

International Center for Public Policy
Working Paper 22-06
August 2022

Fiscal Decentralization and Structural versus Cyclical Unemployment Levels

Benard Akalbeo
Jorge Martinez-Vazquez
Bauyrzhan Yedgenov

**International Center for Public Policy
Working Paper 22-06**

Fiscal Decentralization and Structural versus Cyclical Unemployment Levels

**Benard Akalbeo
Jorge Martinez-Vazquez
Bauyrzhan Yedgenov**

**August
2022**

International Center for Public Policy
Andrew Young School of Policy Studies
Georgia State University
Atlanta, Georgia 30303
United States of America

Phone: (404) 413-0235
Fax: (404) 651-4449
Email: paulbenson@gsu.edu
Website: <http://icepp.gsu.edu/>

Copyright 2022, the Andrew Young School of Policy Studies, Georgia State University.
No part of the material protected by this copyright notice may be reproduced or utilized
in any form or by any means without prior written permission from the copyright owner.

International Center for Public Policy Andrew Young School of Policy Studies

The Andrew Young School of Policy Studies was established at Georgia State University with the objective of promoting excellence in the design, implementation, and evaluation of public policy. In addition to four academic departments, including economics and public administration, the Andrew Young School houses eight leading research centers and policy programs, including the International Center for Public Policy.

The mission of the International Center for Public Policy (ICePP) at the Andrew Young School of Policy Studies is to provide academic and professional training, applied research, and technical assistance in support of sound public policy and sustainable economic growth in developing and transitional economies.

ICePP is recognized worldwide for its efforts in support of economic and public policy reforms through technical assistance and training around the world. This reputation has been built serving a diverse client base, including the World Bank, the U.S. Agency for International Development (USAID), the United Nations Development Programme (UNDP), finance ministries, government organizations, legislative bodies, and private sector institutions.

The success of ICePP reflects the breadth and depth of its in-house technical expertise. The Andrew Young School's faculty are leading experts in economics and public policy and have authored books, published in major academic and technical journals, and have extensive experience in designing and implementing technical assistance and training programs. Andrew Young School faculty have been active in policy reform in over 40 countries around the world. Our technical assistance strategy is not merely to provide technical prescriptions for policy reform, but to engage in a collaborative effort with host governments and donor agencies to identify and analyze the issues at hand, arrive at policy solutions, and implement reforms.

ICePP specializes in four broad policy areas:

- Fiscal policy (e.g., tax reforms, public expenditure reviews)
- Fiscal decentralization (e.g., reform, intergovernmental transfer systems, urban finance)
- Budgeting and fiscal management (e.g., local, performance-based, capital, and multi-year budgeting)
- Economic analysis and revenue forecasting (e.g., micro-simulation, time series forecasting)

For more information about our technical assistance activities and training programs, please visit our website at icepp.gsu.edu or contact us at paulbenson@gsu.edu.

Fiscal Decentralization and Structural versus Cyclical Unemployment Levels

Benard Akalbeo¹, Jorge Martinez-Vazquez² and Bauyrzhan Yedgenov³

August 2022

Abstract

The literature on fiscal federalism has long debated whether fiscally decentralized countries are inherently more economically and fiscally unstable. This paper contributes to this literature by analyzing the impact of fiscal decentralization on one of the most important dimensions of macroeconomic stability, the unemployment level. This is the first study in the literature to address the relationship between fiscal decentralization and unemployment rate at the country level, especially using the decomposition between its structural and cyclical components. The fundamental relationship is explored empirically by using an instrumental variable approach on a panel of 52 countries between 1991 and 2012. The main result is that more fiscally decentralized countries in general tend to experience lower unemployment rates. We also find, as theoretically anticipated, that the impact of fiscal decentralization is mostly on structural unemployment compared to cyclical unemployment. The results are robust to alternative specifications.

Keywords: fiscal decentralization, macroeconomic stability, business cycle, unemployment, structural unemployment, cyclical unemployment

JEL classification: E62, H77, O20, O40

¹ International Center for Public Policy, Georgia State University; email: bakalbeo1@gsu.edu

² International Center for Public Policy, Georgia State University; email: jorgemartinez@gsu.edu

³ International Center for Public Policy, Georgia State University; email: byedgenov1@gsu.edu

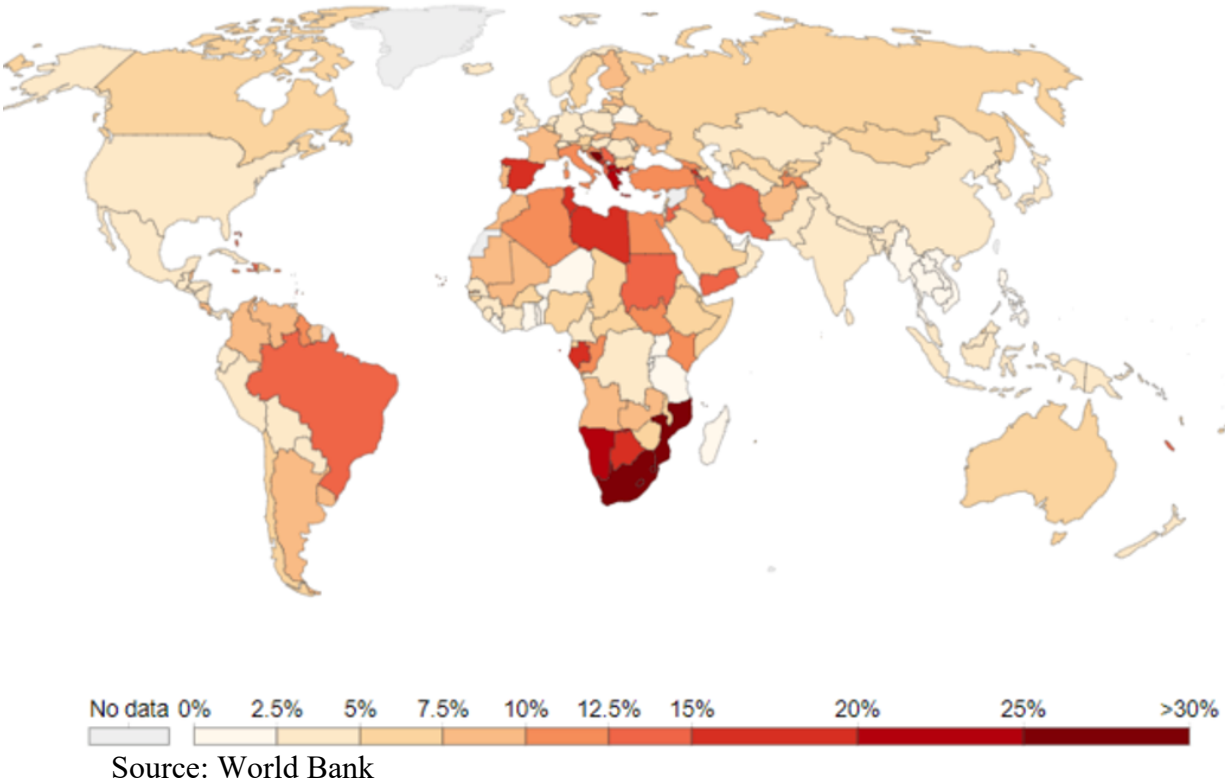
1. Introduction

The potential impact of fiscal decentralization has gained wider recognition due to a continuing global trend towards decentralization among both developing and developed countries. While less decentralized countries have been leaning more towards fiscal decentralization, countries that are already decentralized have embarked on even further decentralization. Garman et al. (2001) found that of the 75 developing countries analyzed, more than 80 percent were undergoing some decentralization of authority by the beginning of the millennium. In the case of developed countries, the index of regional authority computed by Hooghe et al. (2010) for 42 democracies and semi-democracies reveals that 70 percent of the countries have decentralized since 1950.

This paper investigates the impact of fiscal decentralization on aggregate unemployment, which continues to be a significant problem in both developed and developing countries and distinguishing between the cyclical and structural components of unemployment, which tend to exhibit different behaviors in developing and developed countries. While the impact of fiscal decentralization on inflation has been covered extensively in the previous literature, perhaps almost as much as for the impact on economic growth, the same cannot be said about unemployment. One main justification for the focus of this paper is that unemployment can have worse consequences for a country's welfare than high inflation or even slow economic growth; this is especially the case in developing countries where high levels of structural unemployment are prevalent. In many of these countries, population growth continues to outpace economic and job growth—even if some form of economic growth is recorded, it does not necessarily translate into the needed job creation. Thus, if fiscal decentralization could potentially help reduce structural unemployment, then it might be an effective policy for developing countries to consider.

Unemployment is becoming a serious global threat, especially in developing countries. According to the International Labor Organization (ILO) 2019 World Economic Outlook, the average level of unemployment in Africa at the end of 2019 was about 6.8 percent, with North Africa having the higher percentage of 11.8 percent compared to the Sub-Saharan Africa rate of 5.9 percent. The level of informality is lower and income higher in North Africa relative to Sub-Saharan Africa. The unemployment rate in Latin America and the Caribbean stood at 8.0 percent at the end of 2019. Brazil had the highest level of the incidence of unemployment with a 12.2 percent rate which is about 50 percent higher than the regional average. The rate of unemployment in Asia and the Pacific at the end of 2019 was much lower at 3.6 percent.

