Risk Sharing in a Monetary Union: *Blue* States and *Red* States

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Abstract

We examine state GDP synchronicity and consumption risk-sharing channels within the United States as a whole, and among states whose populations have voted consistently Democrat (*Blue*) or Republican (*Red*) in national elections. We document three facts: (1) state GDP growth is asynchronous, and *Blue* and *Red* states are particularly out of sync; (2) at the same time, interstate consumption risk-sharing is very high–it is high even across the political divide, and it is high even where the role of fiscal flows is minimal; and (3) the channels of risk sharing used by *Blue*, *Red*, and *Swing* states are quite different. We also show that previous estimates of states' unshared idiosyncratic consumption risk can be cut in half by accounting for population changes, prices, and durable goods. Together, our findings suggest that political divisions, by themselves, are not necessarily obstacles to risk sharing within a monetary union.

Keywords: monetary union, consumption risk-sharing, economic and political divergence, optimal currency area, currency union, purchasing power
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1 Introduction

As Europe moved deliberately, if uneasily, towards deepening monetary and economic union in the nineteen nineties, the U.S. economy provided a benchmark for envisaging Europe's future. The U.S. experience illustrated how idiosyncratic risks within a union could be smoothed despite having only a single, economy-wide monetary policy. Now, after European monetary and economic union has progressed, rising political tensions in Europe and elsewhere have reignited disagreements about the costs of monetary and economic union. Concerns over migration and fiscal transfers, along with regionally clashing political preferences raise questions about how macroeconomic risks are now shared. Do the political divisions themselves stand in the way of economic integration? Do they prevent risk sharing? This paper addresses these questions by asking another: Is the United States still an example of successful integration despite its own notable political divisions?

To evaluate the relevance of the United States as a modern benchmark for monetary union, we quantify states' economic asynchronicity and risk sharing over the recent decades; and we assess the differences across political regions that we construct based on states' stable voting patterns. To be clear, our goal here is not the identification of the effect of political differences on economic differences in the face of obvious endogeneity.[1] Instead, our goal is to examine whether macroeconomic differences reflect the country's most obvious political divide, and to determine whether and how risk sharing survives in its presence.

[1]Numerous authors have explored how U.S. voting outcomes are linked to purely economic differences, as well as differences in demographics, family structure, education, and health. See, for example, Gelman, Park, Shor, and Cortina (2010) and Carbone and Cahn (2010).

Our examination of risk sharing uses newly available, comprehensive data from the Bureau of Economic Analysis (BEA) on personal consumption expenditures by state. The new data resolve misgivings about previous, related work that could only use retail sales data to measure consumption. New data also allow us to examine the role of risk-sharing channels not yet explored year-by-year within the United States. Specifically, we quantify the extent of risk-sharing that occurs through interstate migration, through price changes, and through consumers' purchases of durable goods.[2] In addition to exploring these new channels, we use the BEA consumption data to re-examine the important fiscal and financial channels studied with only retail sales data in the past, and to assess how these and the other channels differ where political preferences differ.

We document that states' GDPs are quite asynchronous, and the GDPs of the *Blue* (consistently Democratic) and *Red* (consistently Republican) regions are particularly so: in terms of GDP changes, the *Blue* and *Red* regions look as distinct as two sovereign countries. At the same time, we observe that output asynchronicity within the United States provides an opportunity for risk sharing: consumption risk is shared both across states and between the *Blue* and *Red* regions. We also find that the mixture of channels used for risk-sharing differs across the color regions. Finally, we find that the additional risk-sharing channels that we explore are meaningful ones for the country as a whole: together, they cut previously documented unshared idiosyncratic risk in half.

[2] In their early study, Asdrubali, Sorensen, and Yosha (1996) augmented their work by using census data to explore the role of migration; however, because the census data were only available by decade, they were precluded at the time from exploring migration's role in smoothing consumption year by year, as we do here.

