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Tiago Neves Sequeira
Alexandra Ferreira-Lopes

ISCTE - Lisbon University Institute
UNIDE - ECR
AV FORÇAS ARMADAS
1649-126 LISBON-PORTUGAL
http://erc.unide.iscte.pt

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Does a Federal Country Need Federal Transfers when it has Labour Mobility?

Tiago Neves Sequeira* and Alexandra Ferreira-Lopes†

Abstract

In this work we empirically test optimum currency area theory regarding the efficiency of two usual stabilization mechanisms for members of a given monetary union (the United States): federal transfers and migration. The US is recognized as a country where labor mobility between states is high. Despite of this flexibility in the labor market, the Federal Budget still grants some significant amount of funding to the states. Does the country need these two stabilization mechanisms to achieve cyclical convergence between the states? In this paper we jointly assess the consequences of having federal transfers and labor mobility in terms of the states' cyclical output. We conclude that federal transfers undoubtedly contribute to *increase* cyclical output. However, outmigration may *increase* or *decrease* cyclical output, depending on certain conditions. As federal transfers proved to be much more important than migration, the answer to the question in the title is 'yes'.

JEL Classification: $C33$,$E32$,$E61$,$H77$, $R23$, $O51$.

Keywords: Internal Migration, Federal Transfers, Cyclical Convergence, Panel Data, GMM.

*UBI and INOVA, UNL. sequeira@ubi.pt. Management and Economics Department. Universidade da Beira Interior. Estrada do Sineiro, 6200-209 Covilhã, Portugal. Tiago Neves Sequeira acknowledges the financial support from POCI/FCT.

†ISCTE (Lisbon University Institute), Economics Department, Economics Research Center (ERC)-UNIDE, and DINÂMIA. Avenida das Forças Armadas, 1649-026 Lisboa, Portugal. Tel.: +351 217903901; Fax: +351 217903933; E-mail: alexandra.ferreira.lopes@iscte.pt

1 Introduction

Do the USA states need both labour mobility and federal transfers as short-run insurance mechanisms? In this article we empirically test the optimum currency area theory, specifically studying the connection between federal transfers to the states, internal migration, and cyclical convergence of the states. We jointly analyse the effects of these two mechanisms on convergence of the states' cyclical output. We address this problem considering only the short-run dynamics.

Optimum currency area theory with seminal papers by Mundell (1961), Mackinnon (1963), and Kenen (1969) strongly emphasizes the role of labour mobility and the federal budget in stabilizing asymmetric shocks between regions, i.e., in achieving a robust positive business cycle correlation between the members of a given monetary union. In the current debate about the construction project of the European Monetary Union (EMU) the argument in favour of a bigger Union budget stands by the reasoning that labour mobility in the EMU space is low, and since monetary policy is no longer the responsibility of domestic central banks, and fiscal policy is restrained by the Stability and Growth Pact, the Union budget needs to be bigger to smooth possible asymmetric shocks. Labour mobility may contribute to cyclical convergence as the outflow of workers from poor regions to rich ones can alleviate regions in recession. However, when labour mobility is residual, governments may contribute to cyclical convergence between poor and rich regions. This is the aim of transfers from central governments to local authorities all over the world. While labour mobility is a natural market mechanism of adjustment, federal transfers are an institutional mechanism. So, in theoretical terms these two stabilization mechanisms can be substitutes for each other and not complements. Since the EMU is a recent construction, we test this hypothesis on an older monetary union, the USA.

Labour mobility in the United States is usually high. So does the Federal Government still needs to grant this funding to the states? This is an important question to study, since money from federal transfers, if proved inefficient, can be used for other purposes. In the USA, the system grants-in-aid paid out around 418 billion dollars for such different aims as health, highways, and education. In 2004, for example, a significant amount of funding was directed to some existing emergency preparedness programmes.[1] The events of 9/11 and Hurricane Katrina are good examples in which this theory can be used for analysis, since the states involved in these events suffered substantial output fluctuations. In the case of 9/11, the city of New York suffered a significant decline in output and received help from federal transfers, but labour mobility to other states was not very expressive. In the case of Hurricane Katrina, both federal transfers and migration to other states were significant.

This topic has also been a concern of other studies, at both the theoretical and empirical levels. A theoretical study that closely addresses our problem is Wildasin (1995), which emphasizes the role of migration as a potential insurance mechanism against an asymmetrical shock, making, in certain conditions, a redistributive system useless and potentially harmful for the incentive to migrate. Perotti

[1] See, for instance, Cato Institute (2004), Tax and Budget Bulletin, N.20 for the rise in expenditures in grants and on its political motivations. For a historical evolution of the Grants System see Canada (2003) and Boyd (1997).

(2001) discusses the relationship between fiscal federalism and factor mobility and the implications of the results for the case of the EU in a theoretical model. Results suggest that a higher degree of centralization of social expenditures is inefficient, unless mobility of production factors is high. In a survey of the literature, Boadway (2004) concludes that transfers are a determinant of the efficiency in labour allocation across regions, which has been the main focus of the literature on this topic, which is also studied in Boadway et al. (1998), who analyse the fiscal externality that arises with fiscal policy decentralization when labour mobility is present. On the effect of labour mobility on convergence, Rappaport (2005) concluded that outmigration directly contributes to faster income convergence, but also creates a disincentive for gross capital investment that can overcome the positive effect in low income states.

