The Effects of Foreign Capital on State Economic Growth

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Abstract

This study examines the impact of foreign capital on state economic growth from 1987 to 1999. It concludes that foreign capital contributed 3.6 percent to gross state product (GSP) growth, accounting for approximately ten percent of total state growth over the period investigated. However, the contribution of foreign capital was not uniform, with foreign capital making a much larger contribution to state growth from 1995 to 1999, the time of rapid growth in the U.S. economy. Furthermore, the contribution and elasticity of foreign capital to manufacturing growth was much greater than its contribution to overall GSP growth, adding roughly one percent per year to manufacturing GSP growth. This represents approximately one-fourth of the growth in manufacturing output for the period.

The Effects of Foreign Capital on States' Economic Growth

Introduction

Across the U.S., state and local economic development officials have stepped up efforts to increase foreign investment in their jurisdictions. In some cases, the foreign investment came from large, well-known companies. For example, Alabama awarded Honda a $158 million incentive package for locating in the state (Site Selection, June 1999). In addition, Missouri attracted Bayer, a German company, by offering $44.2 million in incentives (Site Selection, May 2000). Other states attracted capital from smaller, foreign firms. For instance, Michigan landed the first U.S. facility for Saint-Gobain Sekurit in exchange for $6 million in incentives (Site Selection, August 2001). Similarly, ZeTek located in Pennsylvania for $3.7 million in incentives (Site Selection, May 2001). For both large and small firms, states provided relatively large incentive deals to obtain foreign companies' investment dollars. Lavine (2001) concluded that despite the increasing magnitude of spending to attract foreign investment, little research has actually examined the impact of foreign capital and has instead tended to focus on the impact of tax incentives.[1]

The relationship between Foreign Direct Investment in the U.S. (FDIUS) and U.S. Direct Investment Abroad (USDIA) shows the increasing importance of foreign capital to the U.S. economy. According to Bureau of Economic Analysis data, the ratio of FDIUS to USDIA rose from 0.88 in 1980 to 2.07 in 1999. Hence, in 1999 foreign companies

[1] For example, see Goss and Phillips (2001), Kolesar (1990), Swenson (1994), and Fisher and Peters (1998).

invested more than twice in the U.S. what U.S. firms invested abroad. Furthermore, the data show that the U.S. began the decade of the 1990s as a net exporter of foreign investment but ended the decade as a net importer of foreign investment. Figure 1 shows the three-year moving average for this ratio over the decade. As evident from the figure, the ratio was greater than one during most of the 80s. It then dropped below one in the early 90s but rose above one by the end of the decade. This trend provides evidence of the importance of foreign direct investment (FDI), and therefore foreign capital, to U.S. economic growth, particularly for the latter half of the 1990s.

Despite its relative importance, researchers have yet to econometrically identify the causes for rising foreign investment. However, Arpan, et al. (1981) identified several factors that account for the rising level of FDI in the U.S. These include:

- Growth in global firms
- Increased maturity of foreign-based multinationals
- Rising foreign wage rates relative to U.S. wages
- Response of other nations to the incursion of the U.S. into their economies
- Desire of foreign firms to gain access to U.S. technology

The researchers noted that despite the significance of FDI in the U.S. economy, scholars have completed little published research on this topic. In suggesting areas for future research, the authors concluded that there was a need for studies examining the impact of inward FDI on local, state, and regional economies. However, the next two decades produced little research examining the relative importance of FDI on the U.S. economy. The lack of reliable data on state capital stock provides a partial explanation for this sparseness of research. Thus, in addition to examining the impact of foreign capital on U.S. growth, an important objective of this study is to derive estimated capital

stocks by state for the sample period. Using this data in an econometric analysis, the study then determines the extent to which differential levels of foreign capital explain the large variance in state economic growth between 1987 and 1999.

Foreign Capital versus Domestic Capital

In order to derive productivity contributions, the analysis that follows separates foreign and domestic capital. Several factors account for productivity differences between foreign and domestic capital. First, foreign capital has been concentrated in manufacturing where productivity growth exceeded that of non-manufacturing.[2] Figure 2 displays the percent of both foreign and domestic capital in manufacturing. During the period 1987 to 1999, approximately ten percent of domestic capital was in manufacturing. At the same time, the amount of foreign capital in manufacturing industries ranged between 33 and 46 percent. Furthermore, from 1995 to 1999, a period of significant U.S. productivity growth, the share of foreign capital in manufacturing rose from 36 to 46 percent.

