Title: Income inequality, unemployment, and government transfer: what does their dynamics tell us

Haydory A. Ahmed (⇌ hahmed2@stedwards.edu)
St. Edward’s University

Hedieh Shadmani
Fairfield University

Research Article

Keywords: income inequality, male and female unemployment rates, government transfer, structural VAR model, impulse response, and variance decomposition

Posted Date: May 25th, 2023

DOI: https://doi.org/10.21203/rs.3.rs-2953489/v1

License: ☕️ This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License
Abstract

In this research, we explore the dynamics among measures of income inequality in the United States, male and female unemployment rates, and growth in government transfer using time series data. This research adopts a macro-econometric approach using a structural VAR model. Our structural impulse responses find growth in government transfer increases unemployment rates for both males and females. Female income inequality declines with increased government transfer. When the female income ratio rises, we observe the government transfer outlays fall over the forecast horizon. Variance decomposition finds that growth in government transfers is impacted by the male unemployment rate relatively more than the female unemployment rate. This research, therefore, suggests gender-specific government transfers to reduce income inequality. This, in effect, may reduce government transfer outlays over time.

JEL code: C32, D63, E24, I38, J16

Highlights

- This research analyzes the dynamics among two separate measures of income inequality, unemployment rates and growth in government transfer in the United States.
- We use structural VAR model to compute the impulse responses and variance decomposition to evaluate the dynamics.
- We estimate the model three separate models to check for robustness.

Introduction

We are observing increasing income inequality in the United States over the past four decades as the rich are getting richer. The share of income going to the wealthiest 10 percent of the population increased from 34 percent of total earnings in 1970 to 46 percent in 2020, a level of income inequality not witnessed since before the Great Depression (see Saez 2015). As per the Congressional Budget Office (2019), average income before transfers and taxes more than doubled for households in the highest quintile between 1979 and 2019. It grew faster among households at the very top of the income distribution than among others in that quintile. Income for poor and middle-income Americans have barely changed since the 1980s and, adjusted for inflation, has declined since 2000 (see Bor et al. 2017). This continual expansion in income inequality since 1980 has caused concern among members of the public, researchers, policymakers, and politicians. Income distribution in the United States is heavily weighted toward the top, even among the richest 20 percent of the population. After taxes, the average income of the top 1 percent is $1.4 million, almost five times that of the next 4 percent.

We can find a consensus on the rising trend in income inequality in the United States, but the factors causing this rising trend and the policy remedies to reverse this trend remain contentious among policymakers and researchers. In theory, policymakers can address rising income inequality using welfare
policy tools—such as taxes and transfer payments. In practice, however, the income redistribution effect of these policy tools depends on the size, mix, and progressivity of each component as well as other economic factors (see for example, Betson and Haveman. 1984; Higgins and Lustig, 2016; Joumard et al., 2013). Governments, around the world, implement various types of in-cash and/or in-kind transfer programs under the social safety net program to help low-income or poverty-stricken families. In the United States, government transfer payments to persons include the Social Security, Medicare, Medicaid, Affordable Care Act, Unemployment Insurance (UI), Supplemental Nutrition Assistance Program (SNAP), and other forms of income supplement programs to support low-income households. Poorer households benefit from these income support programs, although, we observe variation in eligibility and coverage across the states. These transfer payment programs along with their qualifying criteria require the recipients to search for jobs actively or maintain their employment status.

Existing literature ties rising income inequality to several factors. These include technological change and creative destruction, globalization and trade, the decline of unions, and the demographic differences in the labor force such as education, experience, occupation, gender, and marital status. For example, Lemieux (2006), Goldin and Katz (2007), and Autor (2014) emphasize changes in returns to education as a factor. Atkinson (1997) and Acemoglu and Autor (2011) discuss the evolution of skills, tasks, and technologies as important determinants of income inequality. Hoffmann et al. (2020), Acemoglu and Autor (2011), and Autor (2019) are among the large literature showing that changes in the demand for different tasks have contributed to the evolution of wage distribution over time. Fortin, Lemieux, and Lloyd (2021) argue that the decline of labor market institutions such as the union contributes toward rising income equality. Esping-Andersen (2007), Schwartz (2010), and Greenwood et al. (2014) focus on the link between assortative marriage and household income inequality. The aforementioned research uses a micro-econometric approach in analyzing their research question.

Why income inequality is important and what should be done about it? As per Keynes (1936), a reduction in income inequality enhances economic growth, and with appropriate economic policies full employment could be achieved. A large body of work focuses on the importance of tackling income inequality and emphasizes the redistributing effect of welfare policies. Kumhof and Rencière (2010), Ostry (2015), and Stiglitz (2015) suggest that restoring equality by redistributing income could save the global economy from another major crisis. McCombie and Spreafco (2015) and Cynamon and Fazzari (2016) show relevant empirical evidence that greater inequality has been a barrier to economic growth and employment in the United States. Arestis (2018) argues that economic policy initiatives to produce a more equal distribution of income become urgent and there should be coordination of fiscal and monetary policies along with financial stability. Not only would such policies reduce income inequality but would also contribute to the increase of the level of economic activity. These studies adopt a macro-econometric approach with a focus on economic growth and its impact on income redistribution.

While this research acknowledges these aspects, it endeavors to address income inequality from a different perspective. Achieving maximum employment and reducing income inequality are key elements of governments’ objectives. Policymakers actively use stabilization policies to achieve these objectives.
Government transfer is a policy variable, which may grow with business cycle fluctuations. As discussed above, the effect of transfer payments on income inequality and the link between inequality and the unemployment rate have been studied in previous literature both theoretically and empirically. From a macroeconomic perspective, however, unemployment rates, growth in aggregate government transfer, and dispersion in households' earnings may impact each other contemporaneously or subsequently. These associations may influence the redistributing effect of welfare policy, particularly transfer payments.