At the empirical level, literature about this topic is not very extensive and seems to have focused mostly on the long-run relationship between migration and convergence, transfers and convergence, or transfers and migration. Results on the influence of migration in convergence or federal transfers in convergence differ greatly across different studies, according to the different countries or periods analysed or according to the methods employed. Thus, most of these works do not study federal transfers and internal migration jointly as potential substitute insurance mechanisms and instruments to achieve cyclical convergence, as does our study. Also, our work tries to assess which of the main components of federal transfers are more important.[2]

For the United States there are some studies that analyse the relationship between transfers and insurance against asymmetric shocks, hence placing their main focus on short-run issues, although not including migration. Sala-i-Martin and Sachs (1992) find that federal tax reductions contribute much more to insuring the state against regional economic shocks than does an increase in federal transfers. Bayoumi and Masson (1995) study fiscal transfers in the regions of the USA and Canada in terms of both the long term (i.e., the redistributive role of the federal budget) and in the short-term (i.e., the insurance/stabilization role of the federal budget) and compare it to the redistributive component of the structural funds of the EU. They find that the redistributive component in Canada and the US is much larger than the amounts provided by the EU structural funds, but the stabilization component of national fiscal policies of EU member-states has been as effective as federal taxes and transfers in the cases of the US and Canada. Asdrubali et al. (1996) study the channels of risk sharing between the states of the US, and find that the federal government contributes 13 percent to the smoothing of shocks to the gross state product. Fatás (1998) discusses the introduction of federalism in Europe and compares it with the USA. The author estimates the interregional insurance benefits provided by a federation, using measures of volatility and correlation for, and between, the US states. He then applies

[2] Some works study the effect of internal migration and federal transfers in convergence outside the USA. Some concentrate on the first relationship: Helliwell (1996) for Canada, Saracoglu and Kirdar (2006) for Turkey, Shioji (2001) for Japan, and Barro and Sala-i-Martin (1991) make a comparison between countries and regions of Europe with the states of the US. Some others concentrate on the second relationship: Kaufman et al. (1997) and DeJuan and Tomljanovich (2005) for the Canadian provinces. Cashin and Sahay (1995) study separately the effects of grants and internal migration for convergence of the states of India. Obstfeld and Peri (1998) compare the US with Germany, Italy, the UK, and Canada regarding several labor and financial markets indicators. Mélitz and Zumer (1999) compare risk-sharing between regions, either within a country or between countries for the EMU country member-states.

the same methodology to the European Union countries and compares to those of the USA. He finds that previous studies had overestimated the benefits of stabilization provided by the US federal budget and also finds evidence that national tax systems have the power to provide more than 50 percent of the degree of insurance that a European federation would. Moreover, business cycle correlation between European economies is increasing, reducing the need for insurance tax instruments.

The work of Blanchard and Katz (1992) addresses the latter relationship and finds that internal migration is an important stabilization mechanism in the short run whenever there is a negative demand or supply shock. Barro and Sala-i-Martin (1995) reported a non-significant relationship between migration and long-run convergence. In their words "contrary to expectations, the estimate of β does not diminish when the net migration rate is held constant". Fishback et al. (2005) discuss the impact of federal programmes on internal migration on a county level, using the New Deal (1930-1940) as their reference period. They find a positive correlation between allocation of money to a state and internal migration to that state.

Our study sheds light on the efficiency of having two stabilization or cyclical convergence instruments, such as federal transfers and internal migration, to achieve business cycle convergence between the states, and, to our knowledge, no study so far has done this for the United States. This paper is divided into five sections. In Section Two we present the data and methods used in the estimations. Section Three analyses the effects of transfers and migration in the cyclical output level and in cyclical output convergence. Section Four presents the results on the influence of different components of transfers in cyclical output and convergence. Finally, in Section Five, we present the conclusions and comment on future work.

2 Data and Methods

2.1 Data

We have collected annual data for the 50 US states between 1987 and 2004 (900 observations). We excluded the District of Columbia, as it may be considered an outlier, because it is richer than the states, but also is clearly an outlier in migration data. We use several sources to obtain the data needed for this study. Personal income and gross state product are from the Regional Economic Accounts of the Bureau of Economic Analysis (BEA). Total expenditures by state government are from the State Government Finances of the Census Bureau. Federal transfers were obtained from the Consolidated Federal Funds Report (CFFR) CD edition.[3] The stock of physical capital and investment were taken from Garofalo and Yamarik (2000), and we have completed the series for 2001 to 2004, assuming that for these three years the growth rate of the previous five years is maintained. Finally, total US population, population for the states, and internal migration by states were taken from the Census Bureau.

[3] These data were supplied directly by the Census Bureau.

Data were subject to treatment in order to obtain the following main variables:

1. *Per capita* state cyclical output (yc) - this variable is defined as the cyclical component of state *per capita* output. Gross state product at 2000 prices is used for output (in logs), and was detrended using the Hodrick-Prescott filter with a smoothing parameter of 100, as usual in annual data. Cyclical output for each state is obtained by subtracting the output trend from the real output series.

2. *Per capita* union cyclical output (yc_usa) - this variable is defined as the cyclical component of the union *per capita* output. Gross domestic product at 2000 prices is used for output (in logs), and was detrended using the Hodrick-Prescott filter with a smoothing parameter of 100, as usual in annual data. Cyclical output for the USA is obtained by subtracting from the real output series the output trend obtained.

3. Transfers (fed_pi) - this is the total annual federal government transfers to each state as a proportion of the total personal nominal income of the state. Alternative measures are federal transfers as a proportion of gross domestic product (fed_gsp) and as a proportion of total state expenditures ($fed\_$ exp). For this last variable, data are available from 1992 on only, due to data availability for total state expenditures. The main possible problem with the first way to measure federal transfers is that personal income already includes transfers related to retirement and disability payments for individuals, other direct payments for individuals, or other. We construct three variables relating to federal transfers as earlier studies reported different results when measuring the same concept (federal transfers) in different ways. Thus we wish to provide robustness analysis on this.

4. Net internal migration (mig)- this is the net annual outflows of migrants from each state to other US states as a proportion of the labour force. Hereinafter we shall define this variable as migration.