Second, U.S. economic conditions affect FDIUS differently than domestic investment. Figure 3 shows that foreign capital as a percentage of U.S. capital has risen over the past two decades. Between 1980 and 1999, foreign capital as a percent of total capital grew from 4.9 percent to 9.5 percent. The percentage peaked twice over this time span, once in 1982 and again in 1991. These peaks occurred during U.S. recessions, suggesting that foreign capital is slower to respond to changing U.S. economic conditions than domestic capital. A comparison of growth rates of foreign

[2] See Goss (2001).

capital with that of domestic capital provides even more evidence of the different reactions of capital to U.S. economic conditions over the past twenty years. Figure 4 shows that while the growth rate of foreign capital was more volatile than that of domestic capital, the two followed the same general trend. In addition, the growth rate of foreign capital bottoms out in 1983 and 1992, the years following the recessions of the early 1980s and 1990s. This implies that while foreign capital is responsive to the U.S. business cycle but with lag.

Third, foreign firms that locate in the U.S. may attract other foreign firms that participate in the same supply chain. For instance, Florida and Kenney (1994) found that Japanese investment in research and development in the U.S. tended to cluster in the Midwest automotive region and around technologically advanced areas. In another study, Zhang (2001) found foreign investment in China clustered along coastal regions because of advantages in wage rates and infrastructure. Data used in subsequent analyses do show some evidence of clustering, with the level and growth rates experienced across the states varying significantly. Figure 4 displays foreign capital as a percentage of gross state product (GSP) by state for the year 1999. An examination of the figure provides some evidence of clustering of foreign capital. There are clusters in the Northwest including Utah, Nevada, and Wyoming and in the East-Central including Indiana, Kentucky, and Michigan. In addition, foreign firms appear to have invested less in the Northeast and the Midwest than in other regions of the U.S.

Fourth, exchange rate fluctuations have larger impacts on firms that undertake global investment than on U.S. firms that limit their investment to domestic markets. Researchers have found much evidence linking exchange rates to the investment

activity of foreign firms. Specifically, Lin et al. (2001) measured a statistical link between exchange rates and overseas investment decisions. In addition, Amuedo-Dorantes and Pozo (2001) found that greater exchange rate uncertainty decreased FDI in the short run. Similarly, Love and Lage-Hidalgo (2000) concluded that exchange rates affect the timing of U.S. direct investment in Mexico.

Finally, geographic differences in the distribution in profits may produce differences in contributions. For example, Balcao Reis (2001) showed that foreign investment may decrease national welfare due to the transfer of capital returns to foreigners.

Even though researchers have examined many aspects of foreign investment, research has yet to show that states receive any advantages from focusing on the recruitment of foreign capital. While the study does not examine incentive systems focused on attracting FDI, it does investigate how FDI affected state economic growth over the period 1988 to 1999. Accordingly, this examination provides insight into the formation of state economic development policies as they relate to FDI.

Research on Foreign Capital's Impact

While many studies have examined the impact of USDIA (see Meredith and Maki, 1992), the studies on FDIUS have had mixed results. Leichenko and Erickson (1997) summarized the state of this research and concluded that since the early 1980s, there has been widespread debate over the impacts of rising levels of inward FDI in the U.S. economy. Most of the literature on FDIUS has concentrated on narrow categories, such as industry orientation, employment impacts, taxes, and legal issues.

Researchers have focused most of their efforts, though, in examining the geographic dimension of FDI. For example, Coughlin, Terza, and Arromdee (1991) and Buss (2001) examined the location decision of foreign firms.

Research has not linked FDI to economic development directly. Rather, research has shown how FDI has affected manufacturing sectors and employment and thus indirectly affected economic development. An example from this line of research was produced by Shelburne and Bednarzik (1993) in their investigation of the relationship between employment and FDI location in trade-sensitive industries. And in a more recent study, Leichenko and Erickson (1997) found that FDIUS was positively related to exports in the U.S. They speculate that the increased export activity they measured was due to increased productivity caused by FDI. They concluded in their review of relevant literature that there were sound theoretical arguments to support the proposition that increased levels of FDI associated with improved productivity and enhanced international competitiveness of the manufacturing industry in the U.S. led to increased export activity.

Several studies examined the impact of foreign capital on non-U.S. domestic economies. For example, Chamarbagwala, et al. (2000) used a Cobb-Douglas production function to empirically test the relative output elasticity of foreign and domestic capital in a pooled cross-sectional time-series model of seven Asian economies. They found that the elasticity of foreign capital was greater than that of domestic capital. Weitzman (1979) used a Cobb-Douglas production function framework to estimate the impact of Western capital on Soviet economic growth. He

measured no statistical difference between Western capital and domestic (Soviet) capital.