Overall, our findings indicate that–despite its own internal political and economic divisions, including differences in how risk sharing is achieved–the United States still provides a benchmark of economic integration. The stark political differences between the *Blue* and *Red* regions show up just as starkly as economic differences, but their differences do not stand in the way of risk sharing. While we examine only the United States, the single case demonstrates that GDP asynchronicity and even substantial political divisions are not *by themselves* impediments to a successful monetary union even where fiscal flows are small.[3]

Our work proceeds in three steps. We begin with a simple assessment of the extent of inter-state asynchronicity within the United States in section 2. Then, in section 3, we use the newly available consumption data to look at income and consumption together to examine the extent of consumption smoothing. Finally, in section 4, we examine *how* consumption risk is shared across the states.

2 GDP Synchronicity

This section assesses the extent to which the GDPs of the states move together within the United States.[4] We begin by looking at all of the states, then we look separately at regions that we define based on states' voting patterns. We focus on states, rather than counties (despite intra-state heterogeneity) because states correspond most naturally to the country boundaries of other monetary unions (such as the

[3]In the context of monetary union, the political differences across Europe remain of particular interest. Alesina, Tabellini, and Trebbi (2017) compare the political differences within the United States to those within Europe (or at least the EU 15 countries) and–perhaps surprisingly–find substantial similarities in internal political differences.

[4]GDP comovement is among the classic criteria used to evaluate the optimality of a currency or monetary union, but it is not a necessary condition for optimality. We take this up in Section 3.

Euro Area), because states map comprehensively into Congressional representation– which affects federal tax and transfer flows, and because they have the most complete consumption data for use in assessing risk sharing, which we examine in subsequent sections. Note that the synchronicity or asynchronicity of states, like that of countries, reflects size, industrial make up, and a host of other characteristics that (appropriately) are not are not controlled for. To condition on such attributes in measuring synchronicity would be to abstract from the very differences that determine countries' or states' suitability for sharing the same monetary policy.

Here, we characterize states' GDP synchronicity using the negative of the absolute difference in states' GDP growth rates. While there are many possible approaches to characterizing synchronicity, this method is straightforward, it is feasible even when the length of the time series is modest, and it is unaffected by the volatility of output.[5] Specifically, we adapt the approach of Kalemli-Ozcan, Papaioannou, and Peydra (2013), who examine GDP synchronicity across countries, to comparably define synchronicity among states as follows:

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

where $Y_{i,t}$ and $Y_{j,t}$ are the GDPs of the i^{th} and j^{th} states in year t. The measure becomes more negative when GDPs between two states are less synchronised.

Figure 1 shows in black the average in each year of this U.S. state-by-state mea-

[5]The importance of robustness with respect to output volatility was emphasised by Doyle and Faust (2005) even before the Great Recession. Kalemli-Ozcan, Papaioannou, and Peydra (2013) also point out that the asynchronicity measure used here is robust to various filtering methods. Kalemli-Ozcan, Papaioannou, and Peydra (2013), in turn, follow Giannone, Lenza, and Reichlin (2010).

sure of synchronicity from 1993 through 2015.[6] State-by-state 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, asynchronicity has prevailed.