This research envisages providing more details on the dynamic links among a measure of income inequality, unemployment rates, and growth in transfer payments to develop further insight. In particular, we analyze the dynamics of a measure of income inequality to growth in government transfer to persons and unemployment rates for males and females. To this end, we will use time series data analysis in a structural vector auto-regression framework to compute the impulse responses and variance decomposition tools to evaluate these dynamics. We use annual time series data on two measures of income inequality, including the income share ratio between the top 10 percent to bottom 50 percent and top 10 percent to bottom 20 percent of income earners in the United States, unemployment rate for males, unemployment rate for females, and growth in government transfer to persons from 1962 to 2019. We estimate three variations of SVAR model and find several important and interesting results. The results from structural impulse responses show that a shock to growth in government transfer increases unemployment rates for males and females across all three models. This finding conforms to earlier work that shows that government transfers disincentives employment in the labor market (see for example, Ahmed (2022)). Variance decomposition analysis also echoes similar findings. The variance in the growth in government transfer can be explained by male unemployment rate twice as more as the female unemployment rate. A shock to the male unemployment rate increases income inequality, albeit briefly, but a shock to the female unemployment rate reduces income inequality. A shock to the female income ratio lowers income inequality for males and females. Perhaps the associative marriage hypothesis plays an important role in this regard (For example, Greenwood et al. (2014)). We observe that a shock to growth in government transfer reduces income inequality among females. A shock to female income ratio reduces growth in government transfer on impact but then it rises over the forecast horizon. When we analyze the variance decomposition for growth in government transfer, we find female income ratio and the unemployment rates explain a lot of variation in government transfer. This set of findings is indicative of a gender-specific variation. Perhaps, increased government transfer reduces poverty by reducing income inequality among female-headed households. Also, it is noteworthy that increased unemployment in the labor market significantly increases government transfer. Therefore, a gender-directed government transfer may improve social outcomes, and over time reduce government outlays on transfer.

The rest of the paper is organized as follows: Section 2 describes the data and the time series used in the empirical analysis. Section 3 discusses the methodology. Section 4 discusses the empirical results, and section 5 concludes.
Section 2

Data:

This research explores the dynamics among measures of income inequality, unemployment rates for males and females, and growth in government transfer to persons. We use annual data in some measures of income inequality in the United States. The figures below show the plots of the data used in this paper. We employ three separate estimations to develop objective insight into their dynamics. We use annual time series data on the income share ratio between the top 10 percent to bottom 50 percent and the top 10 percent to bottom 20 percent of income earners in the United States (henceforth income ratio) as a measure of income inequality, unemployment rates for male and female, and growth in government transfer to persons from 1962 to 2019. The data on unemployment rates and aggregate government transfer to persons in the United States are collected from the Federal Reserve Bank of St. Louis electronic database, popularly known as the Fred database. We have monthly frequencies available for the unemployment rates and government transfer to persons. The income inequality measures are obtained from the World Inequality Database (WID). This project creates these measures of income inequality using the Distributional National Accounts guidelines. However, the measures of income inequality are available on an annual frequency. Hence, we had to construct the dataset using annual frequency for the subsequent empirical analysis.

In the first structural VAR model, we use the ratio of income earned by the top 10 percent to the bottom 50 percent as the measure of income inequality, unemployment rates for males and females, and growth in government transfer to persons. Our second estimation uses the ratio of income earned by the top 10 percent to the bottom 20 percent as the measure of income inequality, the unemployment rate for males and females, and growth in government transfer to persons. Our final estimation uses five variables that include ratios of income earned by the top 10 percent to the bottom 50 percent as the measure of income inequality for males and females, unemployment rates for males and females, and finally growth in government transfer to persons. Three separate estimations will arguably provide more robust evidence to understand the dynamics among these variables to develop valuable insights.

Figure 1 above indicates that income inequality is more profound between the top 10 percent to the bottom 20 percent compared to the ratio of income earned by the top 10 percent to the bottom 50 percent. But the measure of the top 10 percent to the bottom 50 percent covers the largest income group and a larger fraction of the total population. Figure 3 shows the male and female variations in income inequality for the top 10 percent to the bottom 50 percent. We observe a larger variation for males compared to females. Figure 2 depicts the variation in the growth in government transfer in the United States. Figures 4 and 5 depict the unemployment rates in aggregate and among the male and female variations.

Section 3

Methodology:
This research studies the dynamics among income inequality, unemployment rates, and government transfer using a time series dataset. The structural vector auto-regression model is a simple yet useful vehicle to obtain the impulse responses and variance decompositions which enables us to analyze the dynamic relationship among the variables in the estimated models in an objective manner. We estimate three separate specifications in this research. Our first specification includes the ratio of income earned by the top 10 percent to the bottom 50 percent, unemployment rates for males and females, and finally growth in government transfer. To ensure robustness, our second specification includes the ratio of income earned by the top 10 percent to the bottom 20 percent, unemployment rates for males and females, and finally growth in government transfer. Our final estimation includes ratios of income earned by the top 10 percent to the bottom 50 percent for male and female disaggregates, unemployment rates for male and female disaggregates, and finally the growth in government transfer.