In one of the few studies examining the impact of foreign capital stock on state economic growth in the U.S., Liou (1993) found no evidence that policies of attracting FDI were beneficial during the 1970s and 1980s. Liou determined that other market and individual need considerations, such as exchange rates, had a larger impact on the location of foreign investment than did tax incentives. The next section discusses the methodology to used to estimate the impact of foreign capital on economic growth thus filling an apparent gap in the research literature.

Methodology

Equation (1) presents the production function used to determine the effects of capital and labor on GSP.

$$Q = f(K_d, K_f, L_t, LQ) \quad (1)$$

where Q is GSP, K_d is domestic capital stock, K_f is foreign capital stock, L_t is total employment, and LQ is labor quality. Assuming a Cobb-Douglas production function, Equation (1) can be explicitly defined as:

$$Q = A\, K_d^{\beta 1}\, K_f^{\beta 2}\, L_t^{\beta 3}\, Age^{\beta 4}\, Ed^{\beta 5} \quad (2)$$

where A is the constant term. A description of these variables and their sources is in Table 1 below. Writing Equation (2) in logarithmic form yields Equation (3) below.

$$\ln (Q) = \ln (A) + \beta_1 \ln (K_d) + \beta_2 \ln (K_f) + \beta_3 \ln (L_t) + \beta_4 \ln (Age) + \beta_5 \ln (Ed) \quad (3)$$

Estimations of Equation (3) use pooled GSP, labor, capital, and labor quality data for the years 1987 through 1999 and cross sections of the 50 states. The average age

and percent of college-educated workers proxy labor quality for each state. Each of the estimated parameters represents the elasticity of each factor with respect to GSP. The next section discusses the data used in the empirical tests.

Data

Due to the lack of foreign capital data by state prior to 1987, the analysis is limited to the period 1987 through 1999. The analysis requires further subdivision of the capital stock data into foreign and domestic components. The data on capital stock of foreign affiliates comes from the BEA's publication *Foreign Direct Investment in the United States: Operations of U.S. Affiliates of Foreign Companies*. The BEA defines a foreign affiliate as any new business in the U.S. established by a foreign company or any company in the U.S. that has at least ten percent foreign ownership. Every five years, the BEA publishes its Benchmark Survey of all foreign affiliates, and in the interim years, it collects sample data to produce population estimates.

No U.S. government agency, to the authors' knowledge, publishes domestic capital stocks by state, so a major task of this study was to derive estimated state capital stocks. Implementing Munnell's (1990) methodology, which begins with national capital stocks by industry (available from the BEA), industry proxies for each state are used to divide the national stock into state components.[3] Each state's share of a given

[3] Total capital stock is divided into sixteen sectors: agriculture, manufacturing, construction, mining, other mineral industries, retail trade, wholesale trade, banking, rail transportation, trucking and warehousing, water transportation, air transportation, electric services, gas services, telephone and telegraph, and services.

industry proxy determines the portion of that industry's national stock allocated to the state.[4]

Empirical Results

The correlation coefficient between foreign capital and GSP are 0.80 for 1987 and 0.88 for 1999, meaning that GSP and foreign capital are strongly positively related. Over this period, the states of Nevada, Idaho, and Oregon had economies which grew by the largest percentages – 123 percent, 97 percent, and 90 percent, respectively – and also experienced the largest percentage increases in foreign capital – 367 percent, 382 percent, and 352 percent, respectively. Furthermore, the states with the slowest economic growth (less than 30 percent) over the period – North Dakota, Maine, Hawaii, Louisiana, and Alaska – were all also in the bottom half of the states in percentage growth in foreign capital. Given the diverse success of the individual states in terms of the growth of foreign capital, policymakers and researchers need a more clear understanding of how this varying experience affected economic growth.