In Table 1 we present descriptive statistics for the variables described above. These figures are based on time-series cross-section data.

Table 1 - Overview of the Data

	Average	S.D.	Min.	Max.
Variables				
State Cyclical Output per capita (yc)	-0.001	0.036	-0.183	0.124
Union Cyclical Output per capita (yc_usa)	-0.000	0.029	-0.044	0.062
Federal Transfers / Personal Income (fed_pi)	0.235	0.055	0.135	0.491
Federal Transfers / Gross State Product (fed_gsp)	0.191	0.047	0.096	0.370
Federal Transfers / Total State Gov. Expend. (fed_exp)	0.158	0.038	0.076	0.304
Net Internal Migration / labour Force (mig)	0.001	0.022	-0.197	0.118

Sources: CFFR, BEA, and Census Bureau. For the variable *fed_ exp* only 650 observations are available, for the period between 1992-2004.

In the next table we show contemporaneous and lagged correlations between cyclical output, federal transfers, and migration.

Table 2 - Correlations

Variables	yc	yc_usa	fed_pi	mig	fed_pi$_{t-1}$	mig$_{t-1}$	fed_pi$_{t-2}$	mig$_{t-2}$
yc	1							
yc_usa	0.72***	1						
fed_pi	-0.11***	-0.07**	1					
mig	-0.03	0.01	0.02	1				
fed_pi$_{t-1}$	-0.08**	-0.11***	0.97***	0.00	1			
mig$_{t-1}$	-0.08**	-0.02	0.04	-0.37***	0.03	1		
fed_pi$_{t-2}$	-0.07*	-0.18***	0.94***	0.00	0.97***	0.01	1	
mig$_{t-2}$	-0.06	-0.06*	0.07*	0.27***	0.05	0.36***	0.03	1

Note: Significance levels are indicated at 1% (***), 5% (**), and 10% (*) levels.

Table 2 - Correlations (Cont.)

Variables	fed_pi$_{t-3}$	mig$_{t-3}$	fed_pi$_{t-4}$	mig$_{t-4}$	fed_pi$_{t-5}$	mig$_{t-5}$	fed_pi$_{t-6}$	mig$_{t-6}$
yc	0.02	-0.04	0.09**	-0.03	0.11***	0.02	0.09**	0.04
yc_usa	-0.14***	-0.05	-0.06*	-0.06*	-0.04	-0.05	-0.02	-0.03
fed_pi	0.91***	0.07*	0.89***	0.06	0.86***	0.06	0.84***	0.05
mig	-0.02	0.25***	-0.01	0.24*	-0.03	0.20***	-0.02	0.27***
fed_pi$_{t-1}$	0.94***	0.07*	0.91***	0.06	0.89***	0.06	0.87***	0.04
mig$_{t-1}$	-0.01	0.26***	-0.02	0.24***	-0.01	0.24***	-0.02	0.19***
fed_pi$_{t-2}$	0.97***	0.05	0.94***	0.06	0.92***	0.06	0.90***	0.04
mig$_{t-2}$	0.01	0.35***	0.01	0.26***	-0.02	0.24***	-0.01	0.23***
fed_pi$_{t-3}$	1	0.03	0.97***	0.04	0.94***	0.06	0.92***	0.04
mig$_{t-3}$		1	0.01	0.34***	0.00	0.26***	-0.02	0.23***
fed_pi$_{t-4}$			1	0.02	0.97***	0.04	0.94***	0.05
mig$_{t-4}$				1	-0.00	0.34***	-0.00	0.24***
fed_pi$_{t-5}$					1	0.02	0.97***	-0.03
mig$_{t-5}$						1	-0.00	0.34***
fed_pi$_{t-6}$							1	0.01
mig$_{t-6}$								1

Note: Significance levels are indicated at 1% (***), 5% (**), and 10% (*) levels.

It can be observed from Table 2 that correlation between cyclical output and transfers is negative and significant at the usual levels when fed is lagged one and two periods and that the correlation between migration and cyclical output is negative and significant at the usual levels when migration is lagged one period. Looking at current correlations one can say that it seems that the state receives more in federal transfers when it faces a recession, as the correlation between cyclical output and transfers is negative. However, there is no evidence that people migrate in the same period in which the state faces a recession, as current correlation is non-significant.

It also seems that people stay in states that receive more from the federal government, since correlations between federal transfers and migration are non-significant. Federal transfers are highly autocorrelated, as correlations between different lags of this variable are high (near 0.90). Migration is less autocorrelated as correlations between current level and successive lags are near 0.30 but highly significant. These figures show measures that can be influenced by causality, e.g., we do not know if

people migrate because the state is facing a recession or the fact that people migrate influences the onset of recession. More important than that for our empirical strategy is the fact that the correlation between migration and federal transfers are always below 0.40, which does not raise much concern about collinearity between these two variables, when both enter in regressions.

2.2 Specification

As noted above, we intend to evaluate the joint effect of federal transfers and migration in the cyclical output of USA states. These are not the only variables that potentially influence the business cycle, but they are alternative mechanisms to achieve short-run convergence between the states. A particularly important variable to take into account is investment in physical capital, as this is the traditional source of short-run convergence.[4] As we are not concerned with long-run growth, determinants of economies' long-run performance, such as human capital or technology, are not included in the regressions. As state cyclical output may be influenced by nationwide cyclical output, we introduce this variable in the regression. However, the method used, which will described in detail below, is robust to further omitted variables that we are not introducing in the regression.

We perform the following empirical strategy. First, we evaluate the possible existence of unit-roots in the cyclical output, federal transfers, and migration series, which we immediately disregard from high negative values of the panel-ADF tests for the three variables, using tests by Levin and Lin (1993) and Im, Pesaran, and Shin (2003). This result determines that we proceed with stationary econometrics.