It is very common to use the structural vector auto-regression model in macro-econometrics in analysis using aggregates in a time series framework. We can find a plethora of articles that use this approach, and to develop further insight one can refer to Breitung (2001). The empirical approach in this paper follows Breitung (2001) and Ahmed et al (2022). We estimate a structural vector autoregression (henceforth SVAR) model to derive the impulse responses and variance decomposition to understand their dynamics. We can define a vector autoregression model in the reduced form as follows:

\[ Z_t = A_1 Z_{t-1} + A_2 Z_{t-2} + \cdots + A_p Z_{t-p} + \epsilon_t \]

1

where \( Z_t \) is a \( 4 \times 1 \) vector of time series observations for a measure of income inequality, the unemployment rate for males, the unemployment rate for females, and growth in government transfer to person. For simplicity, we leave out constants, time trends, and seasonal trends. \( A_1, A_2, \ldots, A_p \) are the coefficient matrices for the lagged dependent variables. Eq. (1) is known as the reduced form of the system, and associated with this reduced form model is a structural model given by:

\[ Be_t \equiv R\epsilon_t \]

2

The B and R represent matrices that are assumed to be invertible. \( \epsilon_t \) is an \( (N \times 1) \) vector of structural shocks with a covariance matrix \( E(\epsilon_t\epsilon_t^T) = \Omega \). As per Breitung (2001), this representation is the most general model considered in Amisano and Giannini (1997). The SVAR model can be written as Eq. (3), where \( \epsilon_t = B^{-1}R\epsilon_t \).

\[ BZ_t = A_1^* Z_{t-1} + A_2^* Z_{t-2} + \cdots + A_p^* Z_{t-p} + R\epsilon_t \]

3
\( A_i^* \) for \( i = 1, 2, \ldots, p \) are structural coefficients that differ in general from their reduced form counterparts.

The dynamic effect of the structural shock is analyzed using the following moving average representation:

\[
Z_t = e_t + \theta_1 e_{t-1} + \theta_2 e_{t-2} + \ldots.
\]

\[
Z_t = \theta(L) e_t
\]

\[
Z_t = B^{-1} R e_t + \theta_1 B^{-1} R e_{t-1} + \theta_2 B^{-1} R e_{t-2} + \ldots.
\]

\[
Z_t = \Phi(L) e_t
\]

The \((i, j)\)'th element of the matrix \( \Phi_h \) measures the impact of a shock from the \( j \)'th variable on the \( i \)'th variable \( h \) periods ahead. We can use a number of approaches to identify the structural shocks in the vector auto-regression. In this research, we apply the recursive identification scheme to identify the structural shocks in the system.

We arrange the variables in the following order for the recursive identification scheme to obtain the structural shocks in the SVAR model. We argue that the ratio of income earned by the top 10 percent to the bottom 50 (and the ratio of income earned by the top 10 percent to the bottom 20 percent as well) percent is determined by factors such as productivity, education, experience, and occupation amongst other things. The unemployment rates for males and females, and growth in government transfer to a person do not impact income inequality contemporaneously. Therefore, we place the income inequality ratio first, followed by the unemployment rates, and the growth in government transfer. We argue that the unemployment rates are not contemporaneously impacted by the income ratio and the growth in government transfer. We order the male unemployment rate before the female unemployment rate and also argue that the female unemployment rate may be contemporaneously impacted by the male unemployment rate. We can find a plethora of research related to the concept of “tied migrants” that links male employment to female unemployment. For example, Boyle et al (2001) find that women who migrate long distance with their partners are most likely to be unemployed analyzing the labor markets in the United States and Great Britain. Clark and Withers (2002) examine the impact of mobility on the labor-force participation status of two-earner households in the United States in a longitudinal context. Similar to Boyle et al (2001), this research also finds that female labor force participation drops with migration. The growth in government transfer payment to persons is placed last in the ordering as we argue that transfer payment can be contemporaneously impacted by the income ratio and unemployment rate. We argue that policymakers may increase government allocation to government transfer by observing the inequality and unemployment scenario in the economy. The following equation describes the identification of the structural shocks in a succinct manner:
We use the above-mentioned identification scheme for the structural shocks that are used to obtain the impulse responses and variance decomposition for estimation 1 and estimation 2. In our third estimation, we estimate a five-variable model and employ the following identification scheme.

\[
\begin{bmatrix}
\epsilon_{\text{incineq}} \\
\epsilon_{\text{unemratemale}} \\
\epsilon_{\text{unemratefemale}} \\
\epsilon_{\text{govtrans}} \\
\end{bmatrix} =
\begin{bmatrix}
1 & 0 & 0 & 0 & 0 \\
0 & 1 & 0 & 0 & 0 \\
0 & \theta_{32} & 1 & 0 & 0 \\
\theta_{41} & \theta_{42} & \theta_{43} & 1 & 0 \\
\end{bmatrix}
\times
\begin{bmatrix}
\epsilon_{\text{incineq}} \\
\epsilon_{\text{unemratemale}} \\
\epsilon_{\text{unemratefemale}} \\
\epsilon_{\text{govtrans}} \\
\end{bmatrix}
\]

(4)

We argue that the ratio of the top 10 percent of income to the bottom 50 percent of income is determined by factors such as productivity, education, experience, and occupation amongst other things. The other variables, for example, the unemployment rates for males and females, and growth in government transfer to a person do not impact income inequality contemporaneously. Therefore, the income inequality ratios for males and females are placed first and second respectively, followed by the male and female unemployment rates respectively. We argue that the income inequality among males and females does not impact each other contemporaneously. Also, unemployment rates are not contemporaneously impacted by income inequality measures and the growth in government transfer. We place the unemployment rate for males in the third in our system followed by the female unemployment rate. We claim that the male unemployment rate may impact the female unemployment rate contemporaneously for family reasons following Boyle et al. (2001) and Clark and Withers (2002). Growth in government transfer payment to persons is placed last as we argue that transfer payment can be contemporaneously impacted by income inequality measures and unemployment rates. We argue that policymakers may increase government allocation by observing the inequality and unemployment scenario in the economy.