Figure 1. Unemployment Rates across the World, 2019



The focus on unemployment is also justified because unlike inflation, which works through various indirect mechanisms to affect countries' welfare, unemployment affects the

citizenry directly. A person may not feel the direct impact of increasing inflation depending on their personal consumption basket, while anyone unemployed faces its scourge directly no matter what they consume. That would explain why the subject of unemployment benefits has been the biggest topic of discourse in the United States and across the world ever since the coronavirus pandemic and its associated job losses began. Governments of most developed countries have some form of unemployment insurance benefits to somewhat insulate workers from the direct effects of job losses and to smooth consumption expenditures, which is usually the largest component of GDP.

Several authors, including Oreopoulos et al. (2008), Nicols et al. (2012), and Latsou and Geitona (2018), have argued that there are other effects of unemployment which might be more debilitating than lack of income. These may include health issues such as depression, low self-esteem, anxiety, and other mental health issues (Linn et al., 1985; Farré et al., 2018; Norström et al., 2019). In addition, many crimes are committed by individuals who are unemployed and living in poverty (Steven and Winter-Ember, 2001; Chang and Wu, 2012; Bausman and Goe, 2004). One thing that stands out from all these effects is that unlike inflation or slow economic growth, the consequences of unemployment do not necessarily need any indirect medium to take effect. They affect unemployed persons directly. The long-term impact of unemployment on consumption and the economy could be serious regardless of whether the unemployment is caused by cyclical, structural or even frictional forces.

One difficulty in analyzing the impact of fiscal decentralization on unemployment is the potential presence of endogeneity because of reverse causation or omitted variables. For example, countries may decentralize, among other reasons, to develop their economies and reduce unemployment, or shift the responsibility of unemployment to lower levels of government.

Reverse causality is possible if the desire to tackle unemployment issues could impact fiscal decentralization decisions. While there is no evidence in the literature on the direct impact of unemployment on fiscal decentralization, unemployment might cause higher decentralization through other channels such as internal conflict and regional tensions, especially if the unemployment level is different across regions in the country (Berman et al., 2011; Cramer and Richards, 2011).

To address the issue of potential endogeneity in our estimations we use an instrumental variable approach based on the geographic fragmentation (complexity) index in Canavire et al. (2012). The rationale is that geographic complexity represents an exogenous factor varying across countries affecting the level of decentralization, while this geographic feature should not affect unemployment levels or vice versa. Using a panel dataset for the years 1991-2012 for some 51 countries and applying both fixed effects and instrumental estimation strategies, we find a consistent negative and significant relationship between the unemployment level and fiscal decentralization. Both revenue-based and expenditure-based decentralization coefficients are negative and significant at the 5-percent level, and a 10-percent increase in expenditure decentralization is expected to reduce the unemployment level by 0.7 percent, whereas a 10-percent increase in revenue decentralization should see unemployment fall by 0.58 percent. We also find that the impact of fiscal decentralization on structural unemployment is negative and significant, and a 10-percent increase in expenditure decentralization (revenue decentralization) is expected to reduce the structural unemployment level by 0.81 percent (0.49 percent). Interestingly, the impact of fiscal decentralization on cyclical unemployment is insignificant.

The rest of the paper is organized as follows. Section 2 reviews the previous literature and briefly outlines the conceptual framework. Section 3 address the decomposition of unemployment

into structural and cyclical components. Section 4 discusses the measurements of key variables, the data, and the empirical methodology. Section 5 presents the main empirical results and robustness checks. Section 6 concludes.

2. Literature Review

Although this paper focuses on the impact of fiscal decentralization on unemployment in its own rights, the scarcity of previous studies on this topic in the literature necessarily informs the scope of the literature review. We first look at studies that have investigated the impact of fiscal decentralization on some form of employment creation or unemployment reduction. We then proceed to examine other studies that have researched the impact of fiscal decentralization on other areas of macroeconomic stability, which are relevant to macro stability and unemployment.

Fiscal decentralization, like most other policies could yield benign, negative or no effects on employment depending on the nature and implementation of the policy. The outcome of the policy could also depend on the outcome of interest. For example, Muhammed et al. (2012) find that fiscal decentralization created employment opportunities at the grassroots level helping reduce unemployment in Pakistan. Besides this instance of a within country study, to the best of our knowledge there have not been in the literature any other within or cross-country studies on the impact of fiscal decentralization on the overall unemployment rate.

However, in a related matter, Martinez-Vazquez and Yao (2009) examined the relationship between decentralization and public sector employment, which, of course, is a narrower concept than the overall unemployment level. They used panel data covering the period 1985 – 2005 and concluded that the general level of government employment increases with fiscal decentralization. This is mostly because fiscal decentralization is associated with an expansion of aggregate public expenditures in social services, such as education and health, which are labor

intensive. Public sector employment is an integral part of the total employment of a country, and thus, public jobs creation could lower the aggregate unemployment level. In addition, one feature of public sector employment is that it tends to be more stable over the typical business cycle. Therefore, public employment creation can be considered an important channel through which fiscal decentralization may affect the overall employment level. All other things the same, a country that is more decentralized will tend to have a large share of the population in public employment, potentially reducing structural unemployment in the economy, and making overall employment less sensitive to business fluctuations, that is, reducing cyclical unemployment.

In contrast to the dearth of literature on the direct impact of fiscal decentralization on unemployment, there is a rich literature on the impact of decentralization on other macroeconomic variables. An older conventional view in the fiscal federalism literature has been that fiscal decentralization can weaken the ability of central authorities to implement macro stabilization policy because decentralization leaves them with less leverage to implement traditional fiscal tools, such as expansionary spending, or indirectly because decentralized systems may be more exposed to soft budget constraints and debt bailouts (Prud'homme, 1995; Tanzi, 1995).⁴ A more recent view is that well designed fiscally decentralized systems that incorporate budgetary features such as low vertical imbalances and fiscal rules can actually contribute to the fiscal and macro stability of a country (Baskaran, 2010; Neyapti, 2010, 2013; and Lago-Peñas et al. 2020).

Overall, the evidence is quite strong that higher levels of fiscal decentralization may be associated with lower levels of inflation. Treisman (2000) set to examine the effect of decentralization on the average inflation rate using a panel of 87 countries for four-five years'

⁴ Four counterarguments allaying those concerns see McLure (1995) and Sewel (1996).

periods in the 1970s and 1980s found an inverse relationship between inflation and decentralization among developed and developing countries; more decentralization leads to less inflation and vice versa. Feltenstein and Iwata (2005), Shah (2006), and Thornton (2007) also found less inflation as fiscal decentralization increases. For developing countries, Martinez-Vazquez and McNab (2006) also found that decentralization might lead to less inflation. In addition, several other studies find that revenue decentralization may be more conducive to lower inflation than expenditure decentralization. See Baskaran (2012) for a cross country study and Iqbal and Nawaz (2010) for a within-country study of Pakistan.

Different authors have highlighted the vicious circle implied by more revenue decentralization and a more symmetric system with low vertical fiscal imbalances (Brennan and Buchanan, 1980; Neyapti, 2010; Ivanyna and Shah, 2012; and Martinez-Vazquez, 2015). In this regard, Eyraud and Lusinyan (2014), analyzing the impact of vertical fiscal imbalances on overall fiscal performance in 20 OECD countries, find that that reducing fiscal imbalances—that is, closing the gap between sub-national expenditure and own-revenues, is associated with better fiscal outcomes for the general government.⁵

3. A Simplified Conceptual Framework: Fiscal Decentralization and Structural versus Cyclical Unemployment

The measured unemployment level in any country reflects both the long-term or structural unemployment component, and the shorter term, or cyclical unemployment component. Although the overall unemployment level comprises these different components, statistical data on

⁵ Fiscal decentralization also has the potential of impacting fiscal discipline; for example, Rodden (2002) provides cross-country evidence that revenue autonomy and limits on sub-national borrowing lead to smaller budget deficit. The evidence is that poorly designed fiscal decentralization systems can lead to negative effects on macroeconomic stability, as in the early experiences of Argentina and Brazil in the 1970s and 80s (Dillinger et al. 1999, Dillinger and Webb 1999).

unemployment levels typically are not separated into these components. Nevertheless, the policy reactions to these different components of unemployment are naturally quite different, and, from the perspective of this paper, we can expect fiscal decentralization to play quite different roles on each of the two components.

As for useful background, Mocan (1999) decomposes the overall unemployment level into its structural and cyclical components and finds evidence that those two components may have distinct patterns of movement and statistical properties. Structural unemployment can change over time due to changes in the demand for labor or due to changes in returns to nonwork. It can also change with changes in the composition of the labor force, for example, if the share of teenagers in the labor force rises, this increases the structural rate because teenagers tend to experience higher unemployment rates than prime-aged workers. An increase in worker mobility between sectors may also generate an increase in structural unemployment (Black, 1982; Lilien, 1982). The cyclical component, on the other hand, is influenced more by up and down turns in the business cycle.

