Economic Review

Federal Reserve Bank of San Francisco

Summer 1989 Number 3

Gary C. Zimmerman — The Growing Presence of Japanese Banks in California

Adrian W. Throop — Reagan Fiscal Policy and the Dollar

Adrian W. Throop — Fiscal Policy, the Dollar, and International Trade: A Synthesis of Two Views

Table of Contents

The Growing Presence of Japanese Banks in California 3
Gary C. Zimmerman

Reagan Fiscal Policy and the Dollar 18
Adrian W. Throop

Fiscal Policy, the Dollar, and International Trade: A Synthesis of Two Views 27
Adrian W. Throop

The Federal Reserve Bank of San Francisco's Economic Review is published quarterly by the Bank's Research Department under the supervision of Jack H. Beebe, Senior Vice President and Director of Research. The publication is edited by Barbara A. Bennett. Design, production, and distribution are handled by the Public Information Department, with the assistance of Karen Rusk and William Rosenthal.

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The Growing Presence of Japanese Banks in California

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Japanese-owned banking institutions have dramatically increased their share of the California banking market since the early 1980s. However, the author finds that, overall, the increase in foreign bank ownership in the State has been slight. Japanese bank expansion appears to have arisen primarily from the rapid increase in trade with Japan and Japanese direct foreign investment in California. While Japanese banks emphasize commercial lending and rely more heavily on purchased funding, they have a substantial, and growing, retail presence in the State.

Japanese banks have made significant inroads into the California banking market since the early 1980s. Over the period from 1982 through 1988, assets of Japanese-owned banking institutions in California increased nearly threefold. At the end of 1988, Japanese-owned banks held one-quarter of the banking assets and over 30 percent of all business loans in the State. This expansion has come about through acquisitions and new entry, as well as through rapid growth of existing institutions.

California is not the only market where Japanese banks have made inroads. World-wide, Japanese-owned banking institutions have grown over the last decade and now dominate the list of the world's largest banks. Their overseas branches alone nearly doubled their assets from 1982 to 1987, reaching almost $1.1 trillion by year-end 1987.[1]

In California, in particular, this growth has received considerable attention, raising concerns about its causes and the possibility that with continued growth, Japanese banks could come to dominate the California market. This paper first examines the strong growth and increasing market shares of two groups of Japanese-owned banking institutions: commercial banks chartered in California and the agencies and branches of Japanese banks that operate in California. (A description of the banking powers and services of these different types of banking institutions is provided in the BOX.) Section II then explores possible explanations for the rapid growth of Japanese-owned banking institutions in California, and Section III examines empirical evidence on growth patterns of banking institutions to assess the potential causes of rapid growth. In particular, empirical comparisons of the composition of bank portfolios and funding attempt to determine whether balance sheets of Japanese banks reflect the factors that may be causing rapid growth. Section IV provides some observations and conclusions about the Japanese banking presence in California. Specifically, growth is likely to continue, but at a slower pace, with more emphasis placed on the "retail banking" area.

I. Rapid Growth

The growth of Japanese banks, agencies, and branches in the mid-1980s in the U.S. has been rapid. In California, the traditional measures of market presence reflect that growth; assets, loans, and deposits all show dramatic increases. Between 1982 and 1988, the assets of Japanese-owned banking institutions in California nearly tripled, growing from $34.6 billion to $93.4 billion.[2] As shown in Chart 1A, Japanese-owned institutions' market share, which was 10.7 percent of the total assets of all banks, agencies, and branches in the State in 1982, rose to 25.2 percent by the end of 1988.