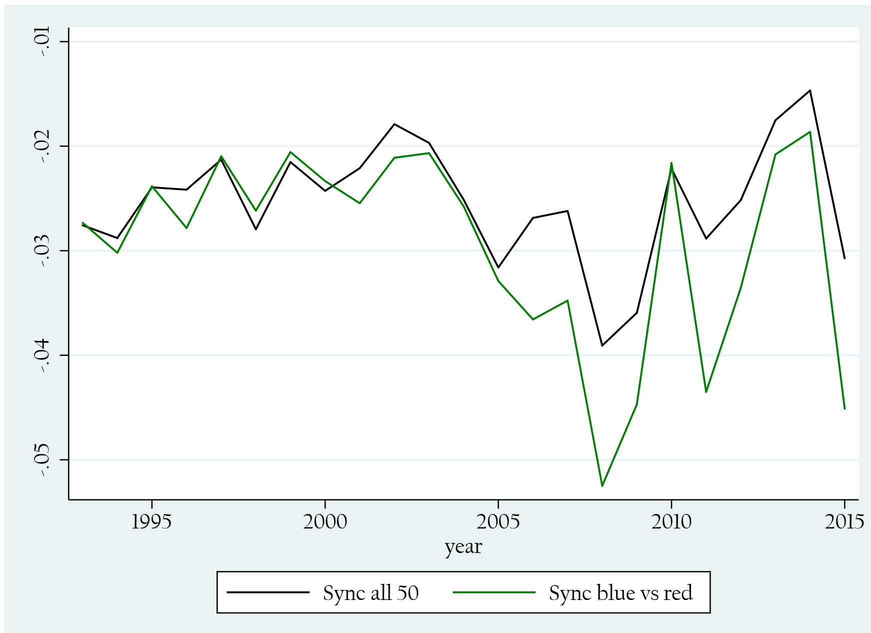

Figure 1: State GDP synchronicity

Over the period as a whole, the average asynchronicity in bilateral 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

[6]Data sources are given in the appendix.

the 2008 downturn.[7] By this measure, the state economies within the United States are more asynchronous than comparable international economies. That is, figure 1 shows us that the current ability of the United States to cohere as a monetary union cannot be attributed to synchronized business cycles among the states.

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. Here, we designate a state as *Blue* if a majority of its voters chose a Democratic presidential candidate in every election between 1987 and 2015; and we designate it as *Red* if the majority of its voters chose a Republican presidential candidate in every election during the period. We designate all other states as *Swing* states.[8]

The synchronicity measure is then:

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

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 cross-region synchronicity is shown by the green line in figure 1. Until the mid-2000s, the economic activity in two groups of states were about as synchronised with each other as were the states

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

[8]We note that a political color designation does not represent an underlying political characteristic that is orthogonal to economic conditions. This is appropriate for our purposes: We are interested in whether the political regions–as different as they are in terms of things like income, urbanization, and education–are nevertheless either synchronized (this section) or able to share risk (next sections).

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.[9]

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 asynchronicity in bilateral GDP growth rates among the consistently *Blue* states is about 1.9 percent; and the average asynchronicity among the consistently *Red* states, at about 3.3 percent, is much more

[9] A Chow test for a structural break half-way through the sample (significant at the one-percent level) helps to confirm the visual impression that economic growth in the *Blue* and *Red* states is more asynchronous now than in the past.

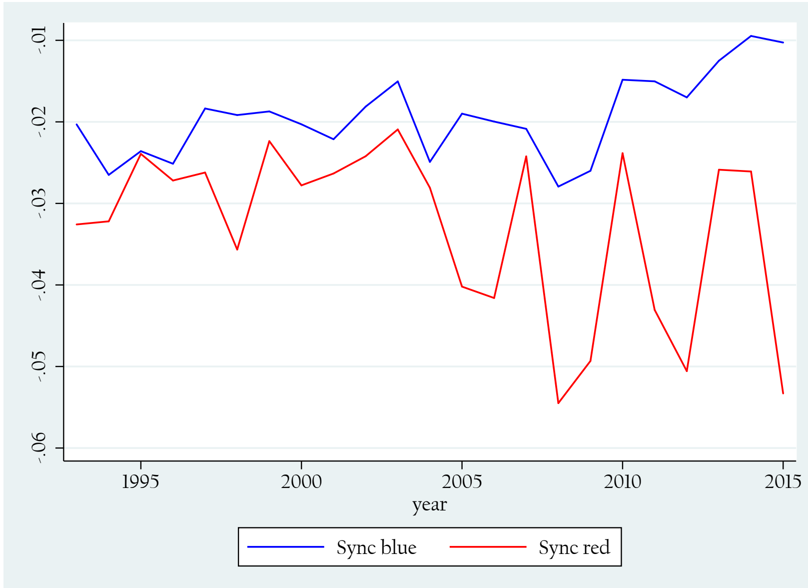

Figure 2: Average GDP synchronicity within each color region

pronounced.[10]

Overall, the synchronicity measures given in this section indicate that–in terms of economic activity–the state economies of the United States 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. Moreover, for *Red* states, the asynchronicity 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 asynchronicity in economic activity is carried over to consumption, or if instead consumption risk is shared across the states.

