Economics Bulletin

Volume 30, Issue 3

Economic Development and Volatility among the States

Thomas Grennes
North Carolina State University

Pablo Guerron-quintana
Federal Reserve Bank of Philadelphia

Asli Leblebicioglu
North Carolina State University

Abstract

Using state level personal income, we empirically demonstrate the importance of economic development and diversification for the changes in volatility. We show that volatility of income growth is initially decreasing in the level of income and the degree of diversification. Yet, as state income continues rising, its volatility starts increasing. We also find that expansion of interstate banking and the size of the service sector are among the factors that have influenced volatility.

Citation: Thomas Grennes and Pablo Guerron-quintana and Asli Leblebicioglu, (2010) "Economic Development and Volatility among the States", *Economics Bulletin*, Vol. 30 no.3 pp. 1963-1976.
Submitted: Jun 18 2010. **Published:** July 27, 2010.

1. Introduction

Recently, there has been an increasing interest in analyzing the reduction in the volatility of real macro variables, not only at the aggregate level, but also at more disaggregated levels. A number of studies document the heterogeneity in the degree and timing of the Great Moderation in the U.S. states.[1] A non-exhaustive list includes Carlino and DeFina (1998), Carlino et al. (2007), Owyang et al. (2008), and Grennes et al. (2009). A common theme in the various state level studies is the finding that not all states have benefitted equally from the moderation the aggregate economy has gone through. While some states experienced extensive reduction in volatility, others have experienced increases in volatility. The literature has explained the heterogeneity based on factors such as the role of banking integration (Morgan et al. (2004)), differences in the manufacturing sector and state banking deregulation (Carlino et al. (2007)), and monetary policy (Owyang et al. (2008)). The purpose of this paper is to empirically investigate how changes in volatility are related to the level of economic development and diversification at the state level.

State level analysis is appealing as it allows one to study changes in the volatility of income growth while holding constant monetary and exchange rate policy, as well as a range of cultural and institutional variables, and any aggregate shocks. Even if one controls for such variables, there remains substantial variation across states in important economic aspects such as specialization in production, the structure of production and employment, financial regulation (Morgan et al. (2004)), and the age distribution of the population (Jaimovich and Siu (2009)). All those variables can differentially impact individual states and hence contribute to asymmetries in the moderation of their volatilities.

The relationship between risk, volatility and economic development has been the focus of many theoretical studies. The prominent examples include Greenwood and Jovanovic (1990), Saint-Paul (1992), Obstfeld (1994), and Acemoglu and Zilibotti (1997). Adopting a portfolio approach, all of these studies highlight the trade-off between investing in high risk sectors with high return and investing in relatively safe but low return sectors. In the absence of full insurance of risks, producing in only a few sectors, either due to scarcity of resources or due to comparative advantage considerations, implies higher variability of output. Therefore, diversification of production provides insurance, yielding to lower volatility of total output. As economies and/or financial markets develop, they start specializing again since gains from specializing in high return projects offset the welfare losses due of higher volatility. Saint-Paul (1992) shows how countries diversify for insurance purposes, and later they start to specialize as financial markets deepen. Greenwood and Jovanovic (1990) and Obstfeld (1994) focus on the role of financial intermediaries and international asset trading, respectively, in providing insurance to the investors, and allowing them to invest in high-yield projects without the volatility consequences. Similarly, Acemoglu and Zilibotti (1997) show that at early stages of development, countries specialize in safe but less productive

[1] The Great Moderation phenomenon has been verified by formal statistical tests that show the existence of a structural break around 1984 in the volatility of U.S. aggregate time series (Stock and Watson (2003)). When data become available, it would be informative to analyze how the effects of the global recession of 2008-9 were distributed among the states.

projects/sectors due to indivisibility and minimum size requirement for each project. Diversification opportunities arise as countries accumulate more capital, allowing them to produce in more productive, albeit more risky, sectors in addition to the safer ones. The higher the number of sectors that are open, the easier it becomes to diversify idiosyncratic risk.