We use the following alternative benchmark specifications, with different lag structures that we explain below:

$$yc_{i,t} = \alpha + \beta_1 yc_{i,t-1} + \beta_2 i/k_{i,t-1} + \beta_3 y\_usa_{i,t} + \beta_4 fed\_x_{i,t-2} + \beta_5 mig_{i,t-2} + \upsilon'_{i,t} \quad (1)$$

$$yc_{i,t} = \alpha + \beta_1 yc_{i,t-1} + \beta_2 i/k_{i,t-1} + \beta_3 y\_usa_{i,t} + \beta_4 fed\_x_{i,t-2} + \beta_5 mig_{i,t-3} + \upsilon''_{i,t} \quad (2)$$

$$yc_{i,t} = \alpha + \beta_1 yc_{i,t-1} + \beta_2 i/k_{i,t-1} + \beta_3 y\_usa_{i,t} + \beta_4 fed\_x_{i,t-3} + \beta_5 mig_{i,t-3} + \upsilon'''_{i,t} \quad (3)$$

where $\upsilon'_{i,t} = u'_i + \varepsilon'_{i,t}$, $t = 1987, 1994, ..., 2004$; $i = 1, 2, ..., 50$, $x = pi, gsp, \exp$ is the variable used to measure federal transfers as a proportion, i/k is the investment-capital ratio that we use as a control, u_i is the fixed-effect by state, and $\varepsilon_{i,t}$ is the error term.

As one of the main issues in this empirical study is causality, we implemented regressions with different lag structures. We begin by considering two lags for both of the two explanatory variables, federal transfers and migration. As is clear from Table 2, there is a negative and significant relationship between outflows of migrants in $t-1$ and cyclical output in t. This may mean that forward looking agents predict a higher point in the business cycle in one state and migrate to that state. The same

[4] In the Solow Model for example, the unique source for transitional dynamics is the investment rate.

occurs in federal transfers: a negative correlation may mean that federal government predicts a good phase of the cycle and reduces the transfer amount accordingly from the previous period. To avoid reverse causality effects, we use the described lag structure for the benchmark analysis. We have also tested the one-lag and fourth to seventh lags' specifications. The significance of coefficients only begin to change appreciably when we introduce the seventh lag. A summary of results and discussion is made below on a specific sub-section.

2.3 Methods

One of the most serious problems when studying the relationship between federal transfers, migration, and cyclical output is the endogeneity of the right-hand-side variables, caused by possible reverse causality, omitted variables, and measurement errors. Particularly, the first two problems can seriously affect these relationships. The amount of transfers given to the states can be determined by the state's level of income or its relative position in the business cycle, but it can also further determine the evolution of the cycle. The amount given to a state can also influence the decision whether to migrate or not. Measurement error can also affect our database.

One omitted variable that can influence cyclical output and federal trasnfers to each state is the political influence of a state's politicians in the central government, which changes over time through the alternation of republicans and democrats in charge, both in each state and in Washington D.C. Migration is also thought to be determined by some fixed state effects: geographic location and features such as climate, frequency of natural disasters, amongst others.

In order to deal with the various types of endogeneity of right-hand-side variables described above in an application where the dependent variable is not so persistent and the time-series available is not so small, the appropriate method is the Generalized Method of Moments (GMM) developed by Arellano and Bond (1991). Under the assumptions that: (a) the error term is not serially correlated and (b) the explanatory variables are weakly exogenous (i.e., the explanatory variables are assumed to be uncorrelated with future realizations of the error term), the GMM dynamic panel uses the following moment conditions: $E[ycv_{i,t-s}\Delta\varepsilon_{i,t}] = 0$ and $E[X_{i,t-s}\Delta\varepsilon_{i,t}] = 0$, for $s \geq 2; t = 3, ..., T;\ i = 1, ..., N$, where X is the complete matrix of covariates included in (1)-(3). These moment conditions indicate that the level of past values for cyclical output, migration, and federal transfers should not be correlated with contemporaneous differences in non-observed determinants of the cycle. Take as an example the possibility that the omitted variable political influence of the state politicians increases from 2003 to 2004, which would enter in $\Delta\varepsilon$. Is it natural to think that this change influences the transfers received or the outflow of workers in the state in 2001 (which enter in X)? The answer to this question is "No"!

All variables are treated as endogenous, which means that their first differences are instrumented with available lags of their own levels. In order to decrease the occurrence of overfitting bias, we have proceeded in the following way: (1) we have collapsed the instruments matrix, following many earlier empirical contributions in other economic fields (e.g. Levine *et al.*, 2000) and (2) we have also reduced the number of lags entered as instruments, so that the number of instruments is kept near 50 (the

number of states). This procedure was suggested by Bowsher (2002). In a sensitivity test we further reduce the number of instruments.

Consistency of the GMM estimator depends on the validity of the instruments. To address this issue we consider three specification tests: the first is the Hansen test of over-identifying restrictions, which tests the overall validity of the instruments (the null is that the instruments are valid); the second is the second-order autocorrelation test for the error term, which tests the null according to which there is no second-order autocorrelation. We have also included Difference-in-Hansen statistics, which are used to test the required exogeneity of sub-sets of instruments, namely those linked with the two variables of interest (fed and mig). Overall, all specification tests indicate that the instruments used are valid.

3 The Effect of Transfers and Migration on the Business Cycle

3.1 Benchmark Analysis

We study the effects of federal transfers and migration in cyclical output, attempting to answer the question whether federal transfers and the outflow of workers influence the evolution of a given cycle (for instance if they alleviate a recession). Table 3 presents the estimation results of equation (1). In the last two columns of the table we show results for a regression in which we add an interaction term between a dummy that takes the value 1 if the state is relatively rich and the transfers or migration variables. With these interaction terms we intend to evaluate if the effect of federal transfers and migration changes when the state is richer. To avoid selection problems the dummy is set to 1 if the state spends most of the sample years above the US average and is set to 0 if it spends the majority of the sample years below the US average.