Using a narrower definition of the banking market, that is, commercial banks only (excluding agencies and branches), there still is a strong increase in the market share of Japanese-owned institutions. As Chart 1B shows, assets of Japanese-owned banks rose from 3.7 percent to 11.9 percent of the "bank only" market from 1982 to 1988.[3] The Japanese-owned commercial banks more than

Chart 1A

Share of Total Bank, Agency and Branch Assets for California

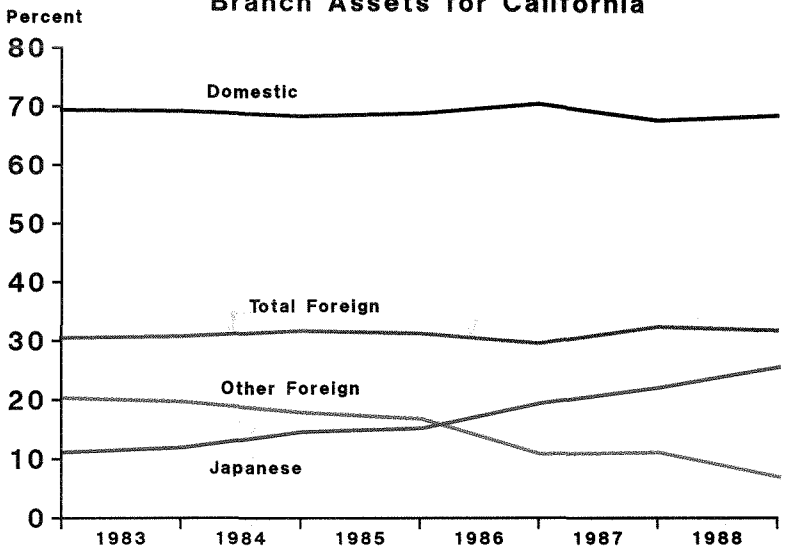
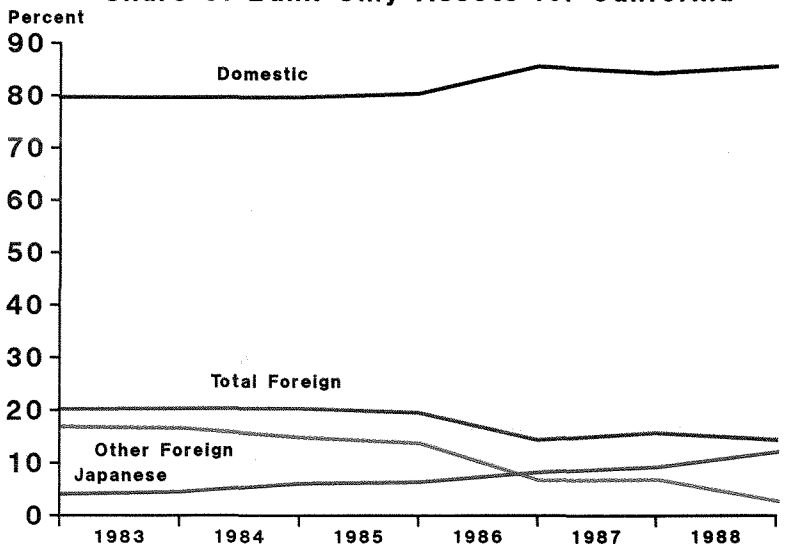


Chart 1B

Share of Bank Only Assets for California



tripled their assets during the period, reaching $35.3 billion by year-end 1988. Sixty percent of this increase resulted from acquisitions of three large foreign-owned banks by Japanese-owned banks.[4] However, Japanese-owned banks in general also grew at a faster pace than did other California banks.

Of the ten Japanese-owned commercial banks operating in the State at year-end 1988, eight were subsidiaries of Japanese banks. Two small banks are Japanese-owned, but are not owned by banks headquartered in Japan. The subsidiary banks account for virtually all of the assets of the Japanese-owned banks in the State. Four of these banks ranked among the top ten banks in the State at year-end 1988: Union Bank (fifth largest at $15.0 billion in assets), Bank of California (sixth largest, $6.9 billion), Sanwa Bank California (seventh largest, $6.4 billion), and Sumitomo Bank of California (ninth largest, $3.7 billion). Earlier in the year Tokai Bank of California ranked tenth.[5]