The negative relationship between output volatility and growth has been documented in numerous country-level studies (see e.g. Ramey and Ramey (1995) and Kose et al. (2006)). More recently, Koren and Tenreyro (2007) analyze the relationship between volatility and the level of economic development in a large panel of countries, and decompose aggregate volatility into its components. They find that the poor countries tend to specialize in fewer and more volatile sectors, and they experience more frequent and severe aggregate shocks. Furthermore, consistent with the findings in Imbs and Wacziarg (2003), they show that sectoral concentration first decreases and then later increases with economic development.

We study the relationship between volatility and the level of development by estimating the impact of the level of income and the degree of specialization on income growth volatility for the US states. We view personal income as an interesting variable to study because of its implications for growth convergence (Barro and Sala-i Martin (1992)), risk sharing (Asdrubali et al. (1996); Athanasoulis and van Wincoop (2001); Del Negro (2002); Kalemli-Ozcan et al. (2003)) and consumption and welfare through the Permanent Income Hypothesis (Friedman (1957); Hall (1978); Luengo-Prado and Sorensen (2008)). We investigate whether the heterogeneity in the volatility behavior of income growth across states reflects the different stages of development process the states have gone through. As predicted by the aforementioned theories, the less developed states might have experienced greater reductions in their volatilities as a consequence of their development processes. On the other hand, the richer states might have experienced increases in their volatilities as they started to invest in high risk-high return sectors along their respective development processes. Therefore, the relationship between volatility and the level of development might be not be monotonic, and it might depend on the degree of diversification at the state level.

Our results show that there is a significant non-monotonic relationship between the level of income and income growth volatility. Volatility first decreases and at later stages increases with the level of income. Moreover, volatility significantly decreases with the level of diversification. These findings imply that as the poor states have diversified their production bases and as their income levels increased, their income growth volatility moderated. Yet, as the rich states started specializing in high risk-high return sectors, their income growth volatility increased. This pattern is consistent with the results of the structural break tests found in Grennes et al. (2009). Our results are robust to the inclusion of some of the state-level determinants of moderation that have been studied in the literature. Additionally, we find that the degree of interstate banking and the size of services and durable manufacturing sectors are significant determinants of income growth volatility.

The rest of the paper is organized as follows. Section 2 presents the empirical specification and describes the data. We present the results in section 3. Some concluding remarks are provided in the last section.

2. Empirical Specification and Data

In order to investigate how the changes in volatility at the state level are associated with economic development and the degree of diversification/specialization, we estimate the following relationship:

$$\sigma_{it} = \upsilon_i + \eta_t + \beta_1 y_{it} + \beta_2 y_{it}^2 + \beta_3 h_{it} + \gamma X_{it} + \varepsilon_{it}, \quad (1)$$

where σ_{it} is the measure of real per capita income volatility in state i and year t, y_{it} is the logarithm of real per capita income, h_{it} is the measure of specialization, and X_{it} is a vector of other potential controls.[2] We allow for the potential non-monotonicity of the volatility-development relationship by including the quadratic income term, y_{it}^2. This term allows us to test whether volatility first decreases with the level of development, and then increases slightly as the states invest in high risk-high return sectors. We include fixed effects, υ_i, in our specification in order to control for time-invariant, state specific characteristics (such as the distance to the capitol or to the oceans), and time effects, η_t, in order to control for macro or policy shocks that are common to all states. Notice that, when we control for time and fixed effects, the remaining variation in income volatility is attributable only to time-varying state level factors. Therefore, we cannot directly assess the importance of some of the common theories offered to explain the Great Moderation, such as more effective national monetary policy.

We use data for personal income, published by the Bureau of Economic Analysis for the period $1960 - 2001$. We obtain real per capita personal income by deflating the personal income series by the consumer price index (source: Bureau of Labor Statistics) due to the unavailability of state level price indexes with the scope needed for our study.[3] Finally, to compute per capita figures, we divide real personal income by annual state population reported by the US Census Bureau.

We construct two income volatility measures: the first measure is the absolute value of the deviations of the growth rate of real per capita personal income away from the average growth rate for each state. This is the same measure used in Stock and Watson (2003). For the second measure, we estimate an AR(1) process for the growth rate of real per capita personal income in each state, and take the absolute value of the residuals of those processes. The correlation between these two volatility measures is 0.91.