Table 3 - Effects of Transfers and Migration on the Cycle (Specification 1)

Transfers Measure	fed_pi	fed_gsp	fed_exp	fed_exp	fed_exp
$Dep.Var.: yc_t$	(1)	(2)	(3)	(4)	(5)
yc_{t-1}	-0.002	0.008	0.216***	0.210***	0.250***
	(-0.06)	(0.19)	(5.58)	(5.29)	(5.66)
yc_usa_t	1.027***	0.850***	0.611***	0.638***	0.608***
	(10.14)	(9.04)	(7.58)	(7.71)	(7.16)
i/k_{t-1}	0.196***	0.068	0.259***	0.307***	0.307***
	(3.38)	(0.95)	(3.66)	(4.55)	(4.01)
fed_{t-2}	0.337***	0.329***	0.794***	1.113***	0.691***
	(5.21)	(3.37)	(4.32)	(4.92)	(3.68)
mig_{t-2}	-0.176	-0.237	-0.345	-0.272	-0.844**
	(-0.74)	(-0.85)	(-1.30)	(-1.06)	(2.06)
$fed_{i,t-2} \times d\_rich$	–	–	–	-0.732***	–
				(-2.84)	
$mig_{i,t-2} \times d\_rich$					0.938**
					(2.13)
Hansen (p-value)	48.99 (0.316)	48.70 (0.326)	47.19 (0.395)	45.06 (0.708)	47.81 (0.774)
Diff-in-Hansen (fed)	3.89 (0.95)	3.94 (0.95)	3.01 (0.96)	3.00 (1.00)	1.41 (0.99)
Diff-in-Hansen (mig)	2.43 (0.99)	2.01 (0.99)	7.20 (0.62)	2.82 (0.97)	9.92 (0.99)
$AR(1)$	-1.88* (0.060)	-1.84* (0.066)	-3.72*** (0.000)	-3.71*** (0.000)	-3.31*** (0.001)
$AR(2)$	-0.13 (0.898)	0.13 (0.900)	0.85 (0.395)	1.06 (0.290)	1.16 (0.244)
Number of Instruments	50	50	48	57	62
Number of Obs	750	750	500	500	500

Notes: t-statistics based on a robust variance-covariance matrix estimated by GMM. Significance levels are indicated at 1% (***), 5% (**), and 10% (*) levels.

In Table 4 we show results of the estimation of equation (2).

Table 4 - Effects of Transfers and Migration on the Cycle (Specification 2)

Transfers Measure	fed_pi	fed_gsp	fed_exp	fed_exp	fed_exp
$Dep.Var.: yc_t$	(1)	(2)	(3)	(4)	(5)
yc_{t-1}	0.301***	0.294***	0.172***	0.175***	0.214***
	(4.40)	(4.70)	(3.15)	(3.07)	(4.86)
yc_usa_t	0.795***	0.650***	0.654***	0.666***	0.644***
	(10.10)	(8.00)	(9.00)	(8.74)	(8.92)
i/k_{t-1}	0.093*	-0.110*	0.251***	0.299***	0.262***
	(1.70)	(-1.75)	(3.00)	(4.09)	(3.40)
fed_{t-2}	0.454***	0.406***	0.758***	1.092***	0.767***
	(8.43)	(5.26)	(4.59)	(5.22)	(5.03)
mig_{t-3}	-0.017	0.022	-0.312	-0.230	-0.284
	(-0.15)	(0.22)	(-1.56)	(-1.17)	(-1.39)
$fed_{i,t-2} \times d\_rich$	–	–	–	-0.723**	–
				(-2.66)	
$mig_{i,t-3} \times d\_rich$	–	–	–	–	0.224
					(1.13)
Hansen (p-value)	48.77 (0.324)	48.59 (0.330)	46.17 (0.267)	46.29 (0.583)	48.16 (0.663)
Diff-in-Hansen (fed)	2.98 (0.98)	4.33 (0.93)	5.16 (0.82)	7.53 (0.98)	-0.09 (1.00)
Diff-in-Hansen (mig)	0.96 (1.00)	2.75 (0.99)	9.42 (0.31)	3.44 (0.90)	10.72 (0.97)
$AR(1)$	-3.21*** (0.001)	-2.89*** (0.004)	-3.27*** (0.001)	-3.35*** (0.001)	-3.79*** (0.000)
$AR(2)$	-0.64 (0.520)	-0.12 (0.908)	1.15 (0.249)	1.40 (0.162)	1.53 (0.126)
Number of Instruments	50	50	46	55	59
Number of Obs	700	700	450	450	450

Notes: t-statistics based on a robust variance-covariance matrix estimated by GMM. Significance levels are indicated at 1% (***), 5% (**), and 10% (*) levels.

In Table 5 we show results of the estimation of equation (3).