The twenty-two foreign agencies and six foreign branches of Japanese-owned banks more than doubled in size over the 1982 to 1988 period. Their combined assets reached $58.1 billion by year-end 1988. The agencies ($44.7 billion) and branches ($13.4 billion) provide an array of commercial, money market, and trade-related banking services, either directly or through international banking facilities that serve only foreign residents.[6]

Shifts in Market Shares

Although the increase in Japanese ownership of banks in the U.S. has raised concerns about "a wave" of Japanese financial services acquisitions,[7] expansion has not occurred at the expense of domestic banks' market share in California. Over the six years ending in 1988, the market share of all foreign banking institutions increased only modestly, from 30.8 percent to 31.7 percent.[8] As can be seen in Chart 1A, rather than gaining market share from domestic banks, Japanese banks essentially have replaced other foreign banks as the dominant foreign banking power in California.

In fact, using the narrow market definition, commercial banks only, foreign market share actually *declined* from 20.2 percent in 1982 to 14.9 percent in 1988. Most of this

Types of Foreign-Owned Banking Institutions

Commercial Bank
- Chartered in the U.S. as a bank.
- Owned by foreign individuals, firms or banks.
- Same capital and insurance requirements as a domestically-owned bank.
- Same regulations as other domestically-chartered banks.
- May offer full range of banking services.
- May provide both retail and wholesale banking services.

Subsidiary Bank
- Owned and operated as a U.S. subsidiary of a foreign commercial bank.
- Subsidiaries are chartered in the U.S. as a bank.
- Incorporated as a separate entity from the foreign parent.
- Same capital and insurance requirements as a domestically-owned bank.
- Same regulations as domestic banks.
- May offer full range of banking services.
- May provide both retail and wholesale banking services.
- May be funded by parent bank or affiliated institutions.

Agency of a foreign bank
- Offers only limited banking services.
- Cannot accept deposits, but may accept "credit balances."
- Concentrates on trade-financing and money-market services.
- May be funded with borrowings from parent or affiliates.

Branch of a foreign bank
- Has full banking powers.
- Can accept deposits.
- Provides many trade-financing and money-market services.
- May be funded with borrowings from parent or affiliates.

International Banking Facility (IBF):
- Not a separate entity, but a set of accounts on the books of the bank, agency, or branch.
- May accept deposits from and extend credit to foreign residents, parent, and other IBFs.
- Not subject to U.S. reserve requirements or interest rate ceilings.

decline resulted from the purchase of the British-owned Crocker Bank by Wells Fargo Bank in 1986.[9] This explains the sharp decline in "other-foreign bank" market share in Chart 1B. Thus, we have seen a shift, rather than an increase, in foreign ownership.

II. Reasons for Expansion

This section examines a number of factors that may have played a role in the growth of Japanese banking assets in California. For example, the growth in trade with Japan and the growth of Japan's current account surpluses are two factors that may have stimulated the growth of Japanese banking institutions in California. Liberalization of domestic capital markets in Japan is another factor that may have stimulated investment in the State. Finally, California's location, making it an important point of entry, as well as the State's perceived attractiveness as a growing banking market, are factors that may have helped to set the stage for the upsurge in investment in Japanese banking in California. These considerations are discussed below.

Banks Follow Trade

One reason for the growth in Japanese banking assets in California may be the growth of U.S. trade with Japan. Because of California's location on the Asia-Pacific Rim, the State has become an important locus of trade-related activity. With the increasing presence of Japanese-owned multinational firms engaging in trade-related activities in the State, there has been a commensurate increase in the need for trade-related financing, exchange, clearing, and other credit and banking services. Japanese-owned banking institutions may have a comparative advantage over the U.S. and other competitors in providing these services. If this is the case, it is logical that Japanese banking assets would increase in the current environment of growing trade with Japan.