The state level sectoral employment data come from the Bureau of Labor Statistics,

[2]We investigated the time series properties of the logarithm of real per capita income using the panel unit root tests developed by Levin and Lin (1993) and Im et al. (2003). When measured in the form of deviations from common year-specific means, the stationarity of real per capita income cannot be rejected with the respective p-values for the test statistics 0.000 and 0.007. Notice that inclusion of time effects in equation 1 eliminates the common trending components from y, and it is equivalent to subtracting the common year-specific means.

[3]This is a common practice in the literature, and a non-exhaustive list of this approach includes Asdrubali et al. (1996), Athanasoulis and van Wincoop (2001) and Luengo-Prado and Sorensen (2008)). Two exceptions to this practice are Del Negro (2002), and Hess and Shin (1998), who are able to build state level CPI's but only for a reduced number of states and at an annual basis.

and the series starts in 1969. The Bureau of Labor Statistics reports employment in each sector based on the SIC classification until 2001, and based on the NAICS classification after 2001. Because there is no straightforward mapping between the two classification systems, we end our sample in 2001. Using the detailed information for each sector, we measure the degree of specialization in each state with the Herfindahl indexes of employment. We construct the Herfindahl indexes by adding up the sum of squared employment shares. The list of the sectors can be found in Table 1. The theories suggest that at the earlier stages of development economies diversify, but as they become more developed, they start to specialize in more productive sectors. Accordingly, we would expect diversification to contribute to the reductions in volatility.[4] We further use employment shares of various major sectors to capture the labor force composition of each state and include them as additional controls. The labor force composition allows us to control for the importance of endowment sectors (agriculture and mining) relative to more advanced sectors such as manufacturing and services.

Another set of controls includes measures of bank integration constructed by Morgan et al. (2004). They show that fluctuation in a state's economic growth falls as banks get more integrated. We include the same bank integration measures in order to check whether the relationship between development and volatility holds when we also control for bank integration. The four bank integration measures we use are: dummy variables for the deregulation of interstate banking and interstate branching, and two continuous measures for capturing the degree of integration. The first one, is the *interstate asset ratio*, which equals the fraction of bank assets in a given state that are owned by a holding company that owns assets in other states. The second measure is the *other state asset ratio*, which is the ratio of total out-of-state assets held by holding companies in state i to total assets in state i. The interstate asset and other state asset ratios are available only for the 1976-1994 subsample. Detailed information about these variables can be found in Morgan et al. (2004).

3. Results

Table 2 presents the Instrumental Variables estimates of equation (1) for the 48 contiguous states. In the first two columns volatility is measured as the absolute value of deviations from the mean growth rate of each state, and in the last two columns it is measured as the residual from the AR(1) specification for the growth rate of personal income. The estimates obtained using the two different volatility measures are quantitatively very similar. In all of the specifications we treat income and specialization as endogenous variables. As instruments, we use appropriate lags of the regressors and two lags of population growth rate of each state. The exact list of instruments can be found at the end of each table. All four specifications in Table 2 are supported by the tests of over-identifying restrictions, for which the Sargan-Hansen test statistics fail to reject the validity of the instrument sets, and by the

[4]The Herfindahl measure lies between 0 and 1, with 1 corresponding to full-specialization. Diversification implies a reduction in the Herfindahl measure; therefore the expected sign for the Herfindahl in our regression is positive.

Kleibergen and Paap (2006) tests of under-identification, for which the null hypotheses of under-identification are strongly rejected.

We start by discussing the results for the baseline specification, which includes income and income-squared only, and then proceed by including Herfindahl index, to capture the impact of diversification. In all four of the specifications the income terms are highly significant. The results in Table 2 show that there is a statistically significant non-monotonic relationship between the level of income and volatility in the US. While volatility initially decreases with income (mathematically, the linear term dominates the quadratic one), it then increases at later stages of development. Intuitively, this result suggests that the initially poorer states experienced a decline in volatility as their income levels increased and as they got economically more developed. Furthermore, the relatively wealthier states did not benefit from the Great Moderation as they were already in an advanced stage of development. This is consistent with the aforementioned theoretical studies that predict that at early stages of development, economies will diversify production and obtain reductions in volatility. At later stages of development, however, they can invest in high risk-high return projects, which would allow them to achieve higher productivity at the cost of increased volatility.