We use the above-mentioned identification scheme to obtain the impulse responses and variance decomposition. These impulse responses and variance decompositions allow us to objectively analyze their dynamics over the selected forecast horizon. We can find a plethora of research that employs this empirical approach, and for the purpose of brevity, we do not discuss the impulse responses and variance decomposition in detail. We use the Akaike and Bayesian criteria for selecting the optimum lag length in our estimated SVAR model. We check for roots if they are within the unit circle for the stability of the
estimated model. These tools, especially the roots, ensure that the estimated model is stationary as a system. Therefore, the impulse responses and variance decomposition are stable as well.

Section 4

Empirical Result:

We present the estimation results and analysis in this section. We start with the first estimation, followed by the second one, and finally the third estimation. This SVAR estimation includes three variables: income ratio of the top 10 percent to the bottom 50 percent, unemployment rates, and growth in government transfer. The sample uses annual data from 1962 to 2019. We maintain this ordering for the recursive identification of the structural shocks in the model described in the methodology section.

Table 1: Roots of the estimated 4 variable models

<table>
<thead>
<tr>
<th></th>
<th>Estimation 1</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.9980826</td>
<td>0.7557300</td>
<td>0.7557300</td>
</tr>
<tr>
<td></td>
<td>Estimation 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.9948219</td>
<td>0.7632764</td>
<td>0.7632764</td>
</tr>
<tr>
<td></td>
<td>Estimation 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.9839498</td>
<td>0.8860955</td>
<td>0.7389520</td>
</tr>
</tbody>
</table>

The estimated roots for all three models indicate that the roots are within the unit circle. This implies that the estimated models are stationary as a system, thereby our impulses are stable.

Estimation 1 Impulse Responses:

Impulse responses from the structural VAR estimation 1 are presented below. Figure 6 below shows the impulse responses from a shock to the ratio of income earned by the top 10 percent to the bottom 50 percent. An increase in income earned by the top 10 percent to the bottom 50 percent does not impact the male unemployment rate in the United States. We do observe a small decline in female unemployment rate which are significant from year 4 and onwards. Perhaps the female workforce engages in the labor market to aid gross family income. The impulse responses indicate that a shock to the income ratio does not impact the growth in government transfer to persons in a statistically significant manner.

Figure 7 depicts the impulse responses from a shock to the male unemployment rate. The ratio of income earned by the top 10 percent to the bottom 50 percent depicts a rising trend and is statistically significant. These results are plausible as more and more males become unemployed, this should increase income inequality. We observe the female unemployment rate increase as well. This is perhaps because of the overall labor market conditions in the economy. Both males and female unemployment rates respond to a common labor market condition. Growth in government transfer shows an increase on impact and remains high for about a year and then starts to decline, which is statistically significant. Policymakers increase government allocation of transfer payments to households to address rising unemployment in
the economy. However, the growth in government transfer is not permanent, as it declines over the forecast horizon. This is also plausible because policymakers often cut spending on government transfer to disincentivize and/or discourage voluntary unemployment.

Figure 8 depicts the impulse responses from a shock to the female unemployment rate. The ratio of income earned by the top 10 percent to the bottom 50 percent depicts a declining trend and is statistically significant. These results are akin to Greenwood et al (2014) who argue that assertive mating between males and females can explain rising income inequality in the United States. Our results indicate that the female unemployment lowers income inequality as rising female unemployment may reduce gross-family income, thereby reducing income inequality. A shock to female unemployment rate does not impact the male unemployment rate and the growth in government transfers.

Figure 9 depicts the impulse response from a shock to growth in government transfer to persons. This shock does not have any significant impact on income inequality. But an increase in government transfer does increase the male and female unemployment rates. Both these unemployment rates remain high for about two years in the forecast horizon. These findings are akin to Johnston and Mas (2018) and Ahmed (2022). Perhaps an increase in government transfer disincentivizes the labor supply.

**Estimation 2 Impulse Responses:**

Impulse responses from the structural VAR estimation 2 are presented below. These findings are similar to our first estimation presented between Figs. 6 to 9 with a shock to the income ratio for the top 10 percent to the bottom 50 percent. Figure 10 shows the impulse responses from a shock to the ratio of income earned by the top 10 percent to the bottom 20 percent. An increase in income earned by the top 10 percent to the bottom 20 percent does not impact the male unemployment rate in the United States. We do observe a small decline in female unemployment rate which are significant from year 4 and onwards. Perhaps the female workforce engages in the labor market to aid gross family income. The impulse responses indicate that a shock to the income ratio does not impact the growth in government transfer to persons in a statistically significant manner.

Figure 11 depicts the impulse responses from a shock to the male unemployment rate. The ratio of income earned by the top 10 percent to the bottom 20 percent depicts a rising trend and is statistically significant. These results are plausible as more and more males become unemployed, this should increase income inequality. We observe the female unemployment rate increase as well. This is perhaps because of the overall labor market conditions in the economy. Both males and female unemployment rates respond to a common labor market condition. Growth in government transfer shows an increase on impact and remains high for about a year and then starts to decline, which is statistically significant. Policymakers increase government allocation of transfer payments to households to address rising unemployment in the economy. However, the growth in government transfer is not permanent, as it declines over the forecast horizon. This is also plausible because policymakers often cut spending on government transfer to disincentivize and/or discourage voluntary unemployment.
Figure 12 depicts the impulse responses from a shock to the female unemployment rate. The ratio of income earned by the top 10 percent to the bottom 20 percent shows a declining trend and is statistically significant. These results are akin to Greenwood et al (2014) who argue that assertive mating between males and females can explain rising income inequality in the United States. Our results indicate that the female unemployment lowers income inequality as rising female unemployment may reduce gross-family income, thereby reducing income inequality. A shock to female unemployment rate does not impact the male unemployment rate and the growth in government transfers.