Researchers in labor economics have long recognized this reality and over the years have attempted to decompose unemployment levels into these two components (Harvey; 1985, Baxter and King; 1999). Assessing whether unemployment is mostly cyclical or structural has implications for the policy response needed to address the unemployment problem (Arpaia et al., 2014). This prior literature informs our approach for how to explore the potential impact of decentralization on the two different components of the aggregate unemployment level. Higher levels of fiscal decentralization may work through mechanisms and channels differently affecting those two types of unemployment. In the case of structural unemployment, higher levels of fiscal decentralization may work via direct effects through how decentralization affects public

expenditure composition and the overall level of public expenditure, and through an indirect effect for how decentralization affects general economic growth. The potential direct effect of decentralization on cyclical unemployment is potentially through an expenditure level effect.

Let us expand on each of those effects. In terms of the expenditure composition direct effect, Martinez-Vazquez and Yao (2009) find, as mentioned above, that fiscal decentralization is associated with higher levels of public employment, and that this is mainly due to the fact that the more decentralized a country is the more the composition of expenditures shifts toward social services, including education and health, which in turn tend to be much more labor intensive than other areas of public spending.⁶ There is additional evidence of fiscal decentralization leading to higher public sector employment in a within-country setting (Marques-Sevillano and Rossello-Villalonga, 2004 for the case of Spain, and Rajaman and Saha, 2008 for the case of India).

In terms of the direct effect through the level of public expenditures, it has been argued that the larger the public sector is in the economy (and that includes both decentralized government and the central government), the higher the overall level of employment. These outcomes may be explained in the context of the theoretical model developed by Battaglini and Coate (2016). In their unemployment model, unemployment has an inverse relationship with the level of the public good produced in an economy, because no matter the level, the public sector is more service oriented and therefore more labor intensive (Poutvaara and Wagener, 2004, 2008; Alesina et al., 2000; Gordon, 2001; Pirttila and Tuomala, 2005).

But does fiscal decentralization increase the size of government? Since individuals generally have more control over public decisions at the subnational levels than at the national

⁶ For evidence on the shifting composition of public expenditures under decentralization see Arze del Granado et al. (2016).

level, they may empower the local public sector with an even wider range of functions and responsibilities when they are carried out by local levels of government. Thereby, the size of subnational (state and local) governments and the public sector can be larger, the more decentralized the fiscal decision-making system is (Oates and Wallis, 1988). The classical contribution to the relationship between fiscal decentralization and the size of government is the Leviathan hypothesis introduced by Brennan and Buchanan (1980), who argued that government size would tend to increase because public officials are generally budget maximizers; however, that expansion would be contained by the intergovernmental competition introduced by fiscal decentralization. More generally, while decentralization should increase the size of sub-national governments, we would also expect some shrinking in the size of the national government; services and functions now provided by the decentralized governments were previously provided by the central government. The net effect of fiscal decentralization on aggregate government size depends on the relative magnitude of those two effects (Jin and Zhou, 2002). Empirically there were some mixed earlier results (Oates 1985), but later empirical research has consistently shown that the size of government tends to increase when decentralized governments are mostly financed with intergovernmental grants, while size tends to decrease when subnational governments are financed with own tax revenues (Grossman, 1989; Stein, 1999; Rodden, 2003; Ashworth et al., 2013; Liberati and Sachi, 2013; and Makreshanska and Petrevski, 2019).

Regarding the indirect effect on structural unemployment through economic growth, the expectation is that if decentralization leads to higher economic growth, over time that growth would generate increases in both private and public employment. But does decentralization actually lead to higher economic growth? Much has been written on this subject with earlier papers showing mixed results and more recent papers converging on the result that fiscal decentralization,

especially when it is well designed (e.g., with adequate revenue autonomy and low vertical fiscal imbalances), can lead to higher economic growth (Martinez-Vazquez et al. 2017).

In the case of the cyclical unemployment component, the role of fiscal decentralization may also be significant, although possibly more complex and controversial. The traditional orthodoxy in fiscal federalism is that subnational governments should not be involved in active macro-stabilization policies, which should be an exclusive function of the central government (Musgrave, 1959; Oates, 1972), the main reason being that the very open economy nature of subnational jurisdictions would doom any subnational fiscal stabilization attempt to failure. Nevertheless, that view has been challenged over the years, with numerous researchers arguing that subnational governments' direct involvement could promote and enhance macroeconomic stability (e.g., Gramlich, 1993; Rodden and Wibbels, 2002; Shah, 1994). And subnational governments do in fact often get actively involved in countercyclical policies so leveraging central government actions in times of recessions, and there is evidence that well-designed fiscal decentralization systems can work to support the macro-stabilization objectives of the central government (Lago-Peñas et al., 2020).

In summary, based on the above discussion, we hypothesize, first, that fiscal decentralization is expected to strongly reduce structural unemployment, and second, that fiscal decentralization may also lead to reductions in cyclical unemployment, although this relationship should be expected to be weaker.

4. Key Variables, Estimation Issues, and Empirical Approach

4.1 Unemployment level

Our main variable of interest, the unemployment rate, measures the share of the labor force that is without work but available for and seeking employment (World Development

Indicators Metadata Glossary, 2022). It is thus seen as an indicator of the efficiency and effectiveness of an economy to absorb its labor force and of the performance of the labor market (ILO, 2013).⁷ Of course, another useful purpose served by the unemployment rate in a country, when available on at least an annual basis, is the ability to track the business cycles.

Because the impact of fiscal decentralization is likely to be different with respect to the two main components of unemployment, structural and cyclical unemployment, we follow Mocan (1999) to decompose our aggregate level unemployment measures into its structural and cyclical components. While we focus on the more commonly used Hodrick-Prescott (HP) decomposition method, we also report results from using the Baxter-King (BK) decomposition method.

4.2 Availability of unemployment benefits

To understand the nature and behavior of unemployment it is important to control for the availability (or lack thereof) of unemployment insurance or benefits. In countries without a safety net with unemployment insurance and welfare benefits, the unemployed often must eke out a living as best as they can, often in the informal economy or in informal work arrangements. In countries with well-developed social protection schemes or when savings or other means of support are available, workers can better afford to take the time to find more desirable jobs (ILO, 2018).

Therefore, the presence of unemployment benefits (insurance) and social assistance programs is an important determinant of the unemployment level. However, the direction of its

⁷ Future starters, that is, persons who did not look for work but have a future labor market stake (made arrangements for a future job start) are also counted as unemployed, as well as participants in skills training or retraining schemes within employment promotion programs, who on that basis, were “not in employment”, not “currently available” and did not “seek employment” because they had a job offer to start within a short subsequent period generally not greater than three months and persons “not in employment” who carried out activities to migrate abroad in order to work for pay or profit but who were still waiting for the opportunity to leave (ILO, 2013).

impact is not completely clear. The existence of a support system may make the unemployed less inclined to look for job matches. Moreover, unemployed persons might refuse certain job offers and wages they would naturally have accepted in the absence of this support system. In this regard, Barro (2010) found that unemployment benefits raised the unemployment rate by 2 percent; however, this finding has been criticized (Rothstein, 2011). It is more generally agreed that unemployment insurance may allow for improving the quality of matches between workers and firms (Marimon and Zilibotti, 2001), and thus even if unemployment benefits increase unemployment duration, the duration of subsequent employment tends to be longer (suggesting better job match quality). Nonetheless, there is no consensus on the impact of unemployment benefits on the level of unemployment; it could be either positive or negative according to empirical studies (Card and Levine, 2000; Nekoei and Weber, 2017; Farooq et al., 2020). In our empirical analysis we use a dummy variable to control for the availability or unavailability of unemployment benefits or insurance in each country.

4.3 Fiscal decentralization (FD)

Fiscal decentralization is the process of delegation of fiscal responsibilities to the sub-national governments, involving devolution of powers to tax and spend along with arrangements for correcting the imbalances between resources and obligations (Malik et al., 2006). To measure the extent of decentralization we use two conventional and frequently utilized measures from the Government Financial Statistics (GFS) database of the International Monetary Fund: (1) the ratio of total subnational expenditures to general government expenditures, and (2) the ratio of total subnational revenues to general government revenues. The potential flaws associated with these two measures have been frequently discussed in the literature (level of actual autonomy, missing

values, etc.), but as Letelier (2005) notes, there is no evidence of a systematic measurement error across countries in the GFS data.⁸

The reason to use expenditure and revenue decentralization measures is that they capture different dimensions of fiscal decentralization, and their impact is therefore potentially different (Martinez-Vazquez and Timofeev 2010). While both measures of decentralization often go hand in hand, using both measures in one equation is likely to lead to multicollinearity issues. But because of the potential problems with the GFS data on decentralization, we also test for robustness an alternative measure of decentralization, the regional authority index (RAI) produced by Hooghe et al (2016).