[10] The difference, 1.4 percentage points with a standard error is 0.2 percent, is statistically significant at all standard confidence levels.

3 Consumption Smoothing

The asynchronicity of economic activity across states, regions, and countries in principle provides an opportunity for integrated areas to share risk in order to smooth their consumption.[11] That is, consumers in integrated economies can benefit from output asynchronicity. In the simplest case of two economies with exogenously given production, individuals in each of the two economies can share risk by holding assets that pay out in the other economy's production. Their consumption would then be related even when their production is not.[12] 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. Moreover, in the spirit of Helpman and Razin (1978), Obstfeld (1994) shows that integration itself can induce specialization, which in turn would lead to output asynchronicity.[13]

In this section, we look at consumption and income together to assess the extent of state-level consumption smoothing within 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

[11] There is a large literature exploring the many facets of the theoretical relationship between economic integration and GDP synchronicity. Both Doyle and Faust (2005) and Imbs (2004) provide overviews in the context of related empirical work.

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

[13] Kalemli-Ozcan, Sorensen, and Yosha (2003) and Imbs (2004) document empirically that specialization and risk sharing are linked both regionally and internationally; Basile and Girardi (2010), in turn, corroborate this finding in a careful examination of regional risk sharing and specialization within the EU 15 member states, and they themselves invite studies of the risk sharing channels.

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* regions, 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' new data on personal consumption expenditures, which is now the Bureau's most comprehensive measure of household consumption. The Bureau of Economic Analysis released its first prototype of these data in 2014, but the series begins in 1997; this makes it possible to include a substantial period both before and after the global crisis. Earlier key studies relied on retail sales data to gauge consumption. While the retail sales data go further back in time, the new personal consumption expenditures data provide a more comprehensive measure of the purchases by residents of each state (including such things as travel expenditures, housing and financial services, and the net expenditures of nonprofit institutions serving households). Furthermore, it does not conflate those purchases with purchases made by nonresidents. These new 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 various 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.

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.[14] The much lower coefficient estimate we find for the United States is

[14] 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.

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: This table provides estimates of Equations 3.1 and 3.2 using annual data from 1997 through 2015; robust standard errors are clustered at the state level and reported in parentheses.

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 measure the extent of consumption risk sharing for the states defined above as *Red*, *Blue*, and *Swing*.[15] Specifically, we estimate the following regression using the same panel data:

Risk sharing among emerging and low-income economies tends to be even lower.

[15]Note that here we still subtract the country's consumption and the country's income from each states' consumption and income. Thus, we measure how much the states in each region share with the country as a whole, not how much they share among themselves.

$$c_{i,t} - \overline{c}_t = \sum_{\substack{j=blue,\\ red,\\ swing}} \beta_j d_{j,i}(y_{i,t} - \overline{y}_t) + u_{i,t}, \tag{3.2}$$

where $d_{j,i}$ are indicator variables for states whose residents have voted consistently Democratic ($j = blue$) or consistently Republican ($j = red$) in presidential elections, or whose residents have not voted consistently for one party or the other ($j = swing$). What is measured here is the average risk sharing of each color region.

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 minor.[16] 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 substantial asynchronicity in economic activity across states enables residents to share income volatility risk and correspondingly smooth their consumption regardless of political differences. In the next section, we explore how that risk sharing is accomplished.

[16]They are small both in absolute terms and relative to their standard errors.