Figure 13 shows the impulse response from a shock to growth in government transfer to persons. This shock does not have any significant impact on income inequality. But an increase in government transfer does increase the male and female unemployment rates. Both these unemployment rates remain high for about two years in the forecast horizon. These findings are akin to Johnston and Mas (2018) and Ahmed (2022). Perhaps an increase in government transfer disincentivizes the labor supply.

**Estimation 3 Impulse Responses:**

We present the impulse responses from our third estimation with disaggregated measures of income inequality and unemployment rates. Figure 14 shows the impulses from a shock to the ratio of income earned by the top 10 percent to the bottom 50 percent for males. This does not have any significant impact on the variables except for the growth in government transfer to persons. Growth in government transfer depicts a decline, albeit briefly between years 1 and 2 of the forecast horizon.

Figure 15 shows the impulses from a shock to the ratio of income earned by the top 10 percent to the bottom 50 percent for females. We observe a statistically significant impact on all the variables in the system. We observe a decline in income inequality among males and the unemployment rates that are statistically significant. The ratio of income earned by the top 10 percent to the bottom 50 percent of males decline over the forecast horizon. Both the unemployment rates decline but return to their initial levels at the end of the forecast horizon, and they are statistically significant up to about 5 years, halfway through the forecast horizon. Growth in government transfer initially depicts a decline but rises after about three years and remains at the same level over the forecast horizon. These impulse responses are significant. A rise in income inequality among females also raising government transfer is perhaps expected. The female-headed households may need government support to sustain their livelihood.

Figure 16 presents the impulse responses from a shock to the unemployment rate for males. We observe a statistically significant increase in the female unemployment rate for about two years, and then it declines. The shock to the male unemployment rate increasing the female unemployment rate may reflect the general labor market conditions, especially during economic downturns. Growth in government transfer initially depicts a statistically significant increase, on impact for a year and then it declines up to year four. This again may reflect the policymaker’s preference to support families in need with required income support. At the same time, they reduce it over some period to disincentivize or discourage voluntary unemployment.
Figure 17 presents the impulse responses from a shock to the unemployment rate for females. We observe a statistically significant decline in the ratio of income earned by the top 10 percent to the bottom 50 percent for males, and the ratio of income earned by the top 10 percent to the bottom 50 percent for females also depicts a statistically significant decline between the years four and seven. These results are interesting because these findings indicate that an increase in female unemployment reduces income inequality. This is perhaps indicative of a gender dimension to rising income inequality in the United States. We are observing a rising trend in female labor force participation but a declining trend for males in the United States. Therefore, it is plausible that family income is higher for households where both husband and wife are working. So, when the women in these families lose their jobs, their overall incomes decline resulting in a fall in income inequality. We can find a plethora of research that links income inequality to marital choices such as Esping-Andersen (2007, 2009), Schwartz (2010), and Greenwood et al. (2014). Response from the growth in government transfer is statistically insignificant.

Figure 18 presents the impulse responses from a shock to growth in government transfer. We observe a statistically significant decline in the ratio of income earned by the top 10 percent to the bottom 50 percent for females up to year 3 in the forecast horizon. Beyond this point, it rises but it is not statistically significant. It is once again interesting that growth in government transfer reduces income inequality among females. This is perhaps indicative of a growing need for income-support programs for female-headed households. Drejerska et al (2023) provide a detailed analysis exploring the linkage between transfer and female labor supply. There are studies that finds positive relationship between government transfer leading to increased female labor force participation (for example, Ennser-Jedenastik (2017) and Ahmed (2022)). One aspect that is highlighted in the literature is the availability of government supported subsidy for childcare that is available for working mothers (Ennser-Jedenastik, 2017). The unemployment rates for males and females rise in a statistically significant manner for about three years in the forecast horizon. We observe both unemployment rates to depict a similar dynamic over the forecast horizon. It is plausible that an increase in government transfer increases unemployment rates consistent with other micro-econometric and macro-econometric studies. Arguably, government transfer creates an incentive to remain unemployed both for males and females. Overall, these findings are indicative of a potential tradeoff facing the policymakers – increasing resources for transfer may reduce income inequality among females at the cost of rising voluntary unemployment.

**Estimation 3 Variance Decomposition**

We present the forecast error variance decomposition for the estimation from model three. Table 2 presents the variance decomposition of the ratio of income earned by the top 10 percent to the bottom 50 percent for the males. In year 1, 100 percent of its variation can be explained by its own innovation. But the impact seems to fall over the forecast horizon, as the explained variation drops below 50 percent from year 7 onwards. The shock in the income ratio for females and growth in government transfer can explain very little variation in the income ratio for males. The unemployment rate for males can similarly explain very little variation in income ratio for males. Interestingly, female unemployment rate has a larger impact on the ratio of income for male. Though it does not impact the income ratio for males in the first
year, the impact grows significantly over the forecast horizon from 5.8 percent in year 2, to 15.9 percent in period 3, 26.3 percent in year 4 and so forth. By year 10, in the forecast horizon, this shock can explain more than 53 percent of variation in the income ratio in male. This finding is perhaps indicative of some influence of the associative marriage hypothesis as evident in Andersen (2007), Schwartz (2010), and Greenwood et al. (2014). Arguably, in family where both husband and wife are working, an increase in female unemployment (or employment) will impact total household income. Perhaps, the male household member may also become unemployed along with the female partner or the male partner may increase labor supply to compensate for the total loss in family income.

