.027***			-0.015***
			(0.004)			(0.004)
Tax (Lag 2 years)	-0.033***	-0.072***	-0.036**	-0.031***	-0.063***	-0.024
	(0.003)	(0.023)	(0.014)	(0.004)	(0.013)	(0.016)
Tax*Black	0.007	0.007	0.012*	0.020**	0.019**	0.025***
	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)
Tax*Hispanic	0.014**	0.015**	0.021***	0.021***	0.022***	0.019**
	(0.006)	(0.007)	(0.008)	(0.007)	(0.007)	(0.008)
Tax *Self Employed			0.044***			0.034**
			(0.014)			(0.014)
Tax*Private			0.020**			0.009
			(0.009)			(0.012)
Industry Fixed Effects		X			X	
Occupation Fixed Effects			X			X
Tax Lag 2 Years for:						
Blacks (p-values)	0.000	0.003	0.071	0.168	0.007	0.961
Hispanics (p-values)	0.002	0.016	0.384	0.109	0.009	0.810
Cumulative Effect (Tax +Tax lag 1 year + Tax lag 2 years) and P-values by Group						
Overall (p-values)	-0.035	-0.072	-0.03	-0.01	-0.04	0.015
	(0.00)	(0.00)	(0.04)	(0.17)	(0.01)	(0.35)
Blacks (p-values)	0.018	0.017	0.023	0.00	-0.00	-0.00
	(0.14)	(0.17)	(0.06)	(0.98)	(0.95)	(0.97)
Hispanics (p-values)	0.00	0.00	0.015	0.05	0.05	0.04
	(0.85)	(0.76)	(0.22)	(0.00)	(0.00)	(0.00)
Observations	821,289	821,289	787,386	967,258	967,258	896,392
R-squared	0.017	0.022	0.018	0.014	0.019	0.015

Note: The source of this data consists of the monthly waves of the Current Population Survey (CPS) during expansionary periods (1976-1979, 1984-1989, 1993-1999, 2004-2006, and 2011-2012) in columns(4)-(6). For all specifications, the sample is limited to those whose employment status (employed or unemployed) has changed during the survey period. The sample is divided into women in columns(1)-(3) and men in columns(4)-(6). The table displays parameter estimates of a linear probability model where the dependent variable is 1 for an individual who is unemployed and 0 for the employed. The main independent variable of interest (reported above) is the measure for the changes in tax liabilities in Romer and Romer (2010). In columns (2) and (5), controls for sector, self-employment status and industry affiliation controls are included (see Table 1 for more information). Columns (3) and (6) include controls for occupational status for those who are not self-employed. All specifications include current and lagged (1 year) changes in taxes each of which is interacted with Black and Hispanic as well as changes in defense spending and the spread (current, lagged one and two years) and those variables interacted with Black and Hispanic. Additional controls include a fourth polynomial in age, a dummy for being married, and six educational attainment dummy variables. Survey weights are used for all specifications. Standard errors are clustered at the state level and reported in parentheses with significance denoted by ***p<0.01, **p<0.05, *p<0.1.

Table 5: Unemployment Outcomes of Disaggregated Tax Shocks (Mertens and Ravn, 2013) by Business Cycle Stage

	Recessions			Expansions		
Y=1 if Unemployed	LPM	LPM	LPM/FE	LPM	LPM	LPM/FE
Y=0 if Employed	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Average Corporate Income Tax Rate (ACITR)						
Black	-0.064***	0.074**		0.025***	0.075***	
	(0.012)	(0.030)		(0.007)	(0.013)	
Hispanic	-0.071***	-0.123***		0.007	0.001	
	(0.011)	(0.026)		(0.006)	(0.015)	
Tax (Lag 2 years)/100	0.072**	0.240***	0.222*	-0.033**	-0.213***	0.297***
	(0.028)	(0.078)	(0.118)	(0.013)	(0.022)	(0.031)
Tax*Black/100	0.384***	0.229**	-0.313	0.055**	0.039	0.254***
	(0.037)	(0.102)	(0.211)	(0.022)	(0.045)	(0.073)
Tax*Hispanic/100	0.139***	0.162	-0.044	0.002	-0.054	-0.076
	(0.047)	(0.156)	(0.255)	(0.028)	(0.053)	(0.081)
Tax Lag 2 Years for:						
Blacks (p-values)	0.000	0.000	0.537	0.459	0.000	0.000
Hispanics (p-values)	0.000	0.001	0.250	0.398	0.000	0.004
Panel B: Average Personal Income Tax Rate (APITR)						
Black	0.181***	0.171**		0.192***	0.049	
	(0.037)	(0.081)		(0.039)	(0.081)	
Hispanic	0.208***	0.252***		0.039	-0.039	
	(0.025)	(0.078)		(0.024)	(0.065)	
Tax (Lag 2 years) /100	0.525***	0.096	0.005	-0.039	-0.060	0.306***
	(0.118)	(0.328)	(0.573)	(0.032)	(0.116)	(0.107)
Tax*Black/100	-0.296	-0.373	1.095	0.105	0.084	0.126
	(0.262)	(0.642)	(0.791)	(0.125)	(0.254)	(0.261)
Tax*Hispanic/100	-0.563***	-0.772	0.356	-0.216**	-0.833***	-0.498
	(0.168)	(0.610)	(0.952)	(0.082)	(0.174)	(0.313)
Tax Lag 2 Years for:						
Blacks (p-values)	0.460	0.704	0.069	0.565	0.913	0.071
Hispanics (p-values)	0.834	0.325	0.589	0.001	0.000	0.517
State/Trend/State*Trend	X	X		X	X	
Individual FE			X			X
Observations	9,095,225	1,148,756	1,148,756	15,060,255	1,555,593	1,555,593
Number of Individuals			292,488			431,430