4 Risk Sharing Channels

This section examines the key channels for sharing consumption risk. That is, while the previous section documented that consumption risk is shared within the United States, this section empirically examines the mechanisms through which it is shared. 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 changes in population, durable goods consumption, and prices.[17]

As before, we first examine the country as a whole, then we look separately at *Blue*, *Red*, and *Swing* states. Allowing for the additional channels, we are able to observe more risk sharing than has previously been reported for the United States as a whole, and we find important differences between the *Blue*, *Red*, and *Swing* states.

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

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

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 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

[17] In related work outside the United States, Asdrubali, Tedeschi, and Ventura (2015) and Jappelli and Pistaferri (2011) use detailed Italian survey data, which now include data on the consumption of durables, to carefully quantify household consumption smoothing in Italy; and Labhard and Sawicki (2006) examine prices as a smoothing mechanism within the United Kingdom using a slightly different approach.

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 consumption smoothing channels.

To the smoothing channels they originally explored, we incorporate three more channels directly into the framework in a way that maintains the identity.[18] First, we allow for smoothing through the purchases of consumer durables, which can be thought of as a nonfinancial form of saving. Our inclusion of consumer durables follows Asdrubali, Tedeschi, and Ventura (2015), who use Italian household survey data around the time of the global financial crisis. Second, we examine the impact of year-by-year population changes. Asdrubali, Sorensen, and Yosha (1996) used decade-long population changes to explore the possibility of longer-run smoothing via migration. Here, we use annual population data, so we are able to measure the year-by-year effect in concert with the other channels.[19] Finally, we add a price channel, which, for the United States, is the same as a real exchange rate channel since the

[18] Work by Chinn and Wei (2013) and others suggests that one might also wish to examine smoothing via what would be state 'current accounts.' We do not add the current account as a channel here for two reasons: first, only limited state-level data are available; and, second, in the absence of state-level official reserve transactions, state-level currents accounts are in principle mirrored in the capital transactions captured by the original channels of Asdrubali, Sorensen, and Yosha (1996), described above.

[19] Our use of population captures the extent to which idiosyncratic population changes account for consumption smoothing at the annual level; but, as in earlier work, the measure embeds, not just migration, but also net births less deaths.

"nominal exchange rate" is fixed across all states. To implement the price channel, we construct state price indices from raw price data obtained from the Council for Community and Economic Research, which has published the *Cost of Living Index* quarterly since 1968.[20] These additions yield a new identity, one that separates price changes from real variables and includes the migration and nondurables channels:

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

Here, $P_{i,t}$ is the i^{th} state's price level,[21] 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 $C_{nd,r,i,t}$ represents real per capita consumption of nondurable goods and services, which is the difference between real total consumption and real durable goods consumption: $C_{nd,r,i,t} = C_{r,i,t} - C_{D,r,i,t}$. Taking logs and first differences, this becomes:

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

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

[20]The data underlying the *Cost of Living Index* have been used by Parsley and Wei (1996) to study law of one price convergence, by Nakamura and Steinsson (2013) to study fiscal multipliers, by Choi and Choi (2016) to study the interplay of market frictions and nominal rigidity, by Choi, Murphy, and Wu (2017) to study market segmentation, and by Choi, Choi, and Chudik (2020) to examine divergence in the purchasing power of wages.

[21]Here, $P_{i,t}$ deflates state GDPs; however, the data come from consumer prices; this introduces a measurement error, and we discuss its implications when we present the empirical results below.

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.[22] Imposing the adding up constraint of equation 4.4 implies a SUR panel regression:

$$\begin{aligned}
p_{i,t} &= \nu_{P,t} + \beta_P y_{i,t} + \eta_{P,i,t} \\
l_{i,t} &= \nu_{L,t} + \beta_L y_{i,t} + \eta_{L,i,t} \\
y_{r,i,t} - \tilde{y}_{r,i,t} &= \nu_{K,t} + \beta_K y_{i,t} + \eta_{K,i,t} \\
\tilde{y}_{r,i,t} - y^d_{r,i,t} &= \nu_{F,t} + \beta_F y_{i,t} + \eta_{F,i,t} \\
y^d_{r,i,t} - c_{r,i,t} &= \nu_{S,t} + \beta_S y_{i,t} + \eta_{S,i,t} \\
c_{r,i,t} - c_{nd,c,i,t} &= \nu_{D,t} + \beta_D y_{i,t} + \eta_{D,i,t} \\
c_{nd,c,i,t} &= \nu_{U,t} + \beta_U y_{i,t} + \eta_{U,i,t}.
\end{aligned} \tag{4.5}$$