A study of U.S. and Japanese banking by Henry Terrell (1979) provides a theoretical and empirical basis for suggesting that in the context of rapid growth in trade, Japanese banks do indeed enjoy comparative advantages in providing banking services in California.[10] In this analysis, Terrell adapts Caves' (1974) model of foreign investment to international banking. He notes that ". . . foreign investment is often associated with product differentiation, which may include possession of intangible assets such as a firm's knowledge about how to produce and distribute its product."[11] Terrell applies this concept to multinational banking, hypothesizing that in foreign markets, foreign banks can differentiate their products from those of domestic competitors by specializing in services to multinational firms from their home country. By specializing in such services, Terrell argues, Japanese banks' subsidiaries, agencies, and branches may enjoy a significant competitive advantage over their domestic competitors on account of their pre-existing business relationships with Japanese firms, as well as their superior knowledge of Japan's markets, customs, and operations.

Thus, Terrell suggests that "rapid growth of foreign branch and subsidiary activities by both Japanese [banks in America] and American banks [in Japan] indicates a customer preference for obtaining banking services [in a foreign country]—such as access to credit, deposit, and payment facilities—from the office of a bank with which they [already] are familiar [in their home country]. . ." He also asserts that "Customers much prefer this approach to the alternatives of either dealing with a local institution or, more expensively, dealing with a far-distant banking facility."[12]

These assertions provide a testable hypothesis; namely, that foreign banking activity is related to growth in trade with a given foreign country, as well as strong local economic conditions in the host country. Indeed, Terrell finds such a positive correlation in his empirical analysis.[13]

The strong relationship Terrell found in the 1970s between international trade and foreign banking activity appears to have been borne out in the 1980s. The surge in trade between Japan and California appears to have increased the demand for Japanese banking services in California and the U.S.[14] Chart 2A shows California's combined volume of imports from and exports to Japan from 1980 to 1987. The volume of trade increased by nearly 150 percent during this period.[15] Similarly, the assets of Japanese-owned banking institutions experienced a surge in growth over this period, as shown in Chart 2B. Moreover, just as Japan's trade with California came to take up a larger share of California's total trade volume (35 percent in 1987, versus 30 percent in 1982), Japanese banking assets in California also accounted for a larger share of foreign banking assets in California by the end of 1987. (See Charts 1A and 1B.)

The British experience provides further support for the view that increased trade helped to stimulate the growth of Japanese banking assets in California. While commerce with Japan has soared, British trade with California has grown only slightly since 1982. (See Chart 2A.) By 1987, California's $3.1 billion total trade with Britain was

dwarfed by the $41.1 billion trade with Japan. According to the "banks follow trade" hypothesis, the lackluster growth in British trade with California should have been associated with lackluster growth in British banking assets during this period. In fact, as discussed earlier, the British banks left the State. Thus, even though they held about 15 percent of California's commercial bank assets in 1982, without growing trade flows to sustain them, a number of years of subpar performances by their California banks induced most of the British banks to sell their California subsidiaries and invest elsewhere.

Direct Foreign Investment

Another factor that may have helped to stimulate the rapid growth in Japanese banking assets in recent years is the growth of Japan's external surpluses over most of this period. Japan's large trade surpluses have made funds available for direct foreign investment. Coupled with the 1980 amendments to the Foreign Exchange and Foreign Trade Control Law, which deregulated capital flows into and out of Japan, these trade surpluses have stimulated a dramatic increase in Japanese investment in the U.S. in general and California in particular.