Table 2 presents the variance decomposition of the income earned by the top 10 percent to the bottom 50 percent by the females (income ratio for females, henceforth). It can explain 100 percent of its variation in year 1, followed by 94 percent in year 2 of the forecast horizon. But the impact seems to significantly fall over the forecast horizon, as the explained variation drops below 50 percent from year 5 onwards. The shocks to the income ratio for males and growth in government transfer can explain very little variation in the income ratio for females. The shock to male unemployment rate can explain variation in the ratio of income for females around 4.6 percent in year 3, 9.7 percent in year 4, 13.09 percent in year 5, and reaches a maximum of 14.77 percent in year 7. Beyond this point, it drops albeit very small in magnitude. This finding is consistent with the associative marriage hypothesis (Greenwood et al, 2014). As expected, we observe that female unemployment rate can explain a larger fraction of the variation in the income ratio for females over the forecast horizon. Although it can explain 0 variations on
impact and explains only 4 percent in year 2, its increases sharply afterward in the forecast horizon. In year 3 it rises to 15.40 percent followed by 27.94 percent in year 4, 39.08 percent in year 5. By year 10 of the forecast horizon, this shock can explain about 66 percent variation.

Table 3

VDC of income earned by top 10 percent to bottom 50 percent females (income ratio for females).

<table>
<thead>
<tr>
<th>Income ratio male</th>
<th>Income ratio female</th>
<th>Unemployment rate male</th>
<th>Unemployment rate female</th>
<th>Growth in Gov transfer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 0.0000</td>
<td>1.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>2 0.0019</td>
<td>0.9422</td>
<td>0.0056</td>
<td>0.0477</td>
<td>0.0027</td>
</tr>
<tr>
<td>3 0.0033</td>
<td>0.7932</td>
<td>0.0465</td>
<td>0.1540</td>
<td>0.0029</td>
</tr>
<tr>
<td>4 0.0042</td>
<td>0.6168</td>
<td>0.0973</td>
<td>0.2794</td>
<td>0.0022</td>
</tr>
<tr>
<td>5 0.0048</td>
<td>0.4719</td>
<td>0.1309</td>
<td>0.3908</td>
<td>0.0016</td>
</tr>
<tr>
<td>6 0.0053</td>
<td>0.3689</td>
<td>0.1454</td>
<td>0.4792</td>
<td>0.0012</td>
</tr>
<tr>
<td>7 0.0057</td>
<td>0.2986</td>
<td>0.1477</td>
<td>0.5472</td>
<td>0.0009</td>
</tr>
<tr>
<td>8 0.0059</td>
<td>0.2505</td>
<td>0.1438</td>
<td>0.5991</td>
<td>0.0007</td>
</tr>
<tr>
<td>9 0.0060</td>
<td>0.2171</td>
<td>0.1373</td>
<td>0.6389</td>
<td>0.0006</td>
</tr>
<tr>
<td>10 0.0061</td>
<td>0.1934</td>
<td>0.1304</td>
<td>0.6696</td>
<td>0.0006</td>
</tr>
</tbody>
</table>

Table 4 presents the variance decomposition for the male unemployment rate. It can explain 100 percent of its variation in year 1, followed by 91 percent in year 2 of the forecast horizon. But the impact seems to fall over the forecast horizon. We can find a similar pattern for a shock to the unemployment rate for females. Arguably, both these labor market indicators depict the same labor market dynamics. Therefore, we will observe a similar pattern. Male income ratio and growth in government transfer can explain very little variance in the unemployment rate for males. Income ratio for females seems to explain some variance in unemployment rate for males in a monotonically increasing manner over the forecast horizon. For example, 1.8 percent in year 2, 3.58 percent in year 3, 5.23 percent in year 4, and so forth.

Table 5 presents the variance decomposition for unemployment rate for females. In year 1, 76 percent of its variation can be explained by its own innovation, this impact drops to 53.44 percent in year 5, stays persistent for couple years, and then increases to 60 percent in year 10 over the forecast horizon. It depicts a u-shaped, but interestingly it depicts an inversely u-shaped pattern for a shock to the unemployment rate for males. The shock to the unemployment rate for males can explain 23.68 percent of variation on the unemployment rate for females in year 1 and keep rising reaching at 41.63 percent in year 4. Then, the variance starts to decline reaching 31.82 percent in year 10. Both these indicators refer to the same labor market. The u-shaped variation may arise due to the associative marriage hypothesis.
A shock to the growth in government transfer can explain very little variance in the unemployment rate for females. Shocks to the ratio of income earned by the top 10 percent to bottom 50 percent for males as well as the females can explain very small variance in the unemployment rate for females. Over the forecast horizon, we find around 3 percent and 4 percent for the unemployment rate for female can be explained by the income ratio for male and females.