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:

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

$$\mathbf{y}_{i,t} = \boldsymbol{\nu}_t + \boldsymbol{\beta} y_{i,t} + \boldsymbol{\eta}_{i,t}, \tag{4.6}$$

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

The panel estimates of equation 4.6 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 U.S.-wide 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 as a whole.[23]

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.[24] Again–despite the political changes in the intervening period–this estimate (for the United States as a whole) is close to that of Asdrubali,

[23]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.

[24]Since we are interested in the ability of states to share risks across state lines, we follow the literature and report how much fiscal flows offset states' idiosyncratic risks. Fiscal flows typically offset somewhat more of the nation-wide, overall fluctuations in GDP.

Table 2: Channels of Consumption Smoothing

	U.S. (1)	Blue (2)	Red (3)	Swing (4)
Capital: $\beta_K, \delta_j \beta_K$	0.4288 (0.0236)	0.4489 (0.0517)	0.3764 (0.0424)	0.4980 (0.0460)
Fiscal: $\beta_F, \delta_j \beta_F$	0.1579 (0.0320)	0.1703 (0.0710)	0.2627 (0.0600)	0.0604 (0.0548)
Saving: $\beta_S, \delta_j \beta_S$	0.1699 (0.0179)	0.1333 (0.0400)	0.1329 (0.0329)	0.1569 (0.0330)
Durables: $\beta_{C_d}, \delta_j \beta_{C_d}$	0.0207 (0.0032)	0.0392 (0.0073)	0.0115 (0.0047)	0.0339 (0.0062)
Prices: $\beta_P, \delta_j \beta_P$	0.0283 (0.0118)	0.0583 (0.0401)	0.0250 (0.0131)	0.0178 (0.0164)
Migration: $\beta_L, \delta_j \beta_L$	0.0783 (0.0094)	0.0921 (0.0144)	0.0393 (0.0132)	0.1532 (0.0229)
Unshared: $\beta_U, \delta_j \beta_U$	0.1161 (0.0076)	0.0579 (0.0459)	0.1521 (0.0190)	0.0799 (0.0267)
Observations	900	234	324	342

Notes: This table provides estimates of Equations 4.6 and 4.7 using annual data from 1997 through 2015; robust standard errors are clustered at the state level and reported in parentheses.

Sorensen, and Yosha (1996), who find that about 13 percent of states' idiosyncratic risk is shared this way.[25] 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.-wide fiscal flows remains higher than the four to six percent reported in Buti (2007) for European countries by the European Commission just prior to the Financial Crisis.[26]

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. This estimate is remarkably close to European estimates of about 15 percent, reported by the European Commission in Buti (2007). It is also somewhat higher than the U.S. estimate of 12 percent reported in Milano and Reichlin (2017) and Milano (2017), which is much lower the 23 percent originally reported by Asdrubali, Sorensen, and Yosha (1996).

The next three pairs of rows provide estimates for the added channels: durable goods, prices, and migration. Because of the newly available state-by-state consumption data, 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 two percent of states' idiosyncratic risk. While this is small compared with estimates for the traditional credit channel, it is very tightly estimated, and combined with the conventional credit measure it brings the

[25] We cannot reject at any reasonable confidence level the hypothesis that the fiscal flow channel amounts to the 13 percent given in Asdrubali, Sorensen, and Yosha (1996).