Table 2 presents the results of the estimation of Equation (3). Column (1) lists the results for the entire period, while Columns (2) and (3) display the results for 1987 to 1994 and 1995 to 1999, respectively. Except for domestic capital for the period 1987 to 1994 and age for the period 1995 to 1999, each variable possesses the expected sign and is statistically significant. The estimations yield production functions exhibiting

[4] This paper's method is the same as Munnell's method with respect to all proxies except those listed here. 1) The 1997 Census of Mineral Industries did not provide capital stock data, so 1992's data was used in its place. In addition, oil and gas extraction were not separated. 2) The proxy for electricity was net generation from the United States Statistical Abstract. 3) Because of the change from SIC to NAICS codes and the resulting different categorizations of service industries, all services were aggregated to produce consistency in the proxy. 4) Miles of rail by state for 1992 was unavailable, so 1997 was used in its place. 5) Aircraft by state for 1997 were unavailable, so 1992 was used. 6) The proxy for water transportation was unavailable for 1987 so 1992 was used.

approximately constant returns to scale for all three periods.[5] The variable of interest, foreign capital, is positive and has a statistically significant impact on GSP for all three periods. The elasticity of foreign capital for the entire period is 0.056, which is statistically larger than the elasticity of domestic capital of 0.037. Importantly, the elasticity of foreign capital is greater than that of domestic capital for both of the sub-periods. During the latter period, 1995 to 1999, in which the U.S. economy experienced more rapid growth, the elasticity of foreign capital was approximately twice the elasticity of the earlier period. As discussed earlier, this is the also the period in which foreign capital became more focused in manufacturing.

Table 3 displays the estimated contributions to GSP growth for all three periods based on parameter estimates from Table 2. According to the model, foreign capital contributed 0.40 percent per year to GSP growth, which was 1/15 of the total GSP growth between 1987 and 1999. During the period 1987 to 1994, foreign capital's yearly contribution to GSP growth was 0.38 percent, and this contribution increased to 0.66 percent per year between 1995 to 1999.

Figure 6 profiles the contribution of foreign capital to GSP growth from 1987 to 1999 across the states. The total contribution ranged from –0.6 percent for Delaware and North Dakota to 9.3 percent for Idaho and Indiana. As presented, there appear to be some regional differences in terms of foreign capital's contribution to growth. Table 4 summarizes the impact of foreign capital by region for the period 1987 to 1999. The heavily industrialized states of Michigan, Indiana, and Kentucky are in the highest

[5] The sum of the foreign capital, domestic capital, and labor coefficients is 1.04 for the entire period, 1.02 for the period 1987 to 1994, and 1.06 for time span 1995 to 1999.

contribution category as well as most of the states in the Pacific Northwest. This reinforces the hypothesis that foreign capital makes a larger contribution in areas with large manufacturing sectors. Most states in the Rocky Mountain region, however, are in the lowest contribution category. In addition, most states in either the highest or middle contribution category are situated on a coast or on a major waterway, such as the Mississippi River or the Great Lakes, suggesting access to water transportation affected foreign capital's contribution. Thus, coastal states and states located on major waterways benefited the most from the expansion of foreign capital from 1987 to 1999.

In addition to the spatial distribution of foreign capital's impact, correlation coefficients between foreign capital's contribution and manufacturing concentration indicate a fairly strong relationship. For 1999, the correlation coefficient is 0.44, implying a strong positive relationship between manufacturing capital and foreign capital. This finding is consistent with the earlier discussion of the concentration of foreign capital in manufacturing industries. To determine if the concentration of foreign capital in manufacturing accounts for the differences in elasticities of foreign and domestic capital, Equation (3) is re-estimated for the manufacturing sector of the states. Table 5 presents these estimates.

As presented, each of the variables has a positive and statistically significant impact on manufacturing output for each period examined. In the full period, foreign capital's elasticity is 0.1204, or more than three times that of domestic capital. From 1987 to 1994, the elasticity of foreign capital is 0.1268, more than six times that of domestic capital. From 1995 to 1999, foreign capital's elasticity is 0.1296, less than a third of that of domestic capital. However, foreign capital's elasticity remains relatively

constant over the periods analyzed, while domestic capital's elasticity varies widely. Some of the variation in domestic's elasticity may be attributable to the shift towards technology in the latter half of the decade of the 90s. This proposition, however, cannot be tested at this time due to the lack of data on the level of foreign capital in technological industries by state.

Despite the data limitations, it is clear that the concentration of foreign capital in manufacturing is not solely responsible for the differences in the elasticities of foreign and domestic capital. Those states with larger concentrations of manufacturing would still benefit more by attracting foreign capital than states with smaller concentrations, but this is not the only factor that policymakers should take into account when contemplating recruiting foreign capital.

Table 6 lists the estimated contribution of foreign capital to manufacturing output using parameter estimates from Table 5. As presented, foreign capital made a relatively larger impact from 1987 to 1994 than from 1995 to 1999. This was due to a significant decline in domestic capital's elasticity relative to foreign capital's from 1987 to 1994. This outcome is a product of the relative stability of domestic capital in periods of economic downturns and by reduced levels of foreign capital after periods of economic malaise.