Chart 2A
Total Volume of Imports and Exports For the State of California

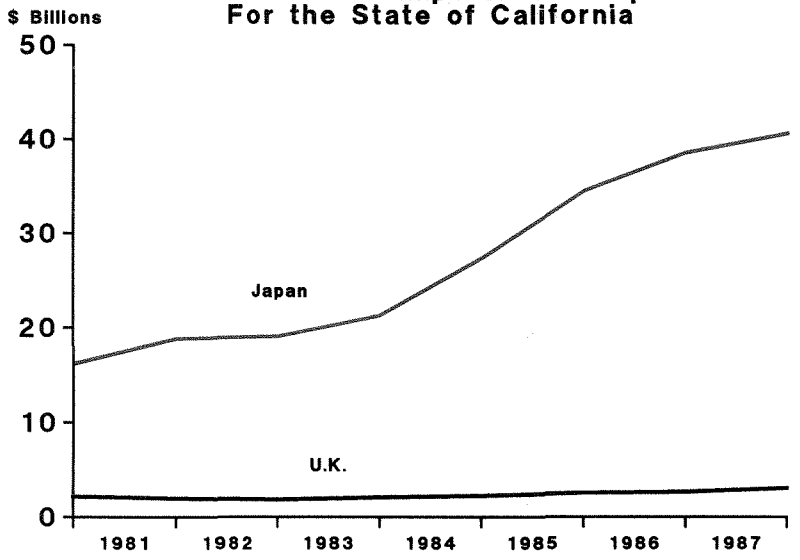
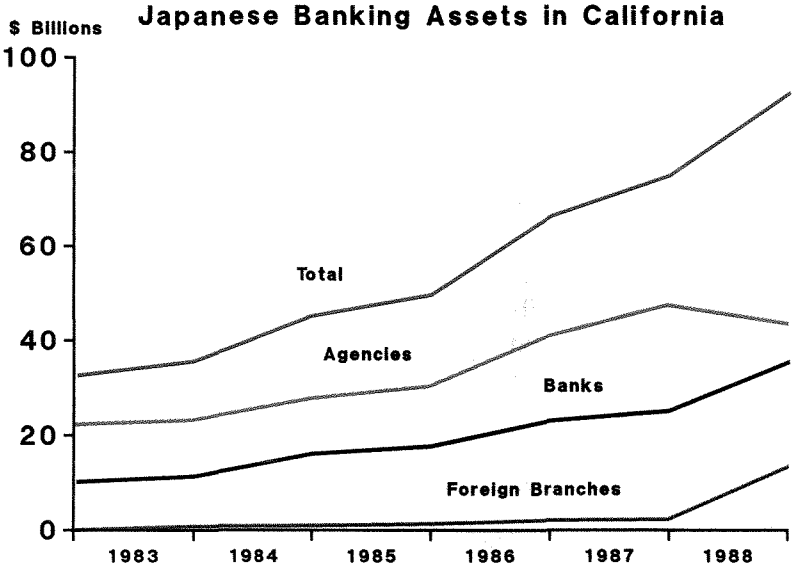


Chart 2B
Japanese Banking Assets in California



Over 700 Japanese firms have established manufacturing operations in the U.S.; about one-quarter of those are located in California.[16] The bulk of the Japanese investment through 1986 was in manufacturing, wholesale trade, and real estate. Finance accounted for under seven percent, according to U.S. Commerce Department data.

According to Commerce Department data, by 1986, Japan accounted for 14.2 percent of total direct foreign investment in California, up from 9.1 percent in 1982. In 1986, Japan was second only to Canada in terms of direct foreign investment in California, with $5.3 billion to Canada's $6.0 billion. However, for Japan, there was a 129.1 percent increase between 1982 and 1986 in the book value of plant, property, and equipment invested in California. Over the same period, Canada's increase was only 9.2 percent. The Japanese also surpassed Britain, which slipped to third, despite a 63.6 percent increase in direct foreign investment over the period.

This increase in direct investment probably has affected the growth of Japanese banks in California both directly and indirectly. The direct effects can be seen in the stepped-up pace of Japanese acquisitions of existing banks in California. Another potential channel for increased direct investment in California may have been increased funding from the parent banks in Japan. Such funds could have enabled Japanese banks in California to grow more rapidly than their competitors.

Increased direct investment also may have provided an indirect stimulus to