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

estimate of the role of savings up to 19 percent.[27]

The role of changes in states' prices is given in the next pair of rows. While the states share a single currency (so there is no scope for smoothing through nominal exchange rates), their prices nevertheless adjust enough relative to one another to have some risk sharing impact. Specifically, the estimate indicates that changes in relative prices smooth about three percent (statistically significant at the five percent level) of states' idiosyncratic risk. Note that the available state-level price data include only consumer prices, rather than a wider set of prices, and the use of the narrow set of prices to deflate states' GDPs introduces a measurement error that biases downward the value of our estimate. Hence, the estimates given in table 2 might more appropriately be considered lower bounds on the fraction smoothed by prices. That said, we observe that our 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.

Substantially more consumption smoothing occurs through migration. As shown in the next pair of rows, migration smooths almost eight percent of states' idiosyncratic income growth. One might have expected an even larger 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.[28] However, Dao, Furceri, and Loungani (2017) show that the U.S. mi-

[27]It is also larger than the extent of smoothing via durables that appears to be suggested by Asdrubali, Tedeschi, and Ventura (2015) for Italian households.

[28]This finding supports the argument of Baddeley, Martin, and Tyler (2000): They document that Core E.U. regional wage flexibility is as high as that of the United States, and they argue that differences in U.S. and E.U. regional unemployment disparities are likely better explained by migration than by wage flexibility. Our migration findings also are closely related to those of Dao,

gration 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, the three additional channels–durable goods purchases, changes in relative prices, and migration–reduce the unshared idiosyncratic risk by more than half. They account for roughly 13 percent more consumption smoothing, which leaves states with less than 12 percent of their idiosyncratic risk unshared.

4.2 Color Regions

Next, we examine the channels within each color region. That is, we adapt equation 4.6 to estimate it for states whose residents vote consistently Democratic, for states whose residents vote consistently Republican, and for the remaining states. Rewriting equation 4.6 using the same indicators of color region used in section 3, $d_{j,i}$, where $j = red$, $blue$, and $swing$, we have:

$$\mathbf{y}_{i,t} = \sum_{\substack{j=blue,\\ red,\\ swing}} \boldsymbol{\nu}_{j,t} + \sum_{\substack{j=blue,\\ red,\\ swing}} \boldsymbol{\beta}_j d_{j,i} y_{i,t} + \boldsymbol{\eta}_{i,t}. \tag{4.7}$$

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 smooth consumption–at almost four percent–is tightly estimated

Furceri, and Loungani (2017) and to House, Proebsting, and Tesar (2018), who compare U.S. and European labor sensitivity to economic conditions.

and roughly double the estimate for the country as a whole.[29] 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 reliably conclude that prices and population changes are more responsive to economic conditions in *Blue* states than in the country as a whole.

The estimates for the *Red* states are given in column 3. Here, the differences are somewhat more marked. In comparison with estimates from the country as a whole, *Red* states appear to benefit much more from fiscal flows, though the standard errors are too high to be conclusive. Importantly, despite smoothing through fiscal flows, *Red* states seem nevertheless to be left with substantially more residual risk. Specifically, as shown in the second pair of rows, fiscal flows appear to insulate more than a quarter of the idiosyncratic risk faced by *Red* states. This compares with a point estimate of 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 15 percent, which (statistically significant at the ten percent level) is greater than that faced by the country as a whole.

Comparing *Red* states directly with *Blue* states, we find three large and statistically significant differences. First, the use of durable goods as a saving device to smooth consumption in *Red* states is about a quarter what it is in *Blue* states. Second, the use of migration in *Red* states is about one-third of what it is in *Blue* states. Third, residual, unshared risk is higher for the *Red* states. In addition, we find that–of all of the channels of smoothing–only the fiscal flows channel appears to

[29] The difference is statistically significant at standard confidence levels.

be larger in *Red* states than *Blue* states.

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. Perhaps surprisingly–and in contrast to both *Blue* and *Red* states–*Swing* states benefit very little–if at all–from risk sharing through fiscal flows. The point estimate of six percent is roughly on par with the EU estimates, and it has a standard error of five percent, which (at any conventional significance levels) renders it indistinguishable from zero.