Results presented in this study did not clearly demonstrate the importance of clustering of foreign capital on economic growth. In fact, the correlation coefficient between foreign capital's contribution by state and the percent of a state's capital that is foreign was –0.06 for 1999. The regional clustering of foreign capital is apparent, but our results do not indicate that this clustering is a source of higher foreign capital

contributions by state. While clustering may provide an explanation for location decisions, it does not appear to account for any of the difference in the elasticities of foreign and domestic capital.

Conclusions

These findings show that foreign capital has become an increasingly important contributor to state economic growth. Specifically, it was concluded that the elasticity of foreign capital from 1995 to 1999 was about twice that from 1987 to 1994. In addition, foreign capital made a significant contribution to GSP growth, accounting for approximately 1/15 of this growth over the period 1987 to 1999. These findings suggest that some states, particularly manufacturing intensive states, have benefited from an expansion in foreign capital.

However, the best approach for states to attract foreign capital in the future remains debatable. Researchers have examined many methods for attracting and retaining foreign capital. Specifically, Coughlin, et al. (1991) found that per capita income and density of manufacturing in a state were the most influential factors. Similarly, Hines (1996) determined that relative state tax rates have a significant impact on the location of foreign investment. Shaver (1998) found that foreign companies tend to locate in coastal rather than inland states. While this study did not address the recruitment issue, it does provide support for the continuation of state efforts to recruit and retain foreign capital.

Results from this study show that contributions of foreign capital to state growth have differed by state. In addition, Rondinelli and Burpitt (2000) found incentives had

much less of an effect than labor, infrastructure, and economic climate on whether foreign investment locates and stays in a state. Furthermore, Single (1999) found that tax holidays had little effect on the location decision of foreign companies' subsidiary firms. The indeterminacy of appropriate recruiting techniques, however, does not diminish the increasing importance of foreign capital to the U.S. economy. Clearly, state policy makers should recognize that foreign capital and domestic capital are not fungible.