4.4 *Potential endogeneity issues*

The primary interest of this paper is to find the exogenous causal effect of fiscal decentralization on overall unemployment and its components of cyclical and structural unemployment. However, there is a possibility that there exists some form of endogeneity caused by unobserved heterogeneity (omitted variable bias) or reverse causality. The latter is possible if the desire to tackle unemployment issues could impact the level of fiscal decentralization adopted in each country; for example, conflict and regional tensions may lead to higher decentralization especially if the unemployment is different across regions in the country (Berman et al., 2011, Cramer and Richards, 2011).

Canavire-Bacarreza et al. (2017) explore the empirical relevance of geography (measured along several dimensions including elevation, land area, and climate) as an instrument for fiscal

⁸ If a country had missing data for most of the years in the covered period, it was dropped from the analysis. For those countries that had a few missing values throughout the period, imputed values, using the method of the average of immediate non-missing years, were added.

decentralization; the attraction is that geography is truly exogenous, while there is a logic that more geographically diverse countries tend to have greater heterogeneity in their populations, including their preferences and needs for public goods and services provision. They find a positive and strong correlation between geographical fragmentation and fiscal decentralization and that the interaction of geography with the development of infrastructure in transportation, communications, etc. tends to reduce, but only slightly, the effect of geography on decentralization. We therefore use Canavire-Bacarreza et al. (2017) Geographical Fragmentation Index (GFI) together with country size as instrumental variables for fiscal decentralization.⁹ The data for computing the GFI are from NASA’s Earth Observing System Data and Information System (EOSDIS) hosted by The Center for International Earth Science Information Network (CIESIN) at Columbia University¹⁰. Last, we note that there is no apparent mechanism through which physical geography directly affects unemployment, nor there is empirical evidence in the literature that might point to such a relationship.

4.5 Empirical approach

Since we use an instrumental variable approach, the estimation of the impact of fiscal decentralization on unemployment proceeds in two stages:

$$\text{First Stage: } FD_{it} = \beta_0 + \theta X_{it} + \gamma Z_{it} + \varepsilon_{it} \dots\dots\dots(1)$$

$$\text{Second Stage: } U_{it} = \rho_0 + \sigma X_{it} + \eta \hat{F}D_{it} + \mu_{it} \dots\dots\dots(2)$$

⁹ Other studies have used a variety of instrumental variables to address the issue of the endogeneity of fiscal decentralization in the context of economic growth. For example, Akai and Sakata, (2002) and Bodman et al.(2009) use initial value of the independent variable while other studies have used lagged independent variables as IVs (Imi, 2005; Enikoplov and Zhuravskaya, 2007; Gemmel, Kneller and Sanz, 2013). It would be possible to borrow such approaches in this work as well. However, fiscal decentralization institutions tend to be quite stable over time and therefore susceptible to auto-correlation, which means that initial or lagged values are likely to be just as endogenous.

¹⁰ The data are available for years 1990, 1995, 2000 and 2010. Due to very low variation of GFI over time, Canavire-Bacarreza et al. (2017) use the 1990 value as the value for years 1990-1994, 1995 value for years 1995-1999, 2000 value for years 2000-2009 and finally, the 2010 value is used for the years from 2010-2012.

Where FD_{it} is the original measure of fiscal decentralization and $\hat{F}D_{it}$ is the predicted value from the first stage; U_{it} , is the unemployment rate measure (overall, structural or cyclical), X_{it} is a vector of control variables, further discussed below. The vector Z_{it} in equation (1) contains the geographic IVs discussed above (the GFI and land area).

Our main coefficient of interest is η , capturing the causal relationship between fiscal decentralization and the unemployment rate (overall, structural and cyclical). It reflects the percentage point change in unemployment associated with one percentage point change in the fiscal decentralization level (either from the revenue or expenditure sides). Therefore, it can be interpreted as the elasticity of the unemployment rate with respect to the level of fiscal decentralization.

Besides our main independent variable, we include in X_{it} several control variables; specifically, first we control for the inflation rate, because of its potential effect on the aggregate demand level and thus the unemployment rate; second, we control for the availability of unemployment benefits or social insurance systems, as discussed above; fourth, for trade openness, computed as the sum of imports and exports as a percentage of GDP; and last, for the education level, to capture the potential impact of education on unemployment.¹¹ Since the various levels of education may have different impacts on the ability to find and maintain employment, we identify the education rates into basic, intermediate and advanced.¹² The data sources for all variables are further described in Table A1 and summary statistics are presented in Table A2, both in the Appendix.

¹¹ Empirically studies have shown that education increases the chance of an unemployed person finding a job, other things equal. Research has also shown it to reduce the time required to find new employment. Craig and Xueda (2011) find that education significantly increases the re-employment rate of the unemployed, and the particularly large impacts are found in the neighborhoods of 12 and 16 years of schooling.

¹² This follows previous related studies, such as Muhammed et al. (2012), and Martinez-Vazquez and Yao (2009).

5. Results

5.1 *Simple OLS and IV results*

The baseline results for the estimation of the impact of fiscal decentralization on overall unemployment using OLS and an IV approach are presented in Table 1. The naïve OLS results we argue are biased due to the potential endogeneity of fiscal decentralization. We therefore present the results from the IV model vis-à-vis the OLS estimates to ascertain how the results change after tackling endogeneity. As reported in the first two columns of Table 1, for the OLS approach, we find a negative and insignificant impact of both measures of fiscal decentralization on the unemployment rate. The last two columns in Table 1 show that using an IV approach the results for decentralization are strengthened and become statistically significant. There is the directional consistency from the naïve OLS model, but significance is only gained after tackling endogeneity using instrumental variables. Thus, our results support those in Muhammad et al. (2012) and Iqbal and Nawaz (2010) for the case of Pakistan.

For the other control variables, the positive and significant coefficient for inflation is similar to those previous findings in the unemployment literature (Phillips, 1958). The relationship between unemployment and the level of education attainment across those in the labor force appears to be positive; this is a counterintuitive result per a large part of the labor economics literature (Applegate et al., 2014; Cutler et al., 2015); however, several previous studies have found this positive relationship (Li et al., 2014; Bairagya, 2015). A possible explanation is the presence of a skills mismatch; for example, Majgaard and Mingat (2012) observe that the rapid expansion of higher education in Sub-Saharan Africa with only moderate growth in formal sector employment opportunities has led to large unemployment numbers among graduates. These results could also reflect the confounding effect of education being endogenous (Riddell and Song, 2011).

Last, the positive coefficient of the dummy variable indicating the availability of unemployment benefits lends support to those results in Barro (2010). Since OECD member countries generally have well organized official unemployment benefit schemes and social assistance programs (as well as other unemployment insurance schemes as discussed in Esser et al., 2013) while developing countries do not,¹³ we include a dummy for OECD countries in our regression estimation. However, this differentiation proves to be statistically insignificant (see Table 1).

The results from using the IV approach are reported in the last two columns of Table 1. A more detailed table with first-stage regressions can be found in the Appendix (Table A3). We find that controlling for potential endogeneity yet again yields a negative, but now also statistically significant impact of fiscal decentralization on the rate of unemployment, for both measures of fiscal decentralization. In fact, the coefficients are larger than those under the simple OLS. With the IVs, a 10-percent increase in expenditure decentralization is expected to decrease the unemployment level by 0.70 percent, whereas a 10-percent increase in revenue decentralization should see unemployment fall by 0.58 percent. Thus, after correcting for endogeneity, the impact of decentralization is much more economically profound, and more importantly, statistically significant.

Table 1. Estimation of the Impact of Fiscal Decentralization on Unemployment

Variables	OLS		IV	
	Expenditure	Revenue	Expenditure	Revenue
Expenditure Decentralization	-0.005 (0.007)		-0.070** (0.028)	

¹³ As we have seen in the review of the literature section, the extent of unemployment benefit system has been shown empirically to affect the rate of unemployment, be it negatively or positively (Barro, 2010; Rothstein, 2011; Marimon and Zilibotti, 2001 and Tatsiramos and Ours, 2014)

Revenue Decentralization		-0.009		-0.058**
		(0.009)		(0.026)
Inflation	0.029*	0.029*	0.018	0.024
	(0.016)	(0.016)	(0.026)	(0.025)
Trade Openness	-0.004	-0.005	-0.020*	-0.016*
	(0.006)	(0.006)	(0.011)	(0.009)
Labor force with Basic Education	0.267***	0.271***	0.315***	0.315***
	(0.082)	(0.082)	(0.102)	(0.102)
Labor force with Intermediate Education	0.428***	0.427***	0.380**	0.401***
	(0.129)	(0.129)	(0.152)	(0.148)
Labor force with Advanced Education	0.124	0.121	0.082	0.091
	(0.081)	(0.082)	(0.090)	(0.083)
Dummy for Unemployment benefit	0.996*	1.000*	1.397**	1.091*
	(0.572)	(0.557)	(0.692)	(0.561)
Dummy for OECD	0.071	0.076	0.742	0.488
	(0.471)	(0.463)	(0.533)	(0.501)
Constant	-0.248	-0.159	1.409	0.914
	(0.824)	(0.814)	(1.299)	(1.225)
Observations	550	550	507	507
R-squared	0.874	0.875	0.820	0.852

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

A look at the first stage results for the IV estimation (see Table A3 in the Appendix) shows that the instruments are positive for both measures of fiscal decentralization, and statistically significant, which is consistent with Canavire-Bacarreza et al. (2016). A confirmation of the adequate strength of these instruments is through an econometric statistical criterion. Since we use country clustered standard errors, we refer to the Kleibergen-Paap Wald rk F statistic of both measures of fiscal decentralization. The Kleibergen-Paap Wald rk F statistic in the case of expenditure decentralization is 12.024, and 10.57 under the revenue basis decentralization. Both values are higher than F test value at the 5 percent level of significance. Therefore, based on the

Stock and Yogo rule of thumb, we can reject the claim that the instruments are weak in both the expenditure and revenue-basis decentralization (Stock and Yogo, 2005). The Cragg-Donald Wald F statistic is also 43.38 for the expenditure-basis decentralization and 60.63 for the revenue-basis decentralization. This further reinforces the validity of the instruments as strong instruments from an econometric point of view.