Table 5 - Effects of Transfers and Migration on the Cycle (Specification 3)

Transfers Measure	fed_pi	fed_gsp	fed_exp	fed_exp	fed_exp
$Dep.Var.: yc_t$	(1)	(2)	(3)	(4)	(5)
yc_{t-1}	0.276***	0.226***	0.045	0.063	0.111**
	(4.96)	(4.13)	(0.82)	(1.25)	(2.15)
yc_usa_t	0.739***	0.628***	0.655***	0.656***	0.642***
	(9.98)	(7.84)	(8.84)	(8.71)	(8.71)
i/k_{t-1}	0.160***	-0.058	0.246***	0.299***	0.273***
	(2.83)	(-1.00)	(2.70)	(3.42)	(3.09)
fed_{t-3}	0.382***	0.436***	0.752***	1.051***	0.746***
	(7.36)	(5.13)	(3.72)	(4.24)	(4.17)
mig_{t-3}	0.075	0.106	-0.417**	-0.310	-0.405*
	(0.62)	(1.12)	(-2.29)	(-1.60)	(-1.77)
$fed_{i,t-3} \times d\_rich$	–	–	–	-0.710**	–
				(-2.55)	
$mig_{i,t-3} \times d\_rich$	–	–	–	–	0.356
					(1.49)
Hansen (p-value)	48.64 (0.329)	48.53 (0.333)	48.13 (0.177)	47.03 (0.471)	48.18 (0.625)
Diff-in-Hansen (fed)	2.96 (0.98)	3.27 (0.97)	8.44 (0.39)	9.30 (0.90)	0.47 (1.00)
Diff-in-Hansen (mig)	1.99 (0.99)	3.92 (0.95)	12.13 (0.15)	7.43 (0.49)	12.97 (0.91)
$AR(1)$	-3.32*** (0.001)	-3.09*** (0.002)	-2.95*** (0.003)	-3.12*** (0.002)	-3.16*** (0.002)
$AR(2)$	0.07 (0.940)	-0.05 (0.956)	0.93 (0.350)	1.22 (0.222)	1.57 (0.117)
Number of Instruments	50	50	45	53	62
Number of Obs	700	700	450	450	450

Notes: t-statistics based on a robust variance-covariance matrix estimated by GMM. Significance levels are indicated at 1% (***), 5% (**), and 10% (*) levels.

All results in Tables 3 to 5 show that federal transfers have a generalized and statistically robust effect in improving the cyclical output, namely alleviating recessions. This effect is obtained by controlling for the influence of country-wide business cycle in the state business cycle, for the influence of the investment-capital ratio, and of internal migration. However the significant effect of federal transfers is not dependent on these variables' entrance in the regressions. The fourth column shows us that the effect of federal transfers in the business cycle tends to decrease in rich states, although it keeps its positive influence on the cycle (the coefficient of the direct effect is always higher than the coefficient of the interaction).

The effect of migration is non-significant most of the times. We achieve a negative and significant result in columns (3) and (5) of Table 5 and in the last column of Table 3, in which federal transfers are measured as a proportion of total state government expenditures. Moreover, in Table 3 - last column - we can note that the effect of outmigration is positive in richer states, because the coefficient of the interaction term is higher than the coefficient of the direct effect. However, we have also noted that most effects of outmigration are conditional on federal transfers. In fact, the statistical significance of migration is dependent on the presence of federal transfers in regressions. For example, when federal transfers are not taken into account, and the interaction effect is present, we reach a negative effect of outmigration but that effect decreases in richer states in all specifications. Additionally, as expected, the accumulation of physical capital usually favours the business cycle.

Overall, specification tests indicate the acceptance of the exogeneity assumption. Specifically, the Hansen test, which tests the validity of all instruments, indicates that the null is not rejected. Also, the first-order autocorrelation test is rejected and the second-order autocorrelation test is not rejected, as necessary for these types of models. Moreover, the Difference-in-Hansen tests, which test the validity of sub-groups of instruments linked with the two variables of interest, indicate the validity of these instruments. These tests also support our main specifications.[5]

3.2 Other Specifications and Robustness

As already mentioned, we have tested other specifications that we do not include in the last section, for space considerations. When we entered both federal transfers and migration in their fourth to sixth lag, results on the federal transfers significance remain practically unchanged when compared to those presented in Tables 3 to 5. Moreover, when considering further specifications, we reached positive and significant effects of migration on cyclical output. In particular, this occurred in specifications that considered four and five lags. There is only one regression, when we consider fifth lagged migration and transfers and when federal transfers are measured as a gross state product proportion, in which migration had a higher effect than federal transfers. In specifications where seven lags are considered, non-significance is the most usual result, with just one positive and significant effect of federal transfers.

Quantitatively, an increase in the standard deviation of federal transfers (a positive variation of nearly 0.05) will lead to an increase in cyclical output from 0.025 to 0.05 (for coefficients from 0.5 to 1).[6] These values represent 69% to 138% of the output volatility, which indicates the importance of federal transfers in influencing the states' business cycle. An increase in migration of 2.2% of the labour force (again one standard deviation) three years before (Table 5) would lead to a decrease of 0.0088 (with a coefficient of -0.4) in the cyclical output, which represents nearly 25% of output volatility. However, if the increase in migration occurred four or five years before, the effects will be positive and near only 18% of the output volatility.[7] This exercise indicates that quantitatively federal transfers are nearly four to eight times more important than migration in the evolution of business cycles.

The following table summarizes results on coefficients for the variables of interest, according to different specifications analysed in the discussion above. This table also indicates regressions in which specification tests indicate that the instruments' exogeneity is not guaranteed (see line 'Problems on Tests'). Thus, we are not considering regressions with lag 1 and regressions with fed_exp_{t-5} and fed_exp_{t-7} in the analysis.

[5] We have also tested the remaining group of instruments (linked with the lagged dependent variable, the cyclical output of the union, and the investment-capital ratio) and as expected the exogeneity assumption is not rejected.

[6] As shown in Tables 3 to 5, higher coefficients are obtained in poorer states.

[7] Considering the effect of two-lagged outmigration in rich states (values from Table 3, column 5), it can enhance cyclical output by 0.002068 (only 5.7% of output volatility).