Note: The source of this data consists of the monthly waves of the Current Population Survey (CPS). Table 5 is similar to Table 2 (see corresponding note) except the Romer and Romer measure of changes in tax liabilities is replaced with the average corporate income tax rate (ACITR) in Panel A and the average personal income tax rate (APITR) in Panel B. ACITR is the share of corporate profits allocated to taxes while APITR represents the share of personal taxable income allocated to personal income taxes and contributions for social insurance. Survey weights are used for all linear probability models that do not use individual fixed effects. Standard errors are clustered at the state level and reported in parentheses with significance denoted by ***p<0.01, **p<0.05, *p<0.1.

Table 6: Model Prediction of the Tax Cuts and Jobs Act of 2017

Estimated Cumulative Effect of ACITR/APITR by group: Table 5A/ 5B; Column(6)	Non-Hispanics	Added Effect of Blacks	Added Effect of Hispanics
ACITR	0.57 (0.00)	-0.15 (0.33)	-0.44 (0.00)
APITR	0.45 (0.098)	-0.31 (0.63)	-1.8 (0.01)
Total Effect ACITR (APITR)	(0.57, 0.45)	(0.42, 0.14)	(0.13. -1.35)
Model Prediction Using Cumulative Effect			
Category	Model prediction	Realized value	Absolute prediction error
Non-Hispanic Whites	0.57*(-7.4 pp) +0.45*(-0.8) = -4.6 pp	-0.5 pp	4.1 pp
Blacks	0.42*(-7.4 pp) +0.14*(-0.8) = -3.2 pp	-1.4 pp	1.8 pp
Hispanics	0.13*(-7.4 pp) -1.4*(-0.8) = 0.16 pp	-0.6 pp	0.8 pp
Model Prediction Using only Coefficients from Lag 2 Years			
Non-Hispanic Whites	0.3*(-7.4 pp) +0.31*(-0.8) = -2.5 pp	-0.5 pp	2 pp
Blacks	0.55*(-7.4 pp) +0.43*(-0.8) = -4.4 pp	-1.4 pp	3 pp
Hispanics	0.22*(-7.4 pp) -0.19*(-0.8) = - 1.5 pp	-0.6 pp	1 pp

Table 7: Panel A: Recessions (Estimates Correspond to Those in Table 3)

Panel A: Recessions (Estimates Correspond to Those in Table 3)						
Y=1 if Unemployed	(1)	(2)	(3)	(4)	(5)	(6)
Taxes Lag 2 Years	−0.009	0.046	0.058	0.045	0.067	0.087
• Interact w/ Black	−0.165	−0.146	−0.171	−0.145	−0.151	−0.174
• Interact w/ Hispanic	0.025	0.025	0.025	0.026	0.011	−0.004
Observations	615,522	615,522	591,126	789,558	789,558	733,923
Panel B: Expansions (Estimates Correspond to Those in Table 4)						
Taxes Lag 2 Years	−0.045	−0.012	−0.009	−0.047	−0.003	−0.006
• Interact w/ Black	0.033	0.04	0.028	0.048	0.045	0.056
• Interact w/ Hispanic	0.026	0.031	0.029	0.028	0.03	0.026
Industry Affiliation Controls		X			X	
Occupation Status Controls			X			X
State/Trend/State*Trend	X	X	X	X	X	X
Observations	821,289	821,289	787,386	967,258	967,258	896,392

Note: Panels A and B produce selection bias bounded coefficients for the parameter of interest and correspond to estimates in Tables 3 and 4 respectively where specifications vary depending on the controls used. CPS monthly data during expansionary periods; specifically, years 1976–1979, 1984–1989, 1993–1999, 2004–2007, and 2011–2012. Note: CPS monthly data during recessionary periods; specifically, years 1980–1983, 1990–1992, 2000–2003 and 2008–2010. The dependent variable is 1 for the unemployed and 0 for the employed.