If one viewed U.S. *Swing* states as 'up for grabs,' one might have expected Federal expenditures to be aggressively used to mitigate their economic vicissitudes. That is, one might have expected the role of fiscal flows to be high, not indistinguishable from zero. However, it is possible that the potential for fiscal smoothing in *Swing* states may be inhibited by their weak Congressional influence. Cohen, Coval, and Malloy (2011) document that Congressional committee chairs consistently direct federal funds flowing through their committees to their own states. Consistent with Congressional influence argument, we find that *Swing* states indeed held relatively few chairs on important committees in the U.S. House and Senate during our sample period.[30]

The *Swing* states largely accomplish their smoothing through factor markets. Overwhelmingly the largest portion of their smoothing, almost 50 percent, occurs

[30]We combine the data of Stewart and Woon (2019) with the influential committee designations of Stewart (2012) to calculate the number of key Congressional committee chairs held by states in each color region: Over the sample period, *Blue* states held an average of 3.2 important chairs and *Red* states held 3.6, while *Swing* states held only 2.3 important chairs. Key Congressional committee chairs are traditionally awarded based on seniority, so the lower number of *Swing* state chairs may reflect higher *Swing* state turnover.

through capital markets, while another 16 percent occurs through credit markets; and another 15 percent occurs through migration. This role for migration in smoothing idiosyncratic risk is considerably larger than it is in either *Blue* or *Red* states; finally, while durables remain only a minor channel for smoothing, *Swing* states do smooth more than average using durables.[31]

Overall, the differences in the channels of smoothing used by the three regions are notable. In terms of fiscal smoothing, *Blue* states might be thought of as being comparable to Canada, while *Red* states might be thought of as comparable to countries where internal fiscal flows are more important in this regard, such as within the United Kingdom or within Germany.[32] *Swing* states, in contrast, do not appear to systematically benefit from fiscal smoothing at all. Additionally, despite the extent of their fiscal smoothing, *Red* states are left with substantial unshared idiosyncratic risk. In contrast, *Blue* states use a breadth of channels to smooth virtually all of their idiosyncratic consumption risk, and *Swing* states smooth a great deal of their risk through factor mobility.

5 Conclusion

This paper takes a fresh look at the United States as a currency-union benchmark. Along with newly available data and important changes in capital and labor markets, the passage of time has brought profound changes in political circumstances. Here, we examine GDP synchronicity and the scope and the channels for sharing idiosyncratic consumption risk across the politically divided regions of the United

[31] The migration and durables differences are statistically significant at one percent.

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

States.

We find that recent U.S. political divisions are mirrored in macroeconomic divisions, but that the country nevertheless continues to smooth consumption risk across the political divide. Specifically, the economies of the politically divided regions are more asynchronous than is typical of even separate countries, but the regions share consumption risk more than separate countries do. We also find that their risk-sharing channels differ markedly: 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 rely the most on migration and benefit little, if at all, from fiscal smoothing; and *Blue* states have the least remaining risk.

The United States has stood out in the past as an exemplar of mobility of many types within its borders. Now, it stands among the notable exemplars of regional political division. Our findings show that such political divisions are attended by macroeconomic differences, but the divisions do not prevent the regions from risk sharing. The evidence suggests that, by themselves, political and economic differences do not necessarily prevent successful participation in a monetary union.

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`, with methods described at `https://www.bea.gov/regional/methods.cfm`. The BEA provides: state GDP, state personal income, and state population. We use annual data from 1993-2015 in section 2, and since the BEA's introduction of state-level personal consumption expenditures data begins in 1997, we use 1997-2015 for the analysis of consumption smoothing in sections 3 and 4. An informative description of personal consumption expenditure data and methodology is provided by Awuku-Budu, Fallon, Kublashvili, and Zemanek (2013). For state level prices, we construct state-level consumer inflation using individual goods and services price data provided by the Council for Community and Economic Research, and using the fixed-weight methodology of the Bureau of Labor Statistics. Additional details are described in Parsley and Wei (2016). 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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