Table 6 - Effects of Transfers and Migration on the Cycle - Different Lags

Lag i	1	2	3	4	5	6	7
(1) fed_pi_{t-i}	n.s.	0.337**	0.382***	0.481***	0.492***	0.301***	0.287***
(2) fed_gsp_{t-i}	n.s.	0.329***	0.436***	0.392***	0.273***	n.s.	n.s.
(3) fed_exp_{t-i}	0.584**	0.794***	0.752***	0.683***	0.494*	0.697***	n.s.
(1) mig_{t-i}	-0.502***	n.s	n.s.	0.259**	0.297***	n.s.	n.s.
(2) mig_{t-i}	-0.595*	n.s.	n.s.	0.274**	0.408***	n.s.	n.s.
(3) mig_{t-i}	-0.541***	n.s	-0.417**	0.326*	n.s.	0.306*	n.s.
Problems on Tests	AR(2)	—	—	—	AR(2); 3	—	AR(2);H;3

Notes: Significance levels are indicated at 1% (***), 5% (**), and 10% (*) levels;
n.s. - non-significant. The Problems on Tests line indicates which test regressions do not pass;
when AR(2) it means that second-order autocorrelation test indicates evidence of autocorrelation;
when H it means rejection of the Hansen Test (exogeneity assumption).

Additionally, it is important to discover if the significant effects described in Table 6 are conditional on the presence of other variables in regressions. This can be done by comparing results in Table 6 with those coming from regressions in which federal transfers and migration enter alternatively. Results showing these regressions (in which only one of the two variables of interest - transfers and migration - are introduced each time) are presented in the Appendix - Table A1. As an example, outmigration (especially with lag 4) favours business cycle only when keeping the same amount of transfers to the states. The same does not happen with federal transfers, which continues to be highly significant when migration is dropped. However, the transfers' coefficients values decrease when migration is introduced.

As a further robustness analysis, we reduce the lags of the federal transfers and migration variables introduced as instruments. Then, if necessary, to obtain a further reduction, we reduce the lags of the other covariates, until we do not reject the Hansen test. In regressions that used fed_pi and fed_gsp (with the time period 1987-2004), the decrease in the number of instruments allowed, in order to not reject the exogeneity assumption (e.g. the Hansen Test), is not high. We can reach regressions with near 40 instruments (instead of the 50 used above) in which all specification tests pass. In these regressions, federal transfers kept the positive and significant sign but migration loses significance. In regressions that used $fed\_$ exp (with the time period 1992-2004), the robustness to the decrease in the number of instruments is greater as we can reduce the number of instruments to near 10. Table 7 shows some results of this last test, with a number of instruments of 20.

Table 7 - Effects of Transfers and Migration on the Cycle - Different Instruments Sets

Lag i	1	2	3	4	5	6	7
(3) fed_exp_{t-i}	0.675*	1.172***	1.359***	1.206***	0.713***	0.991***	n.s.
(3) mig_{t-i}	-1.546***	-0.825***	-0.852**	0.530***	n.s.	n.s.	n.s.
Problems on Tests	AR(2)	—	—	—	AR (2); H	—	AR (2); H

Notes: Significance levels are indicated at 1% (***), 5% (**), and 10% (*) levels;
n.s. - non-significant. The 'Problems on Tests' line indicates which test regressions do not pass;
when AR(2) it means that second-order autocorrelation test indicates evidence of autocorrelation;
when H it means rejection of the Hansen Test (exogeneity assumption).

Table 7 presents a strong positive and significant effect of federal transfers on cyclical output, from six- to one-year lag, and a negative effect of migration on the first three lags, inverted to a positive effect if changes in outmigration occurred with a lag of four years. Thus, this shows, not only that the

effects described in Table 6 are robust to the reduction in the number of instruments, but also that coefficients increase their absolute values.[8]

To evaluate if our results are robust to changes in the sample, we tested if the effects of transfers and migration were maintained if the time-series sample was reduced. We then analyse alternatively the period from 1993 to 2004, which decreases the time-series available by six (when considering fed_pi and fed_gsp). When compared to results discussed above, the results of this robustness test indicate that there are no significance changes on federal transfers coefficients, but the negative and positive effects of migration tend to lose significance.

Overall, these robustness tests demonstrated a highly robust positive effect of federal transfers on cyclical output and that, on the contrary, negative and positive effects of migration on cyclical output are fairly sensitive to changes in sample or in the set of instruments.

Given the positive influence of federal transfers in cyclical output it would be interesting to know which component or components of federal transfers are more important to the business cycle. This is what we do in the next section.

4 On the Influence of Transfers' Sub-Items on the Business Cycle

Due to the effects of federal transfers revealed so far, it is worth knowing which of the components of federal transfers most affects the cycle. To this end, we further investigate which components most influence cyclical output, with migration and the remaining amount of transfers kept constant. This has a direct policy implication for the federal government, since it indicates which components could increase or decrease, maintaining the amount given to the states with other components constant. We show the results in this section. We use only the variable fed_exp here as previous results do not indicate great differences between the three. The components that enter in the federal transfers to the states are the following: retirement and disability payments for individuals (dr), other direct payments for individuals (do), direct payments to other than individuals (dx), grants (gg), procurement contracts (pc), and salaries and wages (sw). In terms of their relative importance they represented in 2004, 31%, 19%, 2%, 21%, 16%, and 10%, respectively. Throughout the period the relative importance of the components have been maintained, but we can observe a slight decrease in the retirement and disability and salaries and wages shares, compensated by an increase in other components.

Table 8 shows results from regressions in which we introduce as regressors each component of federal transfers (dr, do, dx, gg, pc, sw), the remaining amount of federal transfers (fed_rem) and migration, following the specification:

$$yc_{i,t} = \alpha_i + \beta_1 yc_{i,t-1} + \beta_2 i/k_{t-1} + \beta_3 y\_usa_{i,t} + \beta_4 fed\_rem_{i,t-j} + \beta_5 xx_{i,t-j} + v'_{i,t} \qquad (4)$$

[8] The complete regression results corresponding to values in Tables 6 and 7 are available upon request.

where $xx = dr, do, dx, gg, pc, sw,\ j = 1, ..., 7$. The other covariates are defined above. Correlations between each component and the remaining amount of federal transfers are never higher than 0.55, taking the highest values (0.51 and 0.55) for dr and sw and the lowest (near 0.20) for dx and gg. Table 8 shows coefficients and significance of the specific components of federal transfers, using different lag specifications.