5.2 *Structural versus cyclical unemployment*

Table 2 reports the impact of fiscal decentralization on the two components of structural and cyclical unemployment. As expected from our theoretical framework and the previous literature, fiscal decentralization has a significant impact on structural unemployment. A 10-percent increase in expenditure decentralization is expected to decrease the structural unemployment level by 0.81 percent, whereas a 10-percent increase in revenue decentralization should see structural unemployment fall by 0.49 percent. Both coefficients are significant at least at the 10-percent confidence level. In contrast, the impact of fiscal decentralization on cyclical unemployment is statistically insignificant; and while the coefficient for revenue decentralization still has a negative sign, the sign for expenditure decentralization is positive. These results likely reflect the fact that subnational governments generally do not have much control over effective countercyclical policies to impact cyclical unemployment.

We also observe that the existence of unemployment benefits has a significant positive effect on structural unemployment but a negative effect on cyclical unemployment. This result is consistent with the findings in Table 1, while the impact on cyclical unemployment is as expected since the system of unemployment benefits are supposed to counter the impact of the business cycle, especially during recessions. The results for other control variables are consistent with those in Table 1 for overall unemployment.

More detailed results of IV estimation in Table 2 including first stage results are reported in Table A4 and A5 in the Appendix. Similar to results of the overall unemployment estimations, the instruments are positive and significant for both measures of fiscal decentralization and the instrument validity tests show similar strength and consistency using the same statistical analysis as in the case of the overall unemployment.

Table 2. IV Estimation of the Impact of Fiscal Decentralization on Cyclical versus Structural Unemployment Using HP Decomposition

Variables	Cyclical Unemployment		Structural Unemployment	
	Expenditure	Revenue	Expenditure	Revenue
Expenditure Decentralization	0.011 (0.015)		-0.081** (0.034)	
Revenue Decentralization		-0.009 (0.015)		-0.049* (0.027)
Inflation	-0.003 (0.019)	-0.011 (0.022)	0.021 (0.029)	0.035 (0.027)
Trade Openness	0.003 (0.006)	-0.001 (0.006)	-0.024** (0.012)	-0.015 (0.010)
Labor force with Basic Education	0.086*** (0.025)	0.101*** (0.027)	0.229** (0.104)	0.214** (0.100)
Labor force with Intermediate Education	0.054 (0.053)	0.039 (0.048)	0.326* (0.174)	0.362** (0.163)
Labor force with Advanced Education	0.052 (0.072)	0.037 (0.064)	0.030 (0.132)	0.054 (0.113)
Dummy for Unemployment benefit	-1.044** (0.448)	-0.891** (0.396)	2.441*** (0.880)	1.982*** (0.682)
Dummy for OECD	0.240 (0.279)	0.314 (0.266)	0.501 (0.682)	0.174 (0.612)
Constant	-1.628** (0.727)	-1.036 (0.668)	3.037** (1.444)	1.950 (1.243)
Observations	507	507	507	507
R-squared	0.179	0.204	0.614	0.728

Robust standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

5.3 *Robustness checks*

In this section we provide several robustness checks of the main results. To address any potential nonlinear relationship between fiscal decentralization and unemployment rates, we introduce the log form for the unemployment rates (the dependent variable). We do not find any plausible evidence of non-linearity. Again, here, we find that the instruments are valid and non-weak in the first stage. Fiscal decentralization still has considerable impact on the reduction of unemployment rates of countries (see Table A6).

We also test another measure of decentralization, the regional authority index (RAI) produced by Hooghe et al. (2016). This is a test of the strength of our results to alternative measures of decentralization. Our results are robust to this specification. The impact of decentralization on unemployment remains significant and directionally consistency as can be seen from Table A7 in the appendix.

Next, we also report IV estimation of the impact of fiscal decentralization on structural and cyclical unemployment using the Baxter-King (BK) decomposition (Table A8). We again observe an insignificant impact on cyclical unemployment. Although the revenue decentralization significance decreases beyond 10-percent confidence level, we observe a significant impact of expenditure decentralization on structural unemployment similar to HB decomposition.

Additionally, we explore the potential of a joint impact of revenue and expenditure decentralization. Although expenditure and revenue decentralization frequently go hand in hand, they address and measure fundamentally different aspects of fiscal decentralization and capture different mechanisms of the impact of fiscal decentralization on economic growth (Martinez-

Vazquez and Timofeev, 2010). We run IV regressions using the alternative decentralization measures as one of the controls. From the results (Table A9), when we include the other fiscal decentralization variable in the first and second stages, we find out that that fiscal decentralization variable is highly significant in the first stage while none of the decentralization variables is significant in the second stage.

Following the argument of Canavire-Bacarreza et al. (2020), this result suggests that overall, fiscal decentralization efforts go hand in hand, and when a country decides to decentralize, it decentralizes both expenditure and revenue components of the budget, although most often there is more expenditure than revenue decentralization. At the same time, because of the high correlation between the two measures of decentralization, the second stage results suffer from multicollinearity and do not yield any meaningful results. In other words, while they are highly correlated, it makes sense to study them separately to identify the separate mechanism through which fiscal decentralization affects unemployment.

Next, we run checks on how sensitive our baseline results are to the inclusion of new covariates. Specifically, we introduce the exchange rate and gross domestic product as covariates and re-estimate our baseline model. The results are reported in Table A10 in the Appendix. Both revenue and expenditure decentralizations still have a significant effect on unemployment reduction.

6. Conclusion

Unemployment is one of the major macroeconomic issues that can be prevalent in both developed and developing countries. Structural unemployment is generally more prevalent in developing countries and thus, the governments of these countries typically search for a variety of policies that could create avenues to decrease it. Therefore, any policy that results in the reduction

of the level of structural unemployment tends to be considered seriously. There have been recent arguments in the literature that fiscal decentralization can act as a mechanism to improve macroeconomic stability, especially when it is properly designed. On the other hand, there has been a more traditional argument that decentralization may impede the ability of central governments to implement stabilization policies while subnational governments may tend to act recklessly and a lack of fiscal discipline.

The long-standing issue is, therefore, finding the optimal level of monitoring and control from the central government without encroaching on the fiscal autonomy of subnational governments. The results obtained in this paper offer support to the side of the literature which finds that fiscal decentralization can contribute to improved macroeconomic stability, at least when this is measured using the unemployment rate. Subnational governments may not have the right instruments to implement countercyclical policies, but an increased level of decentralized fiscal autonomy is shown in this paper to lead to reductions in the structural component of aggregate unemployment. The significant policy implication of this paper is that policymakers should consider fiscal decentralization as one of the potential solutions to the problem of high structural unemployment rates.

References

- Akai, N. and Sakata, M. (2002). Fiscal decentralization contributes to economic growth: evidence from state-level cross-section data for the United States. *Journal of Urban Economics* 52(1): 93–108.
- Alesina, A., Baqir, R., Easterly, W. (2000). Redistributive public employment. *Journal of Urban Economics* 48(2): 219–241.
- Applegate, J., Chiem, P. and Sanders, C. (2014). *Education and Unemployment Rates Before and after the Great Recession*.
- Arpaia, A., Kiss, A. and Turrini, A. (2014). Is unemployment structural or cyclical? main features of job matching in the EU after the crisis. IZA Policy Paper No. 91.
- Arzaghi, M. and Henderson, J.V. (2005). Why countries are fiscally decentralizing. *Journal of Public Economics* 89(7): 1157–1189
- Ashworth, J., Galli, E., and Padovano, F. (2013). Decentralization as a Constraint to Leviathan: A Panel Cointegration Analysis. *Public Choice*, 156: 491–516.
- Bairagya, I. (2015). Socio economic determinants of educated unemployment in India. Working Papers 343, Institute for Social and Economic Change, Bangalore.
- Bardhan, P. K. and Dilip M. (2000). Capture and Governance at Local and National Levels. *American Economic Review*, 90(2): 135-139.
- Barro, R. (2010, August 13). The folly of subsidizing Unemployment. *Wall Street Journal*.
- Baskaran, T. and Feld, L. P. (2009). Fiscal decentralization and economic growth in OECD countries: is there a relationship. CESifo Working Paper No. 2721.
- Battaglini, M. and Coate, S. (2016). A political economy theory of fiscal policy and unemployment. *Journal of the European Economic Association* 14(2): 303-337.
- Bausman, K. and Goe, W.R. (2004). An examination of the link between employment volatility and the spatial distribution of property crime rates. *American Journal of Economics and Sociology* 63(3): 665–696.
- Baxter, M., and King, R. (1999). Measuring business cycles: approximate band-pass filters for economic time series. *The Review of Economics and Statistics* 81(4): 575–593.
- Berma, E., Callen, M., Felner, J.H., and Shapiro, J.N. (2011). Do working men rebel? insurgency and unemployment in Afghanistan, Iraq, and the Philippines. *Journal of Conflict Resolution* 55(4): 496–528.
- Black, F. (1982). General equilibrium and business cycles. National Bureau of Economic Research Working Paper No. 950.
- Bodman, P., Heaton, K., and Hodge, A. (2009). Fiscal decentralization and economic growth: a Bayesian model averaging approach. MRG Discussion Paper Series No 3509.
- Brennan, G. and Buchanan, J. (1980). *The Power to Tax: Analytical Foundations of a Fiscal Constitution*. Cambridge University Press.