Next, we include the Herfindahl index in our baseline specification in order to evaluate the impact of diversification on the volatilities. The Herfindahl index is positive and highly significant in both of the specifications. This suggests that the diversification of production along the states' development processes, measured by a decrease in the Herfindahl index, has also contributed to the reduction in their volatilities. The estimates in columns (2) and (4) imply that, on average, a 1% increase in diversification (a 1% reduction in the Herfindahl), would decrease income volatility by 2.79% and 3.51%, respectively.[5]

To analyze the impact of specialization further, we report the change in the Herfindahl index from the beginning of the sample to the end, along with per capita real income in 1969, the initial year for the Herfindahl series, for the 48 states in Table 3. As can be seen in Table 3, while most of the states diversified their production bases (decrease in the Herfindahl index), there are 14 states, where the degree of specialization increased. The state that experienced the largest degree of diversification is North Dakota. The 30.11% increase in diversification in North Dakota combined with the estimate of the Herfindahl index in Table 2, implies that the volatility of income growth in North Dakota moderated approximately by 84% (using the first measure of volatility). On the other end of the spectrum, the wealthier states, such as Connecticut and New York, have experienced more specialization (approximately 11% each), which contributed to higher income growth volatility in those states (approximately by 28%, using the first measure).

In order to check the robustness of our results to the inclusion of additional variables that have been previously looked at in the literature, we include employment shares of five major sectors, and the bank integration measures.[6] Since the two volatility measures give

[5]The elasticities of the volatility measures with respect to the Herfindahl index are calculated at the sample means. The means for the two volatility measures are 0.0187 (deviations from the mean measure) and 0.0182 (AR(1) residuals measure). The sample mean for the Herfindahl index is 0.0880.

[6]Another interesting variable that has been looked at in the literature is age composition of the labor force. Jaimovich and Siu (2009) document the link between age composition of the labor force and the

us very similar results, we present results using the volatility measure constructed with the deviations from the mean. Similar to the previous specifications, we treat the additional control variables as endogenous and instrument them. The first column of Table 4 presents the results with the employment shares of agriculture, mining, durable and non-durable manufacturing and services sectors. In their decomposition, Koren and Tenreyro (2007) find that agriculture and mining are more volatile than manufacturing, which is in turn more volatile than services. Based on their finding, we would expect states with larger agriculture and mining sectors to be more volatile and states with larger services sector to be less volatile. We find a significant impact of the services sector only, while income variables and the Herfindahl index are still significant. Since the Herfindahl index measures the extent of diversification by capturing the concentration of employment shares in the various sectors, employment shares might not be providing additional information in this setup. When we exclude the Herfindahl index from this specification, the shares of durable manufacturing and services become negative and significant. The negative and significant impact of durable-goods share is also found in Owyang et al. (2008), who interpret the result as an evidence for volatility reductions due to innovations in durable-goods' inventory management. As expected, a higher share of employment in services is associated with a lower income volatility. Additionally, the estimates imply that a higher share of agriculture in total employment is associated with higher volatility, although the share of agriculture is only marginally significant (the corresponding p-value is 0.106).

Finally, we investigate the impact of banking deregulation on income volatility. Columns (2) and (3) of Table 4, display the results with interstate-banking and interstate-branching deregulation indicators, respectively, and column four displays the results with the interstate and other state asset ratios. Out of these four measures, only the interstate asset ratio is estimated significantly, and the other main variables of interest remain significant. As in Morgan et al. (2004), the negative coefficients imply that increased bank capital mobility is associated with lower income volatility.[7] In all these new specifications, our measures of development and specialization remain statistically significant, which further confirms our conjecture that they are essential factors in understanding the substantial heterogeneity in the degree of moderation across the states.

4. Conclusion

State level data can be a fruitful source of information about economic volatility and its determinants. Our empirical results demonstrate a consistent relationship between volatility and economic development. We find a robust relationship between a state's volatility and its income per capita and degree of specialization. From low levels of income, growth decreases

business cycle volatility in G7 economies. Specifically, they find that the share of 15-29 year olds plus 60-64 year olds (the "volatile-age" groups) in total labor force is positively associated with increased business cycle volatility. Even though it would be very interesting to replicate their study for the US states, the lack of data on detailed age groups for the 1970-2001 sample prohibits us from investigating this channel.