Table 8 - Effects of Transfers and Migration on the Cycle - Components of Federal Transfers

Lag i	1	2	3	4	5	6	7
dr_{t-i}	n.s.	n.s.	-2.384**	-1.614**	-1.391*	n.s	n.s.
do_{t-i}	1.804***	0.693*	n.s.	n.s.	-1.842***	n.s.	n.s.
dx_{t-i}	n.s.	1.044***	2.174***	1.590***	n.s.	-1.874***	-3.755***
gg_{t-i}	n.s.	n.s.	n.s.	n.s.	3.596***	n.s	-2.281***
pc_{t-i}	n.s.	n.s.	n.s.	1.605**	n.s.	1.420**	n.s.
sw_{t-i}	n.s.	n.s.	n.s.	n.s.	n.s.	1.370*	n.s.
mig_{t-i}	(-)	n.s.	(-)	(+)	n.s./(+)	n.s./(+)	n.s.

Notes: Significance levels are indicated at 1% (***), 5% (**), and 10% (*) levels;
n.s. - non-significant. In mig line, we only indicate the coefficient sign when significant and this line should be read as a summary of results.

In almost all regressions (for which Table 8 shows only coefficients for federal transfers' components and the sign of the migration coefficient), the lagged dependent variable, the cyclical output of the union, the investment to capital ratio and the remaining amount of federal transfers present positive and significant coefficients. Migration shows the pattern of the last section. First it tends to decrease cyclical output but after that some positive effects can occur. The analysis of Table 8 shows that retirement and disability payments for individuals (dr) has an overall negative effect on cyclical output, procurement contracts (pc), and salaries and wages somewhat positive effects (sw). Other direct payments for individuals (do) has an almost immediate positive effect but after some periods it can negatively influence the cycle. Direct payments to other than individuals (dx) has positive effects two to four years after an increase and negative effects after six to seven years. Overall, fast positive effects can be better achieved with direct payments (for individuals and other). Decreasing retirement and disability payments for individuals (dr) and increasing procurement contracts (pc) and salaries and wages (sw) can be good for the cycle.

5 Conclusions

Most earlier contributions on convergence amongst states do not distinguish the long-run from the short-run effects, a distinction especially relevant in the study of monetary unions. Some federal transfers are more devoted to long-run convergence (e.g. structural funds in the European Union) and some others are more devoted to short-run expenditures (e.g. grants and emergency preparedness programmes in the USA). Furthermore, although most literature, especially optimum currency area literature, recognizes that internal migration and federal transfers are both insurance and stabilization mechanisms that can substitute for each other, both phenomena have not been studied empirically together to test this assumption.

We contribute to the literature in three main ways. Firstly, we jointly study the impact of federal transfers and migration in the business cycle. Secondly, we specifically seek to reveal the effects in short-run output dynamics, i.e., cycles. Furthermore, we detail the effects of components of transfers, in order to give some policy guidance.

We plausibly assume that endogeneity in its diverse forms affects the relationships between migration, federal transfers, and cyclical output. Thus we implement the dynamic differenced estimator from Arellano and Bond (1991) to study the effect of transfers and migration on cyclical output and the business cycle. We found a significantly positive effect of transfers on cyclical output. The effect of each dollar transfered in a given year is stronger from two to six years later. However, in line with the theoretical finding of Rappaport (2005), migration has some positive effect in the business cycle too, conditional on the level of transfers. This effect is stronger four and five periods later.

Moreover, the quantitative impact of federal transfers is much greater than that of migration. Federal transfers have a positive effect essentially in the relatively poor states, tending to avoid or alleviate their recessions or expand their expansions. Contrary to the effect of federal transfers, migration tends to have a positive effect in richer states.

Thus the answer to the question in the title of this work is clearly "*yes*"! This answer comes not only from the positive and robust impact of federal transfers in the states' cyclical output, but also from the evidence that internal migration may contribute to enhance the business cycle only conditionally on the federal transfers and in richer states. Despite the many doubts that have been cast on the equity and efficiency of transfers in many official and non-official reports, this instrument seems to do its job: provide more help for poor states in difficult times.

We also conclude that amongst the transfers items, direct payments benefit cyclical output and retirement and disability payments for individuals prejudices it.

This paper opens prospects of future research. The natural step forward would be to study federal transfers and migration as determinants of long-run convergence. A simple extension of this work would also be possible through the simple availability of more time-series data, one of the significant constraints of this work. This would allow, for instance, the study of effects state-by-state and the use of panel cointegration techniques. The lower impact of outmigration in the business cycle continues to challenge economic theory, considering the current theoretical knowledge.

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A Appendix

Table A1 - Isolated Effects of Transfers and Migration on the Cycle - Different Lags

Lag i	1	2	3	4	5	6	7
(1) fed_pi_{t-i}	0.144***	0.419***	0.454***	0.502***	0.562***	0.360***	0.280***
(2) fed_gsp_{t-i}	0.209**	0.421***	0.511***	0.462***	0.346***	0.121	0.114
(3) fed_exp_{t-i}	0.759***	0.961***	0.936***	0.619***	0.471***	0.541***	-0.193
(4) mig_{t-i}	-0.615***	-0.387	0.044	0.201	0.404***	0.305	0.226

Notes: Significance levels are indicated at 1% (***), 5% (**), and 10% (*) levels;
n.s. - non-significant.