Blue States and Red States: Business Cycle Divergence and Risk Sharing

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Abstract

We examine business cycle divergence and risk sharing within the United States. In doing so, we also separately examine states whose populations have consistently voted either Democrat (*Blue*) or Republican (*Red*) in national elections. We find that states' business cycles have diverged markedly since the start of this century: they are now more asynchronous than is typical across the international borders of distinct countries. This divergence is even more striking between *Blue* states and *Red* states.

At the same time, we find that states smooth their consumption across these diverging business cycles: they share risk much more than is typical internationally. While they share most of their idiosyncratic risk through financial markets, *Blue*, *Red* and swing states share the remainder of their risk in very different ways. *Red* states smooth the remainder largely through fiscal flows (taxes and transfers), while they are left with more than twice the idiosyncratic risk of the other states. In contrast, swing states smooth the remainder largely through migration, while fiscal flows hardly matter at all. Finally, *Blue* states smooth the remaining idiosyncratic risk through a combination of fiscal flows, migration and the purchases of consumer durables; and they are left with little residual risk.

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1 Introduction

The study of economic integration within the United States hit its heyday in the early nineteen nineties, during the early stages of the move toward European Monetary Union. At that time, studies of the United States provided a benchmark for discerning how much idiosyncratic risk might be expected to be shared in an economy with a single currency and with open capital and labor markets. Many of the studies focused on measuring the extent to which fiscal flows were used in the United States to smooth states' idiosyncratic risk.

Now, after some experience with monetary union, Europe has seen tensions building not only around fiscal flows, but also from intra-European migration. The United States is also experiencing tension from the political polarization across states. In addition, emerging economies with regional disparities, such as China, face their own strains. In light of these tensions, we use newly available data on state consumption to revisit the U.S. as a benchmark for understanding intra-national business cycle divergence and risk sharing. In addition to the usual state-by-state approach, we also break the country up into *Blue* and *Red* regions based on their voting patterns so that we can examine differences across the 'color regions.'[1] We also allow for additional smoothing channels not generally explored within the United States: beside fiscal and financial flows, we allow for smoothing via interstate migration, through the purchases of durable goods, and through changes in prices (real exchange rates).

[1]Numerous authors have explored household and individual level differences across *Blue* and *Red* states, including differences family structure, education, and health. See, for example, Gelman, Park, Shor, and Cortina (2010) and Carbone and Cahn (2010). Our focus is on the macroeconomic aspects of the *Blue* and *Red* differences.

We assess the extent of U.S. business cycle divergence in section 2, the extent of its consumption smoothing in section 3, and the channels of its smoothing in section 4. We find that state business cycles diverge markedly, and the business cycles of the *Blue* and *Red* regions diverge even more: in terms of GDP, the *Blue* and *Red* regions look like two sovereign countries. In general, output divergence provides an opportunity for smoothing consumption; here we find that consumption risk is indeed shared–both across states and between *Blue* and *Red* regions. However, we also find that the channels for risk-sharing differ substantially across the color regions.

2 Business Cycle Divergence

This section uses standard methods of international macroeconomics to examine how the business cycles of the states move together within the United States. We begin by looking at all of the states, then we look separately at regions that we define based on voting patterns.

We follow Kalemli-Ozcan, Papaioannou, and Peydra (2013), who examine the synchronicity of business cycles across countries by measuring the divergence of countries' GDP.[2] Adapting their international measure to states, we comparably define synchronicity among states as the negative of the divergence in states' domestic product growth:

$$\psi_{i,j,t} = -|(\ln Y_{i,t} - \ln Y_{i,t-1}) - (\ln Y_{j,t} - \ln Y_{j,t-1})|, \tag{2.1}$$

[2]Kalemli-Ozcan, Papaioannou, and Peydra (2013), in turn, follow Giannone, Lenza, and Reichlin (2010).

where $Y_{i,t}$ and $Y_{j,t}$ are the GDPs of the i^{th} and j^{th} states in year t.[3] This measure becomes more negative when business cycles between two states are less synchronized.

Figure 1 shows in black the average in each year of this U.S. state-by-state measure of synchronicity. State-by-state business cycle synchronicity declined substantially in the mid-2000s until the great recession, when the state economies slowed together, then began briefly to recover together. Most recently, the state economies have again markedly diverged.

Over the period as a whole, the average divergence in bilateral real GDP growth rates is about 2.5 percent. This number can be put into perspective by comparing it with synchronization measures for international economies. Kalemli-Ozcan, Papaioannou, and Peydra (2013) report an average divergence in bilateral real GDP growth rates of about 1.75 percent for 20 rich economies in the three decades before the 2008 downturn.[4] By this measure, the state economies within the United States are more asynchronous than comparable international economies.