[7]Morgan et al. (2004) use a slightly different volatility measure and find negative and significant impacts of both the inter-state and other-state assets ratios on volatility for 50 states.

volatility, but at higher income levels growth increases volatility. Moreover, increases in specialization contribute to increases in volatility. We also find that expansion of interstate banking and the size of the service sector are among the factors that have reduced volatility. Finally, there is some evidence that the decline in the share of durable manufacturing contributed to lower volatility. Our results complement the literature on state-level moderation, showing that the heterogeneity in moderation across the states can be related to the stage of development and diversification/specialization in the states.

References

Acemoglu, D., and F. Zilibotti (1997): "Was Prometheus unbound by chance? Risk, Diversification, and Growth," *Journal of Political Economy*, 105(4), 709–751.

Asdrubali, P., B. Sorensen, and O. Yosha (1996): "Channels of interstate risk-sharing: United States 1963-1990," *Quarterly Journal of Enomics*, 111, 1081–1110.

Athanasoulis, S., and E. van Wincoop (2001): "Risk sharing within the United States: what do financial markets and fiscal federalism accomplish?," *Review of Economics and Statistics*, 83, 688–698.

Barro, R., and X. Sala-i Martin (1992): "Convergence," *Journal of Political Economy*, 100, 223–251.

Carlino, G., and R. DeFina (1998): "The Differential Regional Effects of Monetary Policy," *Review of Economics and Statistics*, 80, 572–587.

Carlino, G., R. DeFina, and K. Sill (2007): "The Long and Large Decline in State Employment Volatility," *Federal Reserve Bank of Philadelphia Working Paper*, 07-11.

Del Negro, M. (2002): "Asymmetric shocks among U.S. states," *Journal of International Economics*, 56, 273–297.

Friedman, M. (1957): *A Theory of the Consumption Function*. Princeton University Press, Princeton, NJ.

Greenwood, J., and B. Jovanovic (1990): "Financial Development, Growth, and the Distribution of Income," *Journal of Political Economy*, 98(5), 1076–1107.

Grennes, T., P. Guerron-Quintana, and A. Leblebicioglu (2009): "Economic Development and Heterogeneity in the Great Moderation among the States," *mimeo*.

Hall, R. (1978): "Stochastic Implications of the Life Cycle-Permanent Income Hypothesis: Theory and Evidence," *Journal of Political Economy*, 86, 971–987.

Hess, G., and K. Shin (1998): "Intranational business cycles in the United States," *Journal of International Economics*, 44, 289–314.

Im, K., M. Pesaran, and Y. Shin (2003): "Testing for Unit Roots in Heterogeneous Panels," *Journal of Econometrics*, 115, 53–74.

Imbs, J., and R. Wacziarg (2003): "Stages of Diversification," *American Economic Review*, 93(1), 63–86.

Kalemli-Ozcan, S., B. Sorensen, and O. Yosha (2003): "Risk Sharing and Industrial Specialization: Regional and International Evidence," *American Economic Review*, 93(3).

Kleibergen, F., and R. Paap (2006): "Generalized reduced rank tests using the singular value decomposition," *Journal of Econometrics*, 133.

Koren, M., and S. Tenreyro (2007): "Volatility and Development," *Quarterly Journal of Economics*, 122(1), 243–287.

Kose, M., E. Prasad, and M. Terrones (2006): "How do trade and financial integration affect the relationship between growth and volatility?," *Journal of International Economics*, 69(1), 176–202.

Levin, A., and C. Lin (1993): "Unit Root Tests in Panel Data: New Results," *University of California at San Diego Discussion Paper*, 93-56.

Luengo-Prado, M., and B. Sorensen (2008): "What can explain excess smoothness and sensitivity of state-level consumption?," *Review of Economics and Statistics*, 90(1), 65–80.

Morgan, D., B. Rime, and P. Strahan (2004): "Bank Integration and State Business Cycles," *Quarterly Journal of Economics*, 119(4), 1555–1584.

Obstfeld, M. (1994): "Risk-taking, global diversification, and growth," *American Economic Review*, 84(5), 1310–1329.

Owyang, M., J. Piger, and H. Wall (2008): "A state-level analysis of the Great Moderation," *Regional Science and Urban Economics*, 38, 578–589.