Figure 1: Three-Year Moving Average of FDIUS to USDIA Ratio

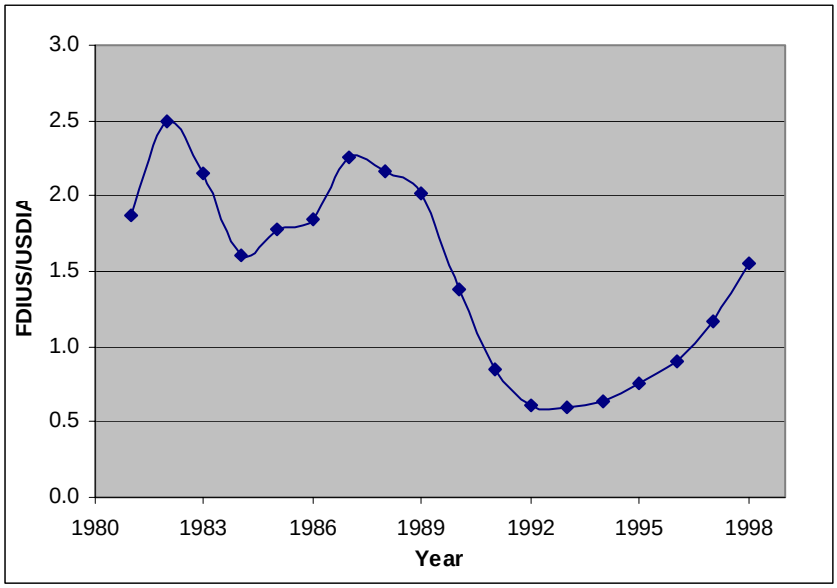

Figure 2: Percent of Capital in Manufacturing Industries

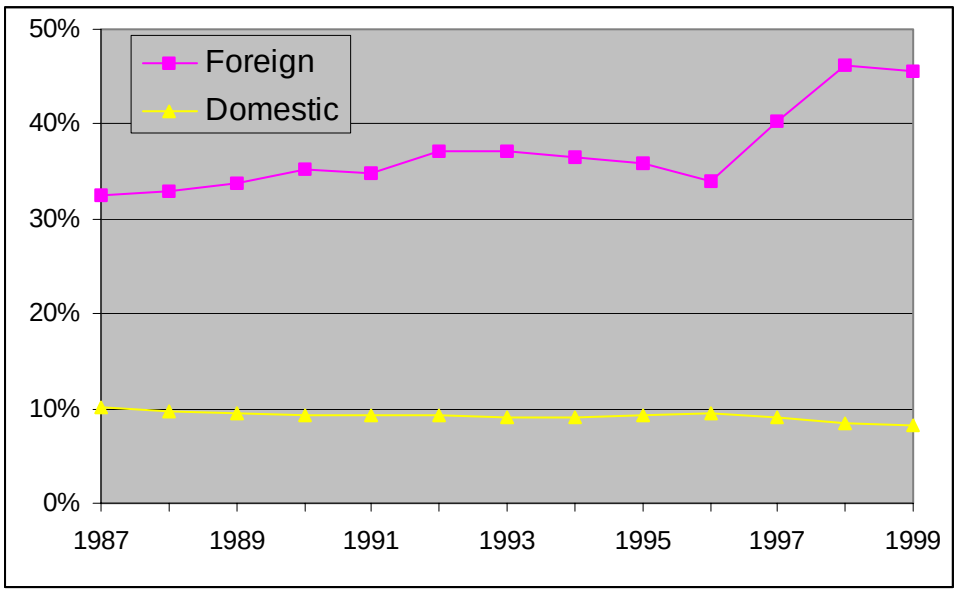

Figure 3: Real Foreign Capital as a Percentage of Real Total Capital 1980 - 1999

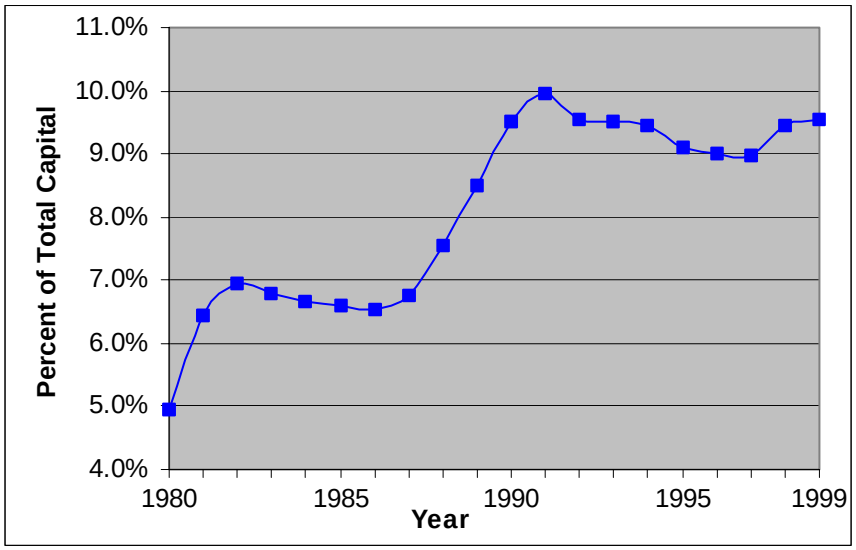

Figure 4: Yearly Growth Rates of Real Foreign and Domestic Capital 1981 - 1999

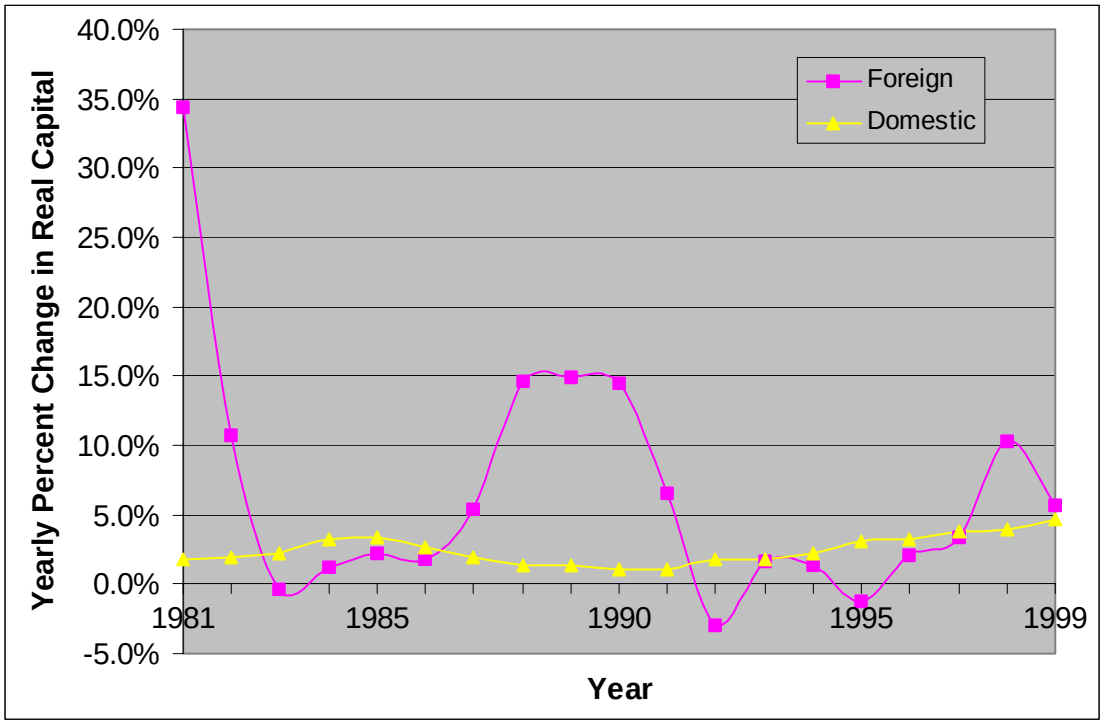

Figure 5: States' Foreign Capital as a Percentage of GSP as of 1999

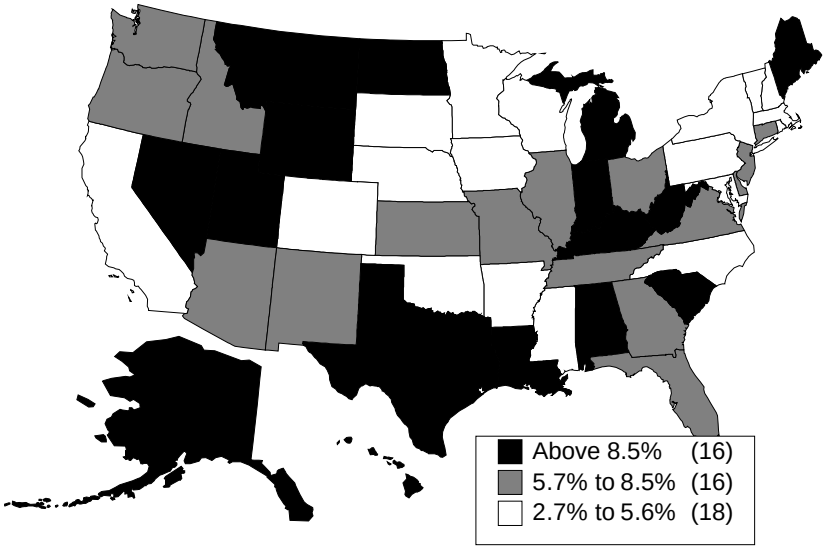

Table 1: Description of data

			Mean Values			
Variable Name	**Variable Description**	**Data Source**	**1987**	**1994**	**1995**	**1999**
Q	Gross State Product (in millions)	Bureau of Economic Analysis	$120,567	$143,052	$147,687	$177,652
K_t	Real Total Capital Stock (in millions)	Estimated from Bureau of Economic Analysis data using Munnell's methodology	$138,366	$158,702	$163,028	$190,999
K_f	Real Foreign Capital Stock (in millions)	Bureau of Economic Analysis	$6,078	$9,571	$9,736	$12,223
K_d	Real Domestic Capital Stock (in millions)	$= K_t - K_f$	$132,288	$149,131	$153,292	$178,776