- Burdekin, R. C. K., Denzau, T., Keil, M. W., Sillihyot, T. and Willett, T. (2004). When Does Inflation Hurt Economic Growth? Different Nonlinearities for Different Economies. *Journal of Macroeconomics* 26(3): 519-532.
- Canavire-Bacarreza, G., Martinez-Vazquez, J and Yedgenov, B. (2017). Reexamining the determinants of fiscal decentralization: what is the role of geography? *Journal of Economic Geography* 17(6): 1209–1249.
- Card, D. and Levine, P. (2000). Extended Benefits and the Duration of UI Spells: Evidence from the New Jersey Extended Benefit Program. *Journal of Public Economics* 78(1): 107–138.
- Chang, J. and Wu, C. (2012). Crime, job searches, and economic growth. *Atlantic Economic Journal* 40(1): 3–19.
- Craig, W.R. and Xueda, S. (2011). The impact of education on unemployment incidence and re-employment success: evidence from the U.S. labor market. *Labor Economics* 18(4): 453–463.
- Cramer, C. and Richards, P. (2011). Violence and war in agrarian perspective. *Journal of Agrarian Change* 11: 277–297.
- Cutler, D. M., Huang W., and Lleras-Muney, A. (2015). When does education matter? The protective effect of education for cohorts graduating in bad times. *Social Science and Medicine* 127, 63–73.
- Dillinger, W., Perry, G. and Burki, S. (1999). Beyond the center: decentralizing the state. World Bank Latin American and Caribbean Studies. Prepublication Conference Edition.
- Dillinger, W and Webb, S. (1999). Fiscal management in federal democracies: Argentina and Brazil. The World Bank Latin America and the Caribbean Region Poverty Reduction and Economic Management. Policy Research working paper No. 2121.
- Ebel, R.D. and Yilmaz, S. (2002). On the measurement and impact of fiscal decentralization. Policy Research Working Paper No. 2809.
- Enikolopov, R. and Zhuravskaya, E. (2007). Decentralization and political institutions. *Journal of Public Economics* 91(11-12): 2261–2290.
- Farooq, A, A Kugler and U Muratori (2020). Do Unemployment Insurance Benefits Improve Match Quality? Evidence from Recent U.S. Recessions. NBER Working Paper No. 27574.
- Farré, L., Fasani, F. and Mueller, H. (2018). Feeling useless: the effect of unemployment on mental health in the Great Recession. *IZA Journal of Labor Econ* 7(1): 1–34.
- Feltenstein, A. and Iwata, S. (2005). Decentralization and macroeconomic performance in China: regional autonomy has its costs. *Journal of Development Economics* 76(2): 481–501.
- Frankel, M., and Gil M. (1998). Inflation and endogenous technological growth. Macroeconomics 9808001. University Library of Munich, Germany.
- Gemmell, N., Kneller, R. and Sanz, I. (2013). Fiscal decentralization and economic growth: spending versus revenue decentralization. *Economic Inquiry* 51(4): 1915–1931.

- Gimpelson, V. and Treisman, D. (2002). Fiscal games and public employment: a theory with evidence from Russia. *World Politics* 54(2):145–83.
- Gordon, R. H. (2001). Taxes and privatization. CEPR Discussion Papers No. 2977.
- Gramlich, E. (1993). A policymaker's guide to fiscal decentralization. *National Tax Journal* 46(2): 229–235.
- Grossman, P.J. (1989). Fiscal Decentralization and Government Size: An Extension. *Public Choice*, 62:63–69.
- Habibi, N., Huang, C., Miranda, D., Murillo, V., Ranis, G., and Sarkar, M. (2003). Decentralization and human development in Argentina. *Journal of Human Development* 4(1): 73–101.
- Harvey, A. (1985). Trends and cycles in macroeconomic time series. *Journal of Business and Economic Statistics* 3(3): 216–227.
- Imi, A. (2005). Decentralization and economic growth revisited: an empirical note. *Journal of Urban Economics* 57(3): 449–461.
- Ivanyna, M. and Shah, A. (2012). How close is your government to its people? Worldwide indicators on localization and decentralization. Policy Research Working Paper No. 6138.
- ILO. (2013). *Global Employment Trends*. Geneva: International Labour Organization.
- ILO. (2018). *World Employment and Social Outlook: Trends 2018*. Geneva: International Labour Organization.
- International Monetary Fund. *Government Finance Statistics Manual 2001*. Washington DC: IMF, 2001.
- Iqbal, N. and Saima, N. (2010). Fiscal decentralization and macroeconomic stability: theory and evidence from Pakistan. Unpublished. MPRA.
- Jin, J. and Zou. H. (2002). How does fiscal decentralization affect aggregate, national and subnational government size? *Journal of Urban Economics* 52(2): 270–293.
- Lago-Peñas, S., Martinez-Vazquez, J. and Sacchi, A. (2020). Fiscal stability during the Great Recession: putting decentralization design to the test, *Regional Studies*, Taylor and Francis Journals 54(7): 919–930.
- Latsou, D. and Geitona, M. (2018). The effects of unemployment and economic distress on depression symptoms. *Mater Sociomed* 30(3): 180–184.
- Letelier, L. (2005). Explaining fiscal decentralization. *Public Finance Review* 33(2): 155–183
- Li, S., Whalley, J., and Xing, C. (2014). China's higher education expansion and unemployment of college graduates. *China Economic Review*, 30(1): 567–582.
- Liberati, P., and Sacchi, A. (2013). Tax decentralization and local government size. *Public Choice*, 157:183–205.
- Lilien, D. M. (1982). Sectoral shifts and cyclical unemployment. *Journal of Political Economy* 90(4): 777–793.

- Lin, J. Y. and Liu, Z. (2000). Fiscal decentralization and economic growth in China. *Economic Development and Cultural Change* 49(1): 1–21.
- Linn, M.W, Sandifer, R. and Stein, S. (1985). Effects of unemployment on mental and physical health. *Am Journal Public Health* 75(5): 502–506.
- Makreshanska, S., and Petrevski, G. (2019). Fiscal Decentralization and Government Size: Evidence from a Panel of European Countries. *Hacienda Pública Española*. 229. 33–58.
- Malik, M. H. (1988). Some new evidence on the incidence of poverty in Pakistan. *The Pakistan Development Review* 27(4): 509–516.
- Marimon, R. and Zilibotti, F. (1999). Unemployment versus mismatch of talents: reconsidering unemployment benefits. *Economic Journal, Royal Economic Society* 109(455): 266–291.
- Martínez-Vázquez, J. and McNab, R.M. (2006). Fiscal decentralization, macrostability and growth. *Hacienda Pública Española / Review of Public Economics, IEF* 179(4): 25–49.
- Martinez-Vazquez, J. and Timofeev, A. (2010). Decentralization measures revisited. *Public Finance and Management* 10 (1).
- Martinez- Vazquez, J. and Yao, M. (2009). Fiscal decentralization and public sector employment: a cross-country analysis. *Public Finance Review* 37(5): 539–571.
- Martinez-Vazquez, Jorge, Santiago Lago-Peñas, and Agnese Sachi. (2017). “The Impact of Fiscal Decentralization: A Survey.” *Journal of Economic Surveys* 31, no. 4: 1095–129.
- Mocan, H.N. (1999). Structural unemployment, cyclical Unemployment, and income inequality. *The Review of Economics and Statistics* 81(1): 122–134.
- Muhammad, Z.F., Mumtaz, A.C. and Fahad, N.A. (2012). The impact of fiscal decentralization, inequality, and poverty on employment: evidence from Pakistan. *Pakistan Journal of Social Sciences* 32(2): 357–369.
- Musgrave, R. (1939). The voluntary exchange theory of public economy. *The Quarterly Journal of Economics* 53(2): 213–237.
- Nekoei, A. and Weber, A. (2017). Does Extending Unemployment Benefits Improve Job Quality? *American Economic Review* 104(2): 527–561.
- Neyapti, B. (2010). Fiscal decentralization and deficits: international evidence. *European Journal of Political Economy* 26(2): 155–166.
- Neyapti, B. (2013). Fiscal decentralization, fiscal rules, and fiscal discipline. *Economics Letters* 121(3): 528–532.
- Norström, F., Waenerlund, A., Lindholm, L., Nygren, R., Sahlen, K. and Brydsten, A. (2019). Does unemployment contribute to poorer health-related quality of life among Swedish adults? *BMC Public Health* 19(1).
- Oates, W. E. (1972). *Fiscal Federalism*. Hamshire, England: Harcourt Brace Jovanovich.
- Oates, W. E. (1985). Searching for Leviathan: An Empirical Study. *The American Economic Review*, 75(4): 748–757.