<table>
<thead>
<tr>
<th>Table 4</th>
<th>VDC of unemployment rate male</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Income ratio male</td>
</tr>
<tr>
<td>1</td>
<td>0.0000</td>
</tr>
<tr>
<td>2</td>
<td>0.0002</td>
</tr>
<tr>
<td>3</td>
<td>0.0013</td>
</tr>
<tr>
<td>4</td>
<td>0.0031</td>
</tr>
<tr>
<td>5</td>
<td>0.0050</td>
</tr>
<tr>
<td>6</td>
<td>0.0065</td>
</tr>
<tr>
<td>7</td>
<td>0.0073</td>
</tr>
<tr>
<td>8</td>
<td>0.0076</td>
</tr>
<tr>
<td>9</td>
<td>0.0075</td>
</tr>
<tr>
<td>10</td>
<td>0.0072</td>
</tr>
</tbody>
</table>

Table 6 presents the variance decomposition of the growth in government transfer. It is interesting that the shock to this variable can explain very little of its own variation in a monotonically decreasing manner over the forecast horizon. It can explain 7.8 percent in year 1, 5.74 percent in year 5, and 5.38 percent in year 10. We can observe that about 1 percent of the variations in the growth in transfer can be explained by the income ratio for males over the forecast horizon, while the scenario is different for a shock to the income ratio for females. This shock can explain 12.60 percent variation in year 1, followed by 11.57 percent in year 2, and 10.60 percent in year 3. The impact, then, continuously increases to 13.89 percent in year 10. Perhaps female-headed families need and apply for government support, which then impacts female income ratio. Also, we may observe opt-out of the program when situations improved for them. We observe shocks to the unemployment rates for the males and females can explain a lot of variation in the growth in government transfer. This is expected as people may apply for government assistance at times of unemployment. We observe that a shock to the unemployment rate for males can explain more than 50 percent of variation in growth in government transfer. It starts with 52.25 percent in year 1, followed by 49.19 percent in year 2, 53.88 percent in year 3, 56.33 percent in year 4, and it remains in that
range over the forecast horizon. We can see a similar pattern for the female unemployment rate as well. It starts with 27 percent in year 1, followed by 31 percent in year 2 and then gradually declines to about 25 percent for the remaining periods in the forecast horizon. The impact of the male unemployment rate is much more profound and quantitatively twice the impact relative to females.

Table 5
VDC of unemployment rate female

<table>
<thead>
<tr>
<th>Income ratio male</th>
<th>Income ratio female</th>
<th>Unemployment rate male</th>
<th>Unemployment rate female</th>
<th>Growth in Gov transfer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 0.0000</td>
<td>0.0000</td>
<td>0.2368</td>
<td>0.7632</td>
<td>0.0000</td>
</tr>
<tr>
<td>2 0.0005</td>
<td>0.0096</td>
<td>0.3653</td>
<td>0.6219</td>
<td>0.0027</td>
</tr>
<tr>
<td>3 0.0030</td>
<td>0.0213</td>
<td>0.4114</td>
<td>0.5595</td>
<td>0.0048</td>
</tr>
<tr>
<td>4 0.0077</td>
<td>0.0320</td>
<td>0.4163</td>
<td>0.5381</td>
<td>0.0058</td>
</tr>
<tr>
<td>5 0.0139</td>
<td>0.0403</td>
<td>0.4052</td>
<td>0.5344</td>
<td>0.0062</td>
</tr>
<tr>
<td>6 0.0202</td>
<td>0.0454</td>
<td>0.3895</td>
<td>0.5387</td>
<td>0.0062</td>
</tr>
<tr>
<td>7 0.0257</td>
<td>0.0474</td>
<td>0.3726</td>
<td>0.5484</td>
<td>0.0059</td>
</tr>
<tr>
<td>8 0.0298</td>
<td>0.0469</td>
<td>0.3549</td>
<td>0.5629</td>
<td>0.0056</td>
</tr>
<tr>
<td>9 0.0326</td>
<td>0.0450</td>
<td>0.3365</td>
<td>0.5807</td>
<td>0.0052</td>
</tr>
<tr>
<td>10 0.0345</td>
<td>0.0424</td>
<td>0.3182</td>
<td>0.6001</td>
<td>0.0048</td>
</tr>
</tbody>
</table>
Table 6
VDC of growth in government transfer

<table>
<thead>
<tr>
<th></th>
<th>Income ratio male</th>
<th>Income ratio female</th>
<th>Unemployment rate male</th>
<th>Unemployment rate female</th>
<th>Growth in Gov transfer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.0014</td>
<td>0.1260</td>
<td>0.5225</td>
<td>0.2720</td>
<td>0.0781</td>
</tr>
<tr>
<td>2</td>
<td>0.0056</td>
<td>0.1157</td>
<td>0.4919</td>
<td>0.3144</td>
<td>0.0724</td>
</tr>
<tr>
<td>3</td>
<td>0.0095</td>
<td>0.1060</td>
<td>0.5388</td>
<td>0.2812</td>
<td>0.0645</td>
</tr>
<tr>
<td>4</td>
<td>0.0111</td>
<td>0.1056</td>
<td>0.5633</td>
<td>0.2602</td>
<td>0.0598</td>
</tr>
<tr>
<td>5</td>
<td>0.0116</td>
<td>0.1108</td>
<td>0.5635</td>
<td>0.2567</td>
<td>0.0574</td>
</tr>
<tr>
<td>6</td>
<td>0.0119</td>
<td>0.1179</td>
<td>0.5556</td>
<td>0.2583</td>
<td>0.0563</td>
</tr>
<tr>
<td>7</td>
<td>0.0122</td>
<td>0.1252</td>
<td>0.5487</td>
<td>0.2582</td>
<td>0.0557</td>
</tr>
<tr>
<td>8</td>
<td>0.0126</td>
<td>0.1314</td>
<td>0.5447</td>
<td>0.2560</td>
<td>0.0552</td>
</tr>
<tr>
<td>9</td>
<td>0.0131</td>
<td>0.1361</td>
<td>0.5421</td>
<td>0.2541</td>
<td>0.0546</td>
</tr>
<tr>
<td>10</td>
<td>0.0137</td>
<td>0.1389</td>
<td>0.5390</td>
<td>0.2545</td>
<td>0.0538</td>
</tr>
</tbody>
</table>