L_t	Total State Employment (in thousands)	Bureau of Labor Statistics	2,032	2,271	2,329	2,564
AGE	Average Age of Population	Bureau of Labor Statistics	38.7	39.6 [a]	39.6 [a]	39.6 [a]
ED	Percent of Population with at Least a Bachelor's Degree	Bureau of Labor Statistics	19.8	23.1 [a]	23.1 [a]	23.1 [a]

[a] Data on age and education are for two years, 1990 and 1997. 1990's data is used for years 1987 through 1993 and 1997's data is used for years 1994 through 1999.

Table 2: Estimated impact of factors on GSP			
	1987 – 1999	**1987 – 1994**	**1995 – 1999**
Ln(Foreign Capital)	0.0562[a] (10.710)	0.0523 [a] (8.893)	0.1086 [a] (14.790)
Ln(Domestic Capital)	0.0365 [a] (3.095)	-0.0170 (-1.114)	0.0821 [a] (4.437)
Ln(Labor)	0.9482 [a] (73.150)	0.9859 [a] (67.320)	0.8692 [a] (63.780)
Ln(Age)	-0.8030 [a] (-6.767)	-0.7413 [a] (-6.888)	0.4814 (1.115)
Ln(Education)	0.2737 [a] (15.990)	0.2363 [a] (14.330)	0.4489 [a] (13.820)
Constant	5.6614 [a] (14.010)	5.9055 [a] (14.330)	0.0009 (0.001)
R^2	.985	.991	.994
N	650	400	250
[a] indicates that coefficient is statistically different from zero at the 95% level of significance.			