- Oates, W.E and Wallis, J.J. (1988). Decentralization in the public sector: an empirical study of state and local government. NBER Chapters, in: *Fiscal Federalism: Quantitative Studies*: 5–32.
- Oreopoulos, P., Page, M. and Stevens, A.H. (2008). The intergenerational effects of worker displacement. *Journal of Labor Economics* 26(3): 455–483.
- Panizza, U. (1999). On the determinants of fiscal centralization: theory and evidence. *Journal of Public Economics* 74(1): 97–139.
- Phillips, A.W. (1958). The Relation Between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom, 1861-1957. *Economica*, 25: 283–299.
- Poutvaara, P. and Wagener, A. (2004). Why is the public sector more labor-intensive? a distortionary tax argument. CESifo Working Paper Series No. 1259.
- Poutvaara, P. and Wagener, A. (2008). Why is the public sector more labor-intensive? A distortionary tax argument. *Journal of Economics* 94(2): 105–124.
- Prud'homme, R. (1995). On the dangers of decentralization. *The World Bank Research Observer*, 201–210.
- Rajaraman, I. and Saha, D. (2008). An empirical approach to the optimal size of the civil service. *Public Administration and Development* 28(3): 223–233.
- Riddell, W.C. and Song, X. (2011). The impact of education on unemployment incidence and re-employment success: evidence from the U.S. labor market. *Labor Economics*, Elsevier 18(4): 453–463.
- Rodden, J. (2003). Reviving Leviathan: Fiscal Federalism and the Growth of Government. *International Organization*, 57: 695–729.
- Rothstein, J. (2011). Unemployment insurance and job search in the Great Recession," *Brookings Papers on Economic Activity*, Economic Studies Program 43(2): 143–213.
- Sevillano, J.M.M. and Joan Rosselló-Villalonga, J. (2004). Public employment and regional redistribution in Spain. *Hacienda Pública Española / Review of Public Economics*, IEF 170(3): 59–80.
- Stein, E. (1999). Fiscal decentralization and government size in Latin America. *Journal of Applied Economics* 2(2): 357–391.
- Tatsiramos, K. and Ours, J.C. (2014). Labor market effects of unemployment insurance design. *Journal of Economic Surveys* 28(2): 284–311.
- Sepulveda, C.F. and Martinez-Vazquez, J. (2011). The consequences of fiscal decentralization on poverty and income inequality. *Environment and Planning C Government and Policy* 29(2): 321–343.
- Shah, A. (2006). Fiscal decentralization and macroeconomic management. *International Tax and Public Finance* 13(4): 437–462.
- Sonin, K. (2003). Why the rich may favor poor protection of property rights. *Journal of Comparative Economics* 31(4): 715–731.

- Steven, R. and Winter-Ember, R. (2001). Identifying the effect of unemployment on crime. *Journal of Law and Economics* 44(1): 259–283.
- Tanzi, V. and Davoodi, H.R. (1998). Corruption, public investment, and growth IMF Working Paper No. 97/139.
- Thiessen, U. (2003). Fiscal decentralization and economic growth in high-income OECD countries. *Fiscal Studies* 24(3): 237–274.
- Thornton, J. (2007). Fiscal decentralization and economic growth reconsidered. *Journal of Urban Economics* 61(1): 64–70.
- Treisman, D. (2000). Decentralization and inflation: commitment, collective action, or continuity? *American Political Science Review* 94(4): 837–857.
- Zhang, T. and Zou. (1998). Fiscal decentralization, public spending, and economic growth in China. *Journal of Public Economics* 67(2): 221–240.

Appendix

Table A1. Description and Sources of data for the variables used in regressions

Variable	Description	Source
Expenditure Decentralization	Share of subnational expenditure in total government expenditure	IMF GFS
Revenue Decentralization	Share of subnational revenue in total government revenue	IMF GFS
Inflation	change in general prices of goods relative to some base year	WDI
Trade Openness	Exports plus Imports divided by real GDP per capita in current prices	WDI
Labor force with Basic Education	Percentage of the labor force that have achieved basic education	WDI
Labor force with Intermediate Education	Percentage of the labor force that have achieved intermediate education	WDI
Labor force with Advanced Education	Percentage of the labor force that have achieved advanced education	WDI
Unemployment rate	Proportion of the labor force without employment	WDI
Dummy for the availability of unemployment benefits or social assistance	Indicates whether a particular country has unemployment benefits and social assistance programs. Some countries have it in the form of social assistance programs	Esser et al. (2013)
GFI	Geographic Fragmentation Index	Canavire-Bacarreza, Martinez-Vazquez and Yedgenov (2016)
Country size	Country area size (residual after regressing on GFI)	Canavire-Bacarreza, Martinez-Vazquez and Yedgenov (2016)

Table A2. Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Unemployment rate	1,144	8.80	6.33	0.58	44.16
Expenditure Decentralization	1,144	18.09	18.22	0	66.45
Revenue Decentralization	1,144	15.90	15.84	0	63.47
Inflation	1,144	21.21	153.62	-29.17	4107.30
Trade Openness	1,144	42.44	27.29	3.48	153.24
Gross Domestic Product (in billions)	1,144	6.53E+11	1.84E+12	32.70	1550
Exchange Rate	1,144	360.00	1269.85	0.00	10389.94
Labor force with Basic Education	565	10.77	6.87	0.31	39.21
Labor force with Intermediate Educ	553	8.76	5.54	0.86	39.03
Labor force with Advanced Education	564	5.08	3.70	0.94	30.28

Table A3 IV Estimation of the impact of fiscal decentralization including first stage

VARIABLES	(1)	(2)	(3)	(4)
	Expenditure	Decentralization	Revenue	Decentralization
	First stage	Second stage	First stage	Second stage
Expenditure Decentralization		-0.070** (0.028)		
Revenue Decentralization				-0.058** (0.026)
Geographic Fragmentation Index (GFI)	0.549 (0.515)		1.044** (0.516)	
Country Size	3.486*** (1.072)		3.763*** (1.000)	
Inflation	-0.429*** (0.147)	0.018 (0.026)	0.418*** (0.155)	0.024 (0.025)
Trade Openness	-0.203*** (0.047)	-0.020* (0.011)	-0.128** (0.052)	-0.016* (0.009)
Labor Force with Basic Education	0.519 (0.382)	0.315*** (0.102)	0.591* (0.329)	0.315*** (0.102)
Labor Force with Intermediate Education	-0.665 (0.545)	0.380** (0.152)	-0.508 (0.451)	0.401*** (0.148)
Labor Force with Advanced Education	-0.525 (0.509)	0.082 (0.090)	-0.602 (0.397)	0.091 (0.083)
Dummy for unemployment benefit	9.409** (3.892)	1.397** (0.692)	8.129*** (2.896)	1.091* (0.561)
Dummy for OECD	2.261 (3.009)	0.742 (0.533)	-0.298 (2.830)	0.488 (0.501)
Constant	7.854 (22.721)	1.409 (1.299)	-15.002 (23.793)	0.914 (1.225)
Observations	507	507	507	507
R-squared		0.820		0.852

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A4. IV Estimation of the Impact of Fiscal Decentralization on Structural Unemployment including First stage - HP Method

VARIABLES	(1)	(2)	(3)	(4)
	Expenditure First Stage	Decentralization Second Stage	Revenue First Stage	Decentralization Second Stage
Expenditure Decentralization		-0.081** (0.034)		
Revenue Decentralization				-0.049* (0.027)
Geographic Fragmentation Index	0.549 (0.515)		1.044** (0.516)	
Country Size	3.486*** (1.072)		3.763*** (1.000)	
Inflation	-0.429*** (0.147)	0.021 (0.029)	-0.418*** (0.155)	0.035 (0.027)
Trade Openness	-0.203*** (0.047)	-0.024** (0.012)	-0.128** (0.052)	-0.015 (0.010)
Labor Force with Basic Education	0.519 (0.382)	0.229** (0.104)	0.591* (0.329)	0.214** (0.100)
Labor Force with Intermediate Education	-0.665 (0.545)	0.326* (0.174)	-0.508 (0.451)	0.362** (0.163)
Labor Force with Advanced Education	-0.525 (0.509)	0.030 (0.132)	-0.602 (0.397)	0.054 (0.113)
Dummy for Unemployment benefit	9.409** (3.892)	2.441*** (0.880)	8.129*** (2.896)	1.982*** (0.682)
Dummy for OECD	2.261 (3.009)	0.501 (0.682)	-0.298 (2.830)	0.174 (0.612)
Constant	7.854 (22.721)	3.037** (1.444)	-15.002 (23.793)	1.950 (1.243)
Observations	507	507	507	507
R-squared		0.614		0.728