Ramey, G., and V. Ramey (1995): "Cross-country evidence on the link between volatility and growth," *American Economic Review*, 85, 1138–1151.

Saint-Paul, G. (1992): "Technological choice, financial markets and economic development," *European Economic Review*, 36(4), 763–781.

Stock, J., and M. Watson (2003): "Has the Business Cycle Changed and Why?," *Federal Reserve Bank of Kansas City Proceedings*, pp. 9–56.

Table 1: Sectors (SIC Classification)

Agriculture, forestry and fishing	Paper products, printing and publishing
Mining	Transportation
Construction	Utilities
Wood, lumber and furniture manufacturing	Communication
Leather products manufacturing	Wholesale trade
Stone, clay and glass manufacturing	Retail trade
Primary and fabricated metals manufacturing	Finance, Insurance and Real Estate
Industrial and electronic machinery and equipment	Hotel, lodging and entertainment services
Motor vehicles and other transport equipment	Personal services
Instruments and related manufacturing	Business services
Miscellaneous manufacturing	Auto and miscellaneous repair services
Food and kindred products manufacturing	Health Services
Tobacco products manufacturing	Legal services
Textile mill products and apparel manufacturing	Educational services
Chemicals manufacturing	Other services
Petroleum products manufacturing	Government
Rubber and plastic manufacturing	

Notes: The Herfindahl index is constructed as the sum of squared employment shares of each of these sectors.

Table 2: Personal Income Volatility and Development Estimates for the States

	(1)	(2)	(3)	(4)
Dependent variable : Volatility of real per capita income, σ_{it}	*Deviations from the mean*		*AR*(1) *residuals*	
Income (y_{it})	-0.4468***	-0.4694***	-0.3891***	-0.4332***
	(0.0700)	(0.1199)	(0.0692)	(0.1267)
Income − squared (y_{it}^2)	0.0255***	0.0269***	0.0232***	0.0253***
	(0.0037)	(0.0059)	(0.0037)	(0.0061)
Herfindahl (h_{it})		0.5920**		0.7265***
		(0.2383)		(0.2495)
Kleibergen − Paap test of under − identification	0.0000	0.0000	0.0000	0.0000
Test of over − identifying restrictions	0.8531	0.7796	0.5953	0.1214
Number of observations	1872	1488	1872	1488

Notes: Reported results are the IV estimates with heteroscedasticity and autocorrelation consistent robust standard errors. The instrument set consists of second lags of income and income squared and lags 1 and 2 of population growth rate in columns (1) and (3). In columns (2) and (4), the instrument set also includes second lag of the Herfindahl index.

The estimations include year and fixed effects.

*, ** and *** denote significance at 1%, 5% and 10%, respectively.

The p-values for the Kleibergen-Paap test of under-identification and the Sargan-Hansen test of over-identifying restrictions are reported.