Table 3: Estimated contribution of foreign capital to GSP growth		
	Yearly Contribution to GSP Growth	Share of GSP Growth
1987-99	0.40%	1/15
1987-94	0.38%	1/3
1995-99	0.66%	1/8

Figure 6: Contribution to GSP Growth, 1987-99

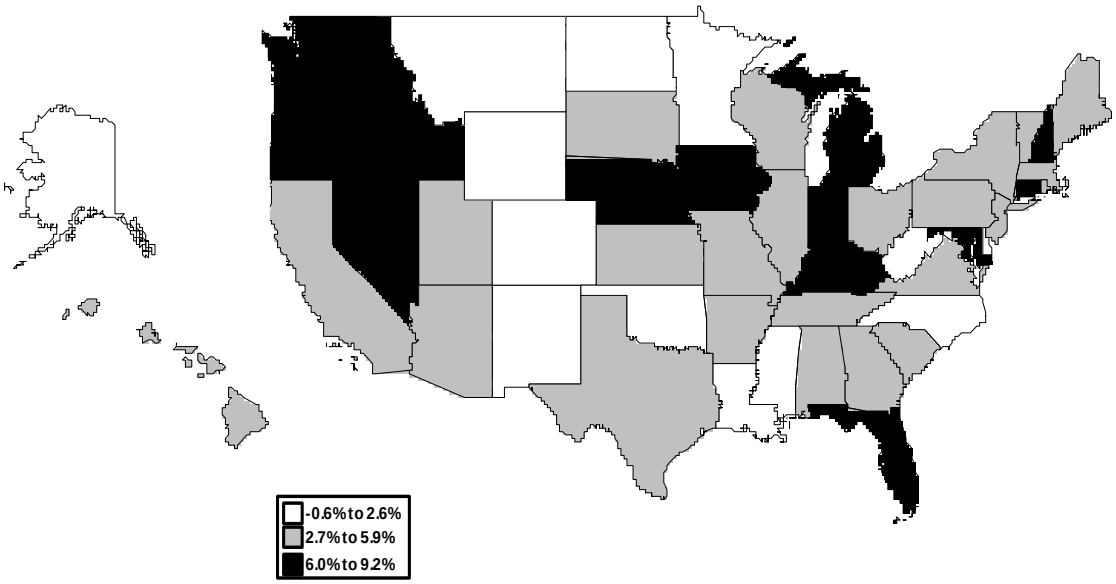

Table 4: Estimated contribution of foreign capital by region	
U.S. Census Region	Total contribution 1987-99 (median for states in region)
Far West	6.5%
Great Lakes	5.9%
New England	4.9%
South East	4.7%
Plains	4.3%
Mid-East	3.7%
Rocky Mountain	2.7%
South West	2.4%

Table 5: Estimated impact of factors on GSP in manufacturing			
	1987 – 1999	**1987 – 1994**	**1995 – 1999**
Ln(Foreign Capital)	0.1204[a] (14.920)	0.1268 [a] (19.540)	0.1296 [a] (10.900)
Ln(Domestic Capital)	0.0384 [a] (4.375)	0.0189 [a] (2.064)	0.4217 [a] (12.510)
Ln(Labor)	0.8811 [a] (66.070)	0.8910 [a] (70.270)	0.4757 [a] (12.780)
Ln(Age)	0.9938 [a] (4.147)	0.7110 [a] (3.960)	2.1114 [a] (3.240)
Ln(Education)	0.2593 [a] (9.175)	0.2056 [a] (9.851)	0.4005 [a] (5.637)
Constant	-0.9819 (-1.141)	0.2407 (0.371)	-7.0159 [a] (-2.781)
R^2	.982	.992	.983
N	624	384	240

[a] indicates that coefficient is statistically different from zero at the 95% level of significance.

Table 6: Estimated contribution of foreign capital to Manufacturing GSP growth		
	Yearly Contribution to GSP Growth	Share of GSP Growth
1987-99	1.02%	¼
1987-94	1.12%	½
1995-99	1.34%	¼

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