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A5. IV Estimation of the impact of Fiscal Decentralization on Cyclical Unemployment including First stage - HP Method

Variables	(1)	(2)	(3)	(4)
	Expenditure First Stage	Decentralization Second Stage	Revenue First Stage	Decentralization Second Stage
Expenditure Decentralization		0.011 (0.015)		
Revenue Decentralization				-0.009 (0.015)
Geographic Fragmentation Index	0.549 (0.515)		1.044** (0.516)	
Country Size	3.486*** (1.072)		3.763*** (1.000)	
Inflation	-0.429*** (0.147)	-0.003 (0.019)	-0.418*** (0.155)	-0.011 (0.022)
Trade Openness	-0.203*** (0.047)	0.003 (0.006)	-0.128** (0.052)	-0.001 (0.006)
Labor Force with Basic Education	0.519 (0.382)	0.086*** (0.025)	0.591* (0.329)	0.101*** (0.027)
Labor Force with Intermediate Education	-0.665 (0.545)	0.054 (0.053)	-0.508 (0.451)	0.039 (0.048)
Labor Force with Advanced Education	-0.525 (0.509)	0.052 (0.072)	-0.602 (0.397)	0.037 (0.064)
Dummy for Unemployment benefit	9.409** (3.892)	-1.044** (0.448)	8.129*** (2.896)	-0.891** (0.396)
Dummy for OECD	2.261 (3.009)	0.240 (0.279)	-0.298 (2.830)	0.314 (0.266)
Constant	7.854 (22.721)	-1.628** (0.727)	-15.002 (23.793)	-1.036 (0.668)
Observations	507	507	507	507
R-squared		0.179		0.204

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A6. IV estimation of the impact of fiscal decentralization on unemployment including first stage - Log unemployment

VARIABLES	(1)	(2)	(3)	(4)
	Expenditure First stage	Decentralization Second stage	Revenue First stage	Decentralization Second stage
Expenditure Decentralization		-0.004* (0.002)		
Revenue Decentralization				-0.003 (0.002)
Geographic Fragmentation Index (GFI)	0.549 (0.515)		1.044** (0.516)	
Country Size	3.486*** (1.072)		3.763*** (1.000)	
Inflation	-0.429*** (0.147)	0.002 (0.002)	0.418*** (0.155)	0.002 (0.002)
Trade Openness	-0.203*** (0.047)	-0.001* (0.001)	-0.128** (0.052)	-0.001* (0.001)
Labor Force with Basic Education	0.519 (0.382)	0.018*** (0.004)	0.591* (0.329)	0.018*** (0.004)
Labor Force with Intermediate Education	-0.665 (0.545)	0.014** (0.005)	-0.508 (0.451)	0.015*** (0.005)
Labor Force with Advanced Education	-0.525 (0.509)	0.011** (0.004)	-0.602 (0.397)	0.011** (0.005)
Dummy for unemployment benefit	9.409** (3.892)	0.069 (0.056)	8.129*** (2.896)	0.054 (0.047)
Dummy for OECD	2.261 (3.009)	0.087** (0.036)	-0.298 (2.830)	0.073** (0.034)
Constant	7.854 (22.721)	0.485*** (0.082)	-15.002 (23.793)	0.464*** (0.077)
Observations	507	507	507	507
R-squared		0.730		0.764

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A7. IV Estimation of the impact of an alternative measure of decentralization on unemployment

VARIABLES	(1) Unemployment
Regional Authority Index	-0.056** (0.024)
Inflation	0.036 (0.027)

Trade Openness	-0.009 (0.007)
Labor Force with Basic Education	0.279*** (0.079)
Labor Force with Intermediate Education	0.308** (0.145)
Labor Force with Advanced Education	0.383*** (0.095)
Dummy for unemployment benefit	0.448 (0.634)
Dummy for OECD	1.132* (0.592)
Constant	-0.181 (1.035)
Observations	473
R-squared	0.851

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A8. BK Decomposition: Structural versus Cyclical Unemployment

VARIABLES	Cyclical	Revenue	Structural Unemployment	
	Unemployment Expenditure		Expenditure	Revenue
Expenditure Decentralization	-0.001 (0.005)		-0.047** (0.022)	
Revenue Decentralization		-0.007 (0.006)		-0.034 (0.023)
Inflation	0.007 (0.008)	0.004 (0.010)	0.018 (0.031)	0.030 (0.027)
Trade Openness	-0.005** (0.002)	-0.006** (0.002)	-0.012 (0.009)	-0.010 (0.009)
Labor force with Basic Education	0.034*** (0.010)	0.039*** (0.011)	0.296*** (0.107)	0.288*** (0.104)
Labor force with Intermediate Education	-0.004 (0.018)	-0.008 (0.018)	0.345** (0.155)	0.373** (0.148)
Labor force with Advanced Education	0.024 (0.023)	0.020 (0.023)	0.013 (0.104)	0.013 (0.096)
Dummy for Unemployment benefit	-0.267* (0.150)	-0.231 (0.152)	1.602** (0.731)	1.252** (0.614)
Dummy for OECD	0.072 (0.115)	0.074 (0.121)		
Constant	-0.193 (0.204)	-0.024 (0.243)	1.824 (1.230)	1.288 (1.099)
Observations	387	387	387	387
R-squared	0.121	0.100	0.813	0.832

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A9. IV Estimation of the impact of fiscal decentralization on unemployment using the other FD measure as control

VARIABLES	(1)	(2)	(3)	(4)
	ALL	COUNTRIES	Revenue	Decentralization
	Expenditure	Decentralization	First stage	Decentralization
	First stage	Second stage	First stage	Second stage
Expenditure Decentralization		-0.142 (0.106)	0.584*** (0.109)	0.039 (0.026)
Revenue Decentralization	0.827*** (0.070)	0.114 (0.094)		-0.066 (0.043)
Geographic Fragmentation Index (GFI)	-0.315 (0.290)		0.724** (0.342)	
Country Size	0.372 (0.579)		1.728** (0.784)	
Inflation	-0.083 (0.076)	0.035 (0.024)	-0.168** (0.084)	0.037* (0.021)
Trade Openness	-0.097*** (0.032)	-0.014 (0.010)	-0.009 (0.032)	-0.008 (0.007)
Labor Force with Basic Education	0.030 (0.239)	0.273*** (0.091)	0.288 (0.220)	0.295*** (0.094)
Labor Force with Intermediate Education	-0.245 (0.273)	0.389*** (0.138)	-0.120 (0.222)	0.428*** (0.137)
Labor Force with Advanced Education	-0.026 (0.213)	0.115 (0.089)	-0.296** (0.137)	0.115 (0.079)
Dummy for unemployment benefit	2.683 (2.696)	1.416 (0.924)	2.635 (2.127)	0.780 (0.536)
Dummy for OECD	2.508* (1.461)	0.907 (0.620)	-1.619 (1.605)	0.301 (0.518)
Constant	20.265* (12.110)	0.444 (1.111)	-19.587 (13.718)	-0.048 (0.998)
Observations	507	507	507	507
R-squared		0.756		0.864

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A10. IV Estimation of the impact of fiscal decentralization on unemployment with additional covariates

VARIABLES	(1)	(2)	(3)	(4)
	Expenditure	Decentralization	Revenue	Decentralization
	First stage	Second stage	First stage	Second stage
Expenditure Decentralization		-0.046** (0.020)		
Revenue Decentralization				-0.042** (0.021)
Geographic Fragmentation Index (GFI)	0.592 (0.548)		1.005* (0.547)	
Country Size	4.035*** (1.229)		4.046*** (1.092)	
Inflation	-0.410*** (0.153)	0.031 (0.020)	-0.373** (0.158)	0.034* (0.019)
Trade Openness	-0.198*** (0.048)	-0.014* (0.008)	-0.117** (0.052)	-0.012 (0.007)
Labor Force with Basic Education	0.337 (0.373)	0.276*** (0.081)	0.431 (0.326)	0.278*** (0.082)
Labor Force with Intermediate Education	-0.428 (0.557)	0.429*** (0.126)	-0.281 (0.463)	0.441*** (0.124)
Labor Force with Advanced Education	-0.473 (0.457)	0.101 (0.095)	-0.529 (0.357)	0.105 (0.093)
Gross Domestic Product	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)
Exchange Rate	-0.002*** (0.001)	-0.000** (0.000)	0.002*** (0.000)	-0.000** (0.000)
Dummy for unemployment benefit	7.933** (4.031)	0.993 (0.606)	6.468** (2.977)	0.808 (0.521)
Dummy for OECD	1.420 (3.068)	0.578 (0.543)	-1.146 (2.729)	0.411 (0.513)
Constant	8.190 (23.242)	0.979 (1.076)	-12.643 (24.556)	0.722 (1.061)
Observations	507	507	507	507
R-squared		0.862		0.873

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1