Table 3: Diversification for the States

State	Herfindahl 1969	Herfindahl 2001	Change in Herfindahl	Income 1969
Alabama	0.0905	0.0823	-0.0081	10437.02
Arizona	0.0795	0.0788	-0.0130	13302.49
Arkansas	0.1003	0.0873	-0.0007	9955.372
California	0.0894	0.0774	-0.0120	17328.87
Colorado	0.1076	0.0840	-0.0236	14073.70
Connecticut	0.0698	0.0775	0.0077	18494.88
Delaware	0.0973	0.0897	-0.0076	16875.43
Florida	0.0934	0.0878	-0.0057	13980.15
Georgia	0.0936	0.0806	-0.0130	12036.80
Idaho	0.0895	0.0823	-0.0143	12392.51
Illinois	0.1020	0.0877	0.0024	16612.80
Indiana	0.0741	0.0766	0.0001	14102.46
Iowa	0.0762	0.0763	-0.0072	13989.99
Kansas	0.1018	0.0846	-0.0172	13581.49
Kentucky	0.0880	0.0830	-0.0050	11298.47
Louisiana	0.0936	0.0882	-0.0054	11051.67
Maine	0.0737	0.0773	-0.0039	11979.02
Maryland	0.1089	0.0928	-0.0161	16053.96
Massachusetts	0.0888	0.0849	0.0036	16072.64
Michigan	0.0790	0.0780	-0.0010	15914.23
Minnesota	0.0829	0.0786	-0.0044	14414.07
Mississippi	0.0782	0.0800	-0.0112	9139.944
Missouri	0.0984	0.0872	0.0018	13647.97
Montana	0.1110	0.0976	-0.0134	12545.57
Nebraska	0.0936	0.0799	-0.0171	13657.42
Nevada	0.1419	0.0992	-0.0203	17252.17
New Hampshire	0.1024	0.0853	0.0021	14292.81
New Jersey	0.0796	0.0817	0.0076	17263.37
New Mexico	0.0710	0.0786	-0.0271	11134.58
New York	0.1315	0.1044	0.0078	17555.40
North Carolina	0.1285	0.1082	-0.0137	11614.49
North Dakota	0.0728	0.0806	-0.0427	11767.74
Ohio	0.0722	0.0786	0.0063	14998.46
Oklahoma	0.1051	0.0874	-0.0177	12241.72
Oregon	0.0862	0.0806	-0.0056	14017.52
Pennsylvania	0.0685	0.0760	0.0075	14576.09
Rhode Island	0.0878	0.0813	-0.0065	14742.96
South Carolina	0.1097	0.0863	-0.0234	10761.75
South Dakota	0.1297	0.0916	-0.0381	11512.33
Tennessee	0.0745	0.0771	0.0026	11278.48
Texas	0.0868	0.0815	-0.0053	12859.38
Utah	0.1171	0.0849	-0.0322	11834.24
Vermont	0.1231	0.0921	0.0043	12894.63
Virginia	0.0771	0.0814	-0.0309	13596.33
Washington	0.1027	0.0868	-0.0159	15617.23
West Virginia	0.0829	0.0770	0.0130	10667.09
Wisconsin	0.0777	0.0907	-0.0059	14331.03
Wyoming	0.1203	0.1029	-0.0174	13645.90

Table 4: Personal Income Volatility and Development Estimates for the States, Additional Controls

Dependent variable : Volatility of real per capita income, σ_{it}	(1)	(2)	(3)	(4)	(5)
Income (y_{it})	-0.7946***	-0.7193***	-0.4690***	-0.4515***	-0.6517*
	(0.2374)	(0.2227)	(0.1200)	(0.1196)	(0.3614)
$Income - squared\ (y_{it}^2)$	0.0442***	0.0402***	0.0269***	0.0259***	0.0394**
	(0.0118)	(0.0110)	(0.0108)	(0.0059)	(0.0174)
$Herfindahl\ (h_{it})$	0.6204*		0.5915**	0.6383***	0.8030*
	(0.3379)		(0.2383)	(0.2467)	(0.4853)
Share of agriculture in total employment	0.9629	1.0276			
	(0.6136)	(0.6366)			
Share of mining in total employment	-0.1412	-0.2318			
	(0.1506)	(0.1484)			
Share of durable manufacturing in total employment	0.0185	-0.1351**			
	(0.0802)	(0.0577)			
Share of nondurable manufacturing in total employment	-0.0252	-0.0938			
	(0.0547)	(0.0726)			
Share of services in total employment	-0.0906*	-0.1222**			
	(0.0530)	(0.0614)			
$Interstate - banking$			-0.0001		
			(0.0022)		
$Interstate - branching$				-0.0023	
				(0.0015)	
Interstate asset ratio					-0.0317**
					(0.0151)
Other state asset ratio					0.0004
					(0.0011)
$Kleibergen - Paap\ test\ of\ under - identification$	0.0000	0.0000	0.0000	0.0000	0.0004
$Test\ of\ over - identifying\ restrictions$	0.8235	0.4739	0.7751	0.8079	0.2047
Number of observations	1488	1488	1488	1488	874

Notes: Reported results are the IV estimates with heteroscedasticity and autocorrelation consistent robust standard errors when volatility is measured as the absolute value of the deviations from the mean.
In columns (1), (2) and (4) second lags of the employment shares are included in the instrument set in addition to the one listed in Table 2, in order to achieve identification. The estimations include year and fixed effects.
*, ** and *** denote significance at 1%, 5% and 10%, respectively.
The p-values for the Kleibergen-Paap test of under-identification and the Sargan-Hansen test of over-identifying restrictions are reported.