We can correspondingly measure the synchronicity between the output in the region made up of the states whose residents consistently vote Democratic (*Blue*) in presidential elections and the output in the region made up of states whose residents consistently vote Republican (*Red*) in presidential elections. Specifically, we measure the following:

$$Sync_{blue,red,t} = -|(\ln Y_{blue,t} - \ln Y_{blue,t-1}) - (\ln Y_{red,t} - \ln Y_{red,t-1})|, \tag{2.2}$$

[3] Data and their sources are described in the appendix.

[4] Developing economies are less synchronized; see Calderón, Chong, and Stein (2007).

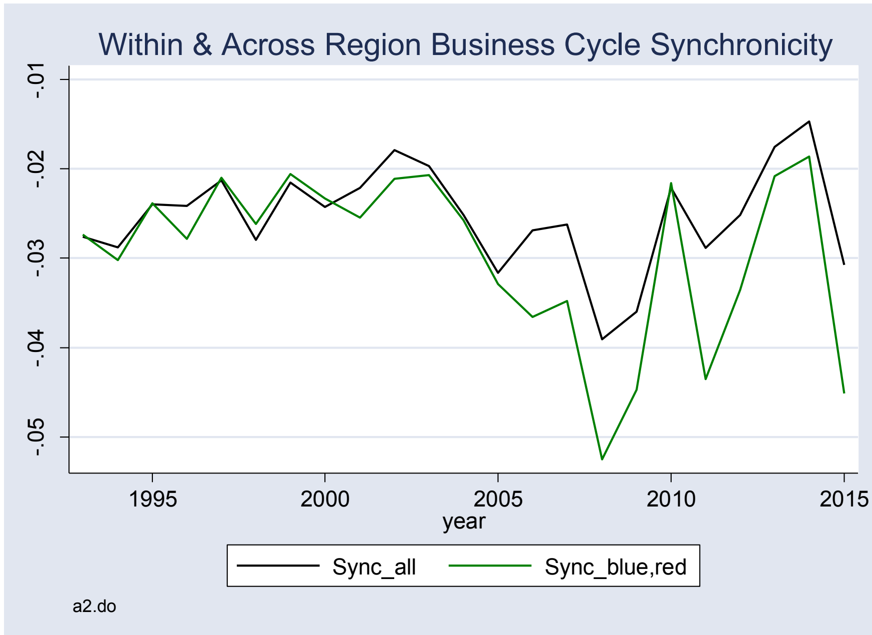

Figure 1: Business cycle synchronicity within the United States

where $Y_{blue,t}$ is t-period output in the 'region' made up of *Blue* states, and $Y_{red,t}$ is the t-period output in the 'region' made up of *Red* states. This measure is shown by the green line in figure 1. Until the mid-2000s, the economic activity in two groups of states were about as synchronized with each other as were the states within the country as a whole. However, the two diverged somewhat more markedly from each other in the run up to the crisis of 2008, and they only briefly returned to the degree of synchronicity exhibited by the country as a whole before diverging yet again.

Other differences between the *Blue* states and the *Red* states become apparent when we examine the synchronicity within each of the two groups. Letting b equal the number of *Blue* states, and r equal the number of *Red* states, the average synchronicity within each color region is given by:

$$Sync_{blue,t} = -\frac{2}{b(b-1)}|(\ln Y_{i,t} - \ln Y_{i,t-1}) - (\ln Y_{j,t} - \ln Y_{j,t-1})|, \forall i,j \in Blue \quad (2.3)$$

$$Sync_{red,t} = -\frac{2}{r(r-1)}|(\ln Y_{i,t} - \ln Y_{i,t-1}) - (\ln Y_{j,t} - \ln Y_{j,t-1})|, \ \forall i,j \in Red. \quad (2.3')$$

These measures are shown in Figure 2: the blue line gives the synchronicity among *Blue* states, and the red line gives the synchronicity among the *Red* states. The economies of the *Blue* states move together more than do the economies of the *Red* states. The difference between the two color regions is most evident recently: economic activity among *Blue* states has converged, while it has diverged among *Red* states. Over the period as a whole, the average divergence in bilateral real GDP growth rates among the consistently *Blue* states is about 1.9 percent; and the average divergence among the consistently *Red* states, at about 3.3 percent, is much more pronounced.

In terms of economic activity, these measures indicate that the state economies of the U.S. diverge greatly. For the country as a whole, the economies of the individual states are as varied as if they were distinct countries. This is particularly true of the *Red* states, those whose residents have consistently voted for Republicans in U.S. presidential elections. Moreover, for *Red* states, the divergence has been greatest over the last decade. Whether within the color regions, across the color regions, or for the country as a whole, economic activity across the states varies greatly.