Conclusion

Rising income inequality is a major concern among policymakers, academics, and the general population in the United States. We can find a plethora of research that investigates rising trends in income inequality using a variety of approaches. Governments, all over the world, use government transfer as a means to tackle income inequality and poverty. In the United States, we have a variety of transfer programs. These transfers are criticized for their disincentivizing impact on the labor market. This research analyzes the dynamics among different measures of income inequality, unemployment rates for males and females, and growth in government transfer. We use annual time series data to estimate structural vector auto-regression models. We use the structural vector auto-regression models to compute impulse responses and variance decompositions to analyze their dynamics. We adopt a macro-econometric approach to develop new insight into their dynamics.

We estimate three variations of SVAR to ensure the robustness of our findings and analysis. The results from structural impulse responses show that a shock to growth in government transfer increases unemployment rates for males and females across all three models. This finding conforms to earlier work that shows that government transfers disincentives employment in the labor market (see for example, Ahmed (2022)). Variance decomposition analysis also echoes similar findings. The variance in the growth in government transfer can be explained by male unemployment rate twice as much as the female unemployment rate. A shock to the male unemployment rate increases income inequality, albeit briefly, but a shock to the female unemployment rate reduces income inequality. A shock to the female income ratio lowers income inequality for males. Perhaps the associative marriage hypothesis plays an
important role in this regard (Andersen (2007), Schwartz (2010), and Greenwood et al. (2014)). We observe that a shock to growth in government transfer reduces income inequality among females. A shock to female income ratio reduces growth in government transfer on impact but then it rises over the forecast horizon. When we analyze the variance decomposition for growth in government transfer, we find the female income ratio and the unemployment rates explain a lot of variation in government transfer. This set of findings is indicative of a gender-specific variation. Perhaps, increased government transfer reduces poverty by reducing income inequality among female-headed households. Also, it is noteworthy that increased unemployment in the labor market significantly increases government transfer. Therefore, a gender-directed government transfer may improve social outcomes, and over time reduce government outlays on transfer.

Our findings suggest that policymakers need to address the income inequality problem with different tools for different genders, as the female workforce depicts different responses compared to their male counterparts.

Declarations

Ethical Approval: Not Applicable

Competing interests: Not applicable.

Authors’ contributions: Haydory Akbar Ahmed contributed to the study conception and design. Material preparation, data collection and analysis were performed by both the authors. Both the authors, Haydory Akbar Ahmed and Hedieh Shadmani jointly contributed to develop the result analysis section of this paper. The manuscript (all previous versions of the manuscript) is jointly written by Haydory Akbar Ahmed and Hedieh Shadmani.

Funding: Not applicable.

Availability of data and materials: Data and software codes are available upon request. This paper uses secondary data available in Federal Reserve Bank of St. Louis online database and the World Income Inequality database.

Research involving human participants and/or animals: Not applicable

Informed Consent: Not applicable

References


Footnotes

1. World inequality database

2. 2018 Average household income after taxes and transfers, Congressional Budget Office

3. The sample starts from 1948. But the male and female unemployment rates and the male and female disaggregate for the income ratios are available for the top 10 percent to the bottom 50
percent. The gender-based disaggregation is available from 1962 onwards. Hence, we were limited to using the sample starting from 1962 to 2021.


5. We acknowledge that a monthly frequency would have been a better choice if it was available.

6. The male and female disaggregate data is not available for the ratio of the top 10 percent to the bottom 20 percent

Figures

Figure 1

Measures of income inequality

Note: 1. Sample is from 1948 to 2021, 2. IR1050 is the ratio of income earned by the top 10 percent to the bottom 50 percent, 3. IR1020 is the ratio of income earned by the top 10 percent to the bottom 20 percent.
Figure 2

Growth in Government Transfer to Persons in the United States

Figure 3

Ratio of income earned by the top 10 percent to the bottom 50 percent between male and female

Note: 1. Sample is from 1962 to 2019, 2. IR1050F is the ratio of income earned by the top 10 percent to the bottom 50 percent for females, 3. IR1050M is the ratio of income earned by the top 10 percent to the bottom 50 percent for males.
Figure 4

Unemployment Rate in the United States

Note: This sample is from 1947 to 2021 obtained from the Federal Reserve Bank of St. Louis database.

Figure 5

Male and female unemployment rates in the United States

Note: 1. Sample is from 1962 to 2019, 2. UR F is the female unemployment rate, 3. UR M is the male unemployment rate
Figure 6

Impulse responses from a shock to income ratio (top 10 to bottom 50)
Figure 7

Impulse responses from a shock to unemployment rate-male
Figure 8

Impulse responses from a shock to unemployment rate-female
Figure 9

Impulse responses from a shock to growth in government transfer
Figure 10
Impulse responses from a shock to income ratio (top 10 to bottom 20 percent)

Figure 12
Impulse responses from a shock to unemployment rate-female

Figure 13

Impulse responses from a shock to government transfer
Figure 14

Shock to the ratio of income earned by the top 10 percent to the bottom 50 percent for males
Figure 15

Shock to the ratio of income earned by the top 10 to the bottom 50 percent for females
Figure 16

Shock to unemployment rate male
Figure 17

Shock to unemployment rate female
Figure 18

Shock to growth in government transfer