In the next section, we explore whether the pronounced divergence in economic

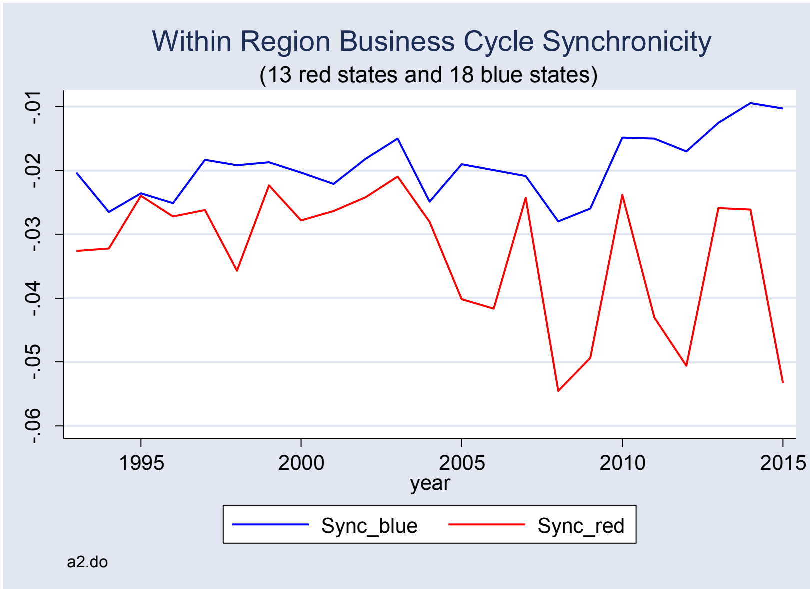

Figure 2: Business cycle synchronicity among Red states and among blue states

activity is carried over to consumption, or if instead consumption risk is shared across the states.

3 Consumption Smoothing

The divergence of economic activity across states, regions, and countries provides an opportunity for integrated areas to share risk in order to smooth their consumption.[5] That is, consumers in integrated economies benefit from output divergence. In the simplest case of two economies with exogenously given production, individuals in each of the two economies can in principle share risk by holding assets that

[5]Moreover, in the spirit of Helpman and Razin (1978), Obstfeld (1994), shows that integration itself can induce specialization, which itself would lead to output divergence. Kalemli-Ozcan, Sorensen, and Yosha (2003), document that specialization and risk sharing are linked both regionally and internationally.

pay out in the other economy's production. Their consumption would then be related even when their production is not.[6] With consumption risk spread between the two economies, neither economy's consumption would be tied lock step to its own production, and divergent economic activity would allow both economies to smooth consumption.

In this section, we look at consumption and income together to see if this is the case for the United States. Using consumption data not available at the time of the previous studies of U.S. consumption smoothing, we find that a great deal of consumption risk indeed is shared within the United States. This contrasts with the international evidence. That is, while economic activity is as asynchronous across the states as it is internationally, consumption smoothing tells a different story: consumption risk is shared within the United States, even across the *Blue* and *Red* sets of states, much more than it is internationally. (*How* that sharing is accomplished is the subject of section 4.)

This section's examination of consumption and income follows Rangvid, Santa-Clara, and Schmeling (2016), Kose, Prasad, and Terrones (2009), Lewis (1996), Obstfeld (1993), and others who examine the diversification of consumption risk internationally. Specifically, we regress idiosyncratic consumption growth on idiosyncratic income growth. Where consumption risk is shared, the estimated coefficient on idiosyncratic income should be low.

To measure consumption for each state, we use the Bureau of Economic Analysis' data on personal consumption expenditures, the Bureau's most comprehensive

[6]For example, with iso-elastic utility and complete asset markets, the consumption growth rates in the two economies would be completely equalized.

measure of household consumption.[7] Earlier key studies relied on retail sales data to gauge consumption.[8] The personal consumption expenditures data provides a more comprehensive measure of the purchases by residents of each state, and it omits the purchases by nonresidents.[9] These data also allow us to separately examine the use of durable goods purchases as a mechanism for smoothing consumption. For comparability with earlier work, we focus on total personal consumption in this section; however, in the next section, where we study the the channels of smoothing, we separate out durable goods purchases, which themselves can be thought of as a saving vehicle that can be used to smooth consumption.

We begin by examining consumption risk sharing within the United States as a whole. Let $c_{i,t}$ equal the growth rate of consumption in the i^{th} state in year t. We regress each state's idiosyncratic rate of consumption growth on its idiosyncratic rate of GDP growth in a panel, as follows:

$$c_{i,t} - \overline{c}_t = \beta_{u.s.}(y_{i,t} - \overline{y}_t) + v_{i,t}. \tag{3.1}$$

In each period, the average consumption, $\overline{c}_t$, and the average output growth, $\overline{y}_t$, is each defined over all of the United States. An output coefficient equal to zero would imply that states completely insulate their consumption from idiosyncratic changes

[7]The Bureau of Economic Analysis released its first prototype of these data in 2014.

[8]Asdrubali, Sorensen, and Yosha (1996) pioneered the use in this context of state retail sales data, which they scaled up by the ratio of aggregate personal consumption to U.S. retail sales. Their use of retail sales was followed by Athanasoulis and van Wincoop (2001), Asdrubali and Kim (2004), and many others.

[9]For example, personal consumption expenditures include travel expenditures abroad, the imputed value of housing and financial services, and the net expenditures of nonprofit institutions serving households.

in income. In contrast, a coefficient equal to one would imply that the states are individually in autarky.

The first column of table 1 gives the results of this regression. As shown, the estimated coefficient on idiosyncratic output growth is 0.22. That is, just over one-fifth of a state's idiosyncratic output growth shows up in a corresponding change in its consumption. This implies a much higher degree of risk sharing than is reported in international studies. For example, with more than a century of data for risk sharing among rich countries, Rangvid, Santa-Clara, and Schmeling (2016) report values of consumption risk sharing that imply coefficient estimates ranging from about 0.40 to about 0.85.[10] The much lower coefficient estimate we find for the United States is well below even the nadir of their international values. For the country as a whole, consumption risk sharing among the states is much greater than is international consumption risk sharing.

We also examine whether consumption risk sharing differs among the states whose residents vote consistently red, among states whose residents vote consistently blue, and among the remaining states. Specifically, we estimate the following regression using the same panel data:

$$c_{i,t} - \overline{c}_t = \sum_{\substack{j=blue,\\ red,\\ swing}} \beta_j d_{j,i}(y_{i,t} - \overline{y}_t) + u_{i,t},$$

[10]Rangvid, Santa-Clara, and Schmeling (2016) construct "consumption risk sharing values" by multiplying their regression estimates by 100, then subtracting the product from 100. They report consumption risk sharing values of 15 to 60, which imply the coefficient estimates of about 0.40 to 0.85 mentioned above. In terms of their measures, our estimate of about 0.22 implies a consumption risk sharing value of 78, which exceeds even the peak of their reported international risk sharing. Risk sharing among emerging and low-income economies tends to be even lower.

Table 1: Consumption Smoothing

$c_{i,t} - \overline{c}_t$	(1)	(2)
$y_{i,t} - \overline{y}_t$	0.2234***	
	(-0.0119)	
$d_{blue,i}(y_{i,t} - \overline{y}_t)$		0.2131***
		(0.060)
$d_{red,i}(y_{i,t} - \overline{y}_t)$		0.2307***
		(0.048)
$d_{swing,i}(y_{i,t} - \overline{y}_t)$		0.2413***
		(0.074)
Observations	900	900
R^2	0.299	0.301

Notes
The dependent variable is $c_{i,t} - \overline{c}_t$.
Robust standard errors are clustered at the country level and reported in parentheses; and asterisks indicate statistical significance at the one (***), five (**) and ten percent (*) levels.

where $d_{j,i}$ are indicator variables for states whose residents have voted consistently blue ($j = blue$) or consistently red ($j = red$) in presidential elections, or whose residents have not voted consistently ($j = swing$).

The results of this estimation are shown in the second column of table 1. While the point estimates themselves might indicate that consumption in the *Blue* states is slightly less tied to idiosyncratic state GDP growth than is the consumption in *Red* states or in swing states, the differences are not statistically significant at any conventional significance level. The estimates for each of the three state groupings are all roughly on par with the estimate for the country as a whole. All of the coefficient estimates indicate that there is much more consumption risk sharing among the states than across international borders.

The estimates provided in this section show that consumption risk sharing within the United States is substantial. The wide divergence in economic activity across states enables residents to share risk and correspondingly smooth their consumption. In the next section, we explore how that is accomplished.

4 Risk Sharing Channels

This section examines the key channels for sharing consumption risk. While the previous section documented that consumption risk is shared within the United States, this section examines *how* it is shared. Here, we estimate the extent to which idiosyncratic consumption is smoothed via financial markets and via fiscal transfers, and we expand the usual list of U.S. channels to include population movement, durable goods consumption, and changes in prices (real exchange rates).[11] As before, we first estimate the channels for the country as a whole, then we look separately at *Blue* and *Red* states. Allowing for the additional channels, we are able to observe somewhat more risk sharing than has previously been reported for the United States as a whole, and we find important differences between the *Blue* and *Red* states.

We begin with the now-standard identity of Asdrubali, Sorensen, and Yosha (1996):

[11] Asdrubali, Tedeschi, and Ventura (2015) use detailed Italian survey data to carefully quantify household consumption smoothing in Italy. Asdrubali and Kim (2004) use prices in examining the role of nominal and real exchange rates in consumption sharing across countries, but they do not report their results using state price data to examine such risk sharing across the state borders within the United States. Labhard and Sawicki (2006) examine prices as a smoothing mechanism within the United Kingdom using a slightly different approach. Asdrubali and Kim (2004) generalize the approach by embedding it in a structural vector autoregression.

$$Y_{i,t} = \frac{Y_{i,t}}{\tilde{Y}_{i,t}} \frac{\tilde{Y}_{i,t}}{Y^d_{i,t}} \frac{Y^d_{i,t}}{C_{i,t}} C_{i,t}. \tag{4.1}$$

As above, $Y_{i,t}$ is defined as the i^{th} state's GDP. $\tilde{Y}_{i,t}$ is defined as the i^{th} state's income, which (as in Asdrubali, Sorensen, and Yosha (1996)) includes net payments of dividend, interest and rent across state borders. $Y^d_{i,t}$ is defined as the i^{th} state's disposable income, which accounts for taxes and transfers (including social security), and Federal grants to states; and $C_{i,t}$ is the i^{th} state's consumption. As above, we use state-by-state consumption data that was not available in the earlier studies that had to either rely on retail sales or other proxies for consumption.

As pointed out by Asdrubali, Sorensen, and Yosha (1996), risk sharing via the capital market diminishes the correlation between $\tilde{Y}_{i,t}$ and $Y_{i,t}$. Likewise, risk sharing via Federal transfers diminishes the correlation between $Y^d_{i,t}$ and $Y_{i,t}$. Risk that remains unshared shows up in the correlation that remains between $C_{i,t}$ and $Y_{i,t}$. Thus, their identity provides a way of assessing the empirical importance of these risk sharing channels.

We build on their approach by adding terms to identity 4.1 that capture consumption smoothing via migration and via price changes, which here (given the fixed "nominal exchange rate" of one across the United States) are the same as real exchange rate changes. In addition, we follow Asdrubali, Tedeschi, and Ventura (2015) in allowing for smoothing through the purchases of consumer durables, which can be thought of as a nonfinancial form of saving. This gives a new identity:

$$Y_{i,t} = P_{i,t} L_{i,t} \frac{Y_{r,i,t}}{\tilde{Y}_{r,i,t}} \frac{\tilde{Y}_{r,i,t}}{Y^d_{r,i,t}} \frac{Y^d_{r,i,t}}{C_{r,i,t}} \frac{C_{r,i,t}}{C_{N,r,i,t}} C_{N,r,i,t}. \tag{4.2}$$

Here, $P_{i,t}$ is the i^{th} state's price level, and $L_{i,t}$ is its population; the subscripts r indicate real per capita values; $C_{D,r,i,t}$ represents real per capita durable goods consumption; and $C_{N,r,i,t}$ represents real per capita consumption of nondurable goods and services, which is the difference between real total consumption and real durable goods consumption: $C_{N,r,i,t} = C_{r,i,t} - C_{D,r,i,t}$. Taking logs and first differences, this becomes:

$$y_{i,t} = p_{i,t} + l_{i,t} + (y_{r,i,t} - \tilde{y}_{r,i,t}) + (\tilde{y}_{r,i,t} - y^d_{r,i,t}) + (y^d_{r,i,t} - c_{r,i,t}) + (c_{r,i,t} - c_{N,r,i,t}) + c_{N,r,i,t}, \tag{4.3}$$

where $p_{i,t}$ and $l_{i,t}$ are the log changes in state prices and population, and $y_{r,i,t}$, $\tilde{y}_{r,i,t}$, $y^d_{r,i,t}$, $c_{r,i,t}$, $c_{N,r,i,t}$ are the log changes in state per capita GDP, income, disposable income, consumption, and nondurable consumption.

To gauge the relative role of each potential smoothing channel under consideration, one can multiply equation (4.3) by $y_{i,t}$ and take the expected value; when scaled by the variance of $y_{i,t}$, this gives a simple sum:

$$1 = \beta_P + \beta_L + \beta_K + \beta_F + \beta_S + \beta_{C_D} + \beta_U, \tag{4.4}$$

where each term is equivalent to a single coefficient in a univariate regression.[12] Imposing the adding up constraint of equation 4.4 implies a SUR panel regression:

[12] Specifically, $\beta_P = \frac{cov(p_{i,t}, y_{i,t})}{var(y_{i,t})}$, $\beta_L = \frac{cov(l_{i,t}, y_{i,t})}{var(y_{i,t})}$, $\beta_K = \frac{cov(y_{r,i,t} - \tilde{y}_{r,i,t}, y_{i,t})}{var(y_{i,t})}$, $\beta_F = \frac{cov(\tilde{y}_{r,i,t} - y^d_{r,i,t}, y_{i,t})}{var(y_{i,t})}$, $\beta_S = \frac{cov(y^d_{r,i,t} - c_{r,i,t}, y_{i,t})}{var(y_{i,t})}$, $\beta_{C_D} = \frac{cov(c_{r,i,t} - c_{N,c,i,t}, y_{i,t})}{var(y_{i,t})}$, $\beta_{C_N} = \frac{cov(c_{N,c,i,t}, y_{i,t})}{var(y_{i,t})}$.

$$
\begin{aligned}
p_{i,t} &= \nu_{P,t} + \beta_P y_{i,t} + \eta_{P,i,t} \\
l_{i,t} &= \nu_{L,t} + \beta_L y_{i,t} + \eta_{L,i,t} \\
y_{r,i,t} - \tilde{y}_{r,i,t} &= \nu_{K,t} + \beta_K y_{i,t} + \eta_{K,i,t} \\
\tilde{y}_{r,i,t} - y^d_{r,i,t} &= \nu_{F,t} + \beta_F y_{i,t} + \eta_{F,i,t} \\
y^d_{r,i,t} - c_{r,i,t} &= \nu_{S,t} + \beta_S y_{i,t} + \eta_{S,i,t} \\
c_{r,i,t} - c_{N,c,i,t} &= \nu_{D,t} + \beta_D y_{i,t} + \eta_{D,i,t} \\
c_{N,c,i,t} &= \nu_{U,t} + \beta_U y_{i,t} + \eta_{U,i,t}.
\end{aligned}
$$

Here $\nu_{\cdot,t}$ are time fixed effects that capture factors that are common across states in each period, making the estimates analogous to the idiosyncratic measures used in sections 2 and 4. We write this more compactly as:

$$
\mathbf{y}_{i,t} = \boldsymbol{\nu}_t + \boldsymbol{\beta} y_{i,t} + \boldsymbol{\eta}_{i,t}, \tag{4.5}
$$

where $\mathbf{y}_{i,t} = [p_{i,t}, l_{i,t}, (y_{r,i,t} - \tilde{y}_{r,i,t}), (\tilde{y}_{r,i,t} - y^d_{r,i,t}), (y^d_{r,i,t} - c_{r,i,t}), (c_{r,i,t} - c_{N,r,i,t}), (c_{N,r,i,t})]'$; $\boldsymbol{\nu}_t = (\nu_{P,t}, \nu_{L,t}, \nu_{K,t}, \nu_{F,t}, \nu_{S,t}, \nu_{C_D,t}, \nu_{U,t})'$; $\boldsymbol{\beta} = (\beta_P, \beta_L, \beta_K, \beta_F, \beta_S, \beta_{C_D}, \beta_U)'$, and $\boldsymbol{\eta} = (\eta_{P,i,t}, \eta_{L,i,t}, \eta_{K,i,t}, \eta_{F,i,t}, \eta_{S,i,t}, \eta_{C_D,i,t}, \eta_{C_N,i,t})'$.

The panel estimates of equation 4.5 measure the role of each smoothing channel and are given in table 2.

4.1 All States

The first column of table 2 gives the channel estimates for a panel that includes all states. Consistent with earlier studies, the largest share of smoothing occurs in the capital market, given in the first pair of rows. Capital markets now smooth about 43 percent of states' idiosyncratic risk. Despite the many changes in capital markets in the United States in the last three decades, this estimate is roughly on par with that of Asdrubali, Sorensen, and Yosha (1996), who find that about 39 percent of states' idiosyncratic risk is shared in U.S. capital markets.[13]

The next pair of rows gives the estimate for the extent of smoothing that occurs through taxes and transfers. About 16 percent of idiosyncratic output is smoothed through such fiscal flows.[14] Again–despite the many changes in the intervening period–this estimate is close to that of Asdrubali, Sorensen, and Yosha (1996), who find that about 13 percent of states' idiosyncratic risk is shared this way.[15] It is also not far from the range of estimates provided in von Hagen (1998), who gives a summary of earlier studies, though it is somewhat lower than the more recent estimate of roughly 25 percent reported in Feyrer and Sacerdote (2013). Notably, the role of U.S. fiscal flows is much higher than the four to six percent reported in Buti (2007) for European countries by the European Commission just prior to the

[13]Hepp and von Hagen (2013) find a slightly higher fraction, about 50 percent, for Germany since the nineties, but Buti (2007) reports lower numbers for most of the Euro Area.

[14]A substantial portion of the risk faced by individual states is faced by the country as a whole; and taxes and transfers further offset the nation-wide changes in GDP: U.S. Taxes and transfers smooth about 23 percent of states' *overall* GDP changes in the sample compared with the 16 percent of their idiosyncratic changes.

[15]With our estimates, the hypothesis that the fiscal flow channel amounts to 13 percent, as in Asdrubali, Sorensen, and Yosha (1996), cannot be rejected at any reasonable confidence level.

Table 2: Channels of Consumption Smoothing

	U.S. (1)	Blue (2)	Red (3)	Swing (4)
Capital: $\beta_K, \delta_j\beta_K$	0.4288***	0.4489***	0.3764***	0.4980***
	(0.0236)	(0.0517)	(0.0424)	(0.0460)
Fiscal: $\beta_F, \delta_j\beta_F$	0.1579***	0.1703**	0.2627***	0.0604
	(0.0320)	(0.0710)	(0.0600)	(0.0548)
Saving: $\beta_S, \delta_j\beta_S$	0.1699***	0.1333***	0.1329***	0.1569***
	(0.0179)	(0.0400)	(0.0329)	(0.0330)
Durables: $\beta_{C_D}, \delta_j\beta_{C_D}$	0.0207***	0.0392***	0.0115**	0.0339***
	(0.0032)	(0.0073)	(0.0047)	(0.0062)
Prices: $\beta_P, \delta_j\beta_P$	0.0271**	0.0632	0.0082	0.0148
	(0.0132)	(0.0430)	(0.0144)	(0.0224)
Migration: $\beta_L, \delta_j\beta_L$	0.0783***	0.0921***	0.0393***	0.1532***
	(0.0094)	(0.0144)	(0.0132)	(0.0229)
Unshared: $\beta_U, \delta_j\beta_U$	0.1173***	0.0530	0.1690***	0.0829***
	(0.0168)	(0.0495)	(0.0205)	(0.0317)
Sum	1	1	1	1
Observations	900	234	324	342

Notes:
Asterisks indicate statistical significance at the one (***), five (**) and ten percent (*) levels.

Financial Crisis.[16]

The role of credit or saving, as conventionally measured, is given in the next pair of rows. For the country as a whole, credit smooths an estimated 17 percent of states' idiosyncratic risk. While this is somewhat lower than the 23 percent originally reported by Asdrubali, Sorensen, and Yosha (1996), it somewhat higher than the more recent U.S. estimate of 12 percent reported in Milano and Reichlin (2017).[17] It is also remarkably close to European estimates of about 15 percent, reported by the European Commission in Buti (2007).

The next three pairs of rows provide estimates for the channels not widely explored using this framework in the existing literature: durable goods, prices, and migration. Because the new U.S. consumption data includes state observations of consumers' purchases of durable goods, we are able to estimate the extent to which durable goods purchases are used as a saving device to further smooth consumption. For the United States as a whole, durable goods smooth about three percent of states' idiosyncratic risk. While this is small compared with estimates for the traditional credit channel, it is very tightly estimated, and with the conventional credit measure it brings the estimate of the role of savings up to about 20 percent.

The role of changes in states' prices is given in the next pair of rows. While all the states share a single currency, their prices nevertheless adjust enough relative to one another to have some risk sharing impact: changes in relative prices smooth about three percent (statistically significant at the five percent level) of states' idiosyncratic

[16]It is also higher than the roughly ten percent reported for inter-provincial fiscal smoothing within China; see Du, He, and Rui (2011).

[17]Milano and Reichlin (2017), in turn, cite a working paper by Milano (2017), but that paper was unavailable to us at the time of this writing.

risk. This estimate is in keeping with that found across regions within the United Kingdom by Labhard and Sawicki (2006), who use a slightly different, though related, approach.

More smoothing, about eight percent, occurs through migration, given in the next row. One might have expected an even higher value since the United States is often regarded as having a highly mobile labor force that is very responsive to labor conditions, and intra-U.S. migration remains high relative to intra-Europe migration. However, Dao, Furceri, and Loungani (2017) show that the U.S. migration response to relative economic conditions–while still high by international standards–has roughly halved since the 1990s–the start of the sample period in our study. Together, these three channels, durable goods purchases, changes in relative prices, and migration, allow for additional smoothing of roughly 13 percent of states' idiosyncratic risk. As shown in the last pair of rows, this leaves states with only about 12 percent of their idiosyncratic risk unshared.

4.2 *Red* and *Blue* Channels

Next, we examine the channels within each color region. That is, we reestimate equation 4.5 for states whose residents vote consistently red, for states whose residents vote consistently blue, and for the remaining states. Adapting equation 4.5 using the same indicators of color region used in section 3, $d_{j,i}$, where $j = red$, $blue$, and $swing$, we have:

$$\mathbf{y}_{i,t} = \sum_{\substack{j=blue,\\ red,\\ swing}} \boldsymbol{\nu}_{j,t} + \sum_{\substack{j=blue,\\ red,\\ swing}} \boldsymbol{\beta}_j d_{j,i} y_{i,t} + \boldsymbol{\eta}_{i,t}. \tag{4.6}$$

The results are shown in columns 2 through 4 of table 2. For the *Blue* states, shown in column 2, the standard channels, capital markets, fiscal flows, and saving, show only minor changes. However, smoothing through durables is notably higher. While still relatively small, the use of durable goods as a saving device to to smooth consumption–at almost four percent–is roughly double the estimate for the country as a whole. The point estimates for the roles of prices and migration are also substantially higher than for the country as a whole, however the estimates are noisy, so we cannot conclude that prices and people respond more to economic conditions in *Blue* states than in the country as a whole.

The estimates for the *Red* states are given in column 3. There, the differences are more marked. Most importantly, in comparison with estimates from the country as a whole, *Red* states benefit much more from fiscal flows, yet they are nevertheless left with substantially more residual risk. As shown in the second pair of rows, fiscal flows insulate more than a quarter of the idiosyncratic risk faced by *Red* states. This compares with only 16 percent for the country as a whole. As shown in the last rows of estimates, *Red* states are left with unshared idiosyncratic risk of about 17 percent, which is significantly higher than the 12 percent faced by the country as a whole.

The use of durable goods as a saving device to smooth consumption in *Red* states is about a quarter what it is for *Blue* states, and the use of migration in *Red* states is about one-third of what it is in *Blue* states. Residual, unshared risk is highest for the *Red* states, and of all of the channels of smoothing, only fiscal flows is larger in *Red* states than in the rest of the country.

The estimates for the swing states, those that do not consistently vote *Blue* or

Red, are given in column 4. Like the *Red* states, the biggest difference occurs in the fiscal flows. However, in this case the difference is in the other direction. In contrast to all the other states, swing states benefit very little, if at all, from risk sharing through fiscal flows. They accomplish a great deal of smoothing–almost 50 percent–through capital markets. And, swing states smooth much more through migration than do either *Red* or *Blue* states: their migration offsets another 15 percent of their idiosyncratic risk. They also smooth more than average by using durables to save (and possibly by saving in general, but the differences are not statistically significant).

Overall, there are significant differences across the states' color regions. In terms of fiscal smoothing, *Blue* states might be thought of as being in the same range as Canada, while *Red* states are in the higher ranges, somewhere between the United Kingdom and Germany.[18] Swing states, in contrast have not systematically benefited from fiscal smoothing. While *Red* states benefit the most from fiscal smoothing, they are left with substantial unshared idiosyncratic risk. In contrast, *Blue* states smooth virtually all of their idiosyncratic consumption risk, and swing states receive almost no benefit from fiscal smoothing.

5 Conclusion

This paper revisits the study of the United States as a benchmark for understanding business cycle synchronicity and the scope for sharing idiosyncratic consumption risk within a currency union. At the same time, it explores whether the politically divided regions within the United States themselves share risk as if they exist within

[18] See the summary of international work provided by von Hagen (1998)

a single country. We find that the economies of the politically divided regions are more asynchronous than separate countries, but they share consumption risk more than separate countries do. We also find that the channels for their risk sharing differ markedly across the regions: their reliance on fiscal smoothing and on migration differs, as does the extent of their remaining, unshared idiosyncratic risk. Notably, *Red* states benefit the most from fiscal smoothing, yet they also end up with the most residual risk; while swing states benefit little, if at all, from fiscal smoothing; and *Blue* states have the least remaining risk.

A Data Sources

Much of the data used in this study comes from the Regional Economic Accounts of the Bureau of Economic Analysis (BEA), and is available online at `https://www.bea.gov/regional`. This source provides: GSP in current dollars, real GSP in chained dollars, state personal income, state population, and, since 2008, implicit regional price deflators, by state. BEA methodologies are described at: `https://www.bea.gov/regional/methods.cfm`. For this study, the state level consumer price index construction is based on Bureau of Labor Statistics fixed-weight methodology and is described in Parsley and Wei (2016). As noted above, earlier studies of U.S. consumption risk sharing pre-dated the BEA's introduction of state-level personal consumption expenditures data beginning in 1997, and hence were subject to measurement error criticisms that are mitigated by the BEA's new data. An informative description of personal consumption expenditure data and methodology is provided by Christian Awuku-Budu and Zemanek (2013). For this study, we extend the BEA state-level inflation series backward (i.e., 1997-2007) using state-level consumer price indexes created using individual goods and services price data collected by the American Chamber of Commerce Researchers Association. Finally, election results were compiled from data provided by the office of the Federal Register, `https://www.archives.gov/federal-register/electoral-college/map/historic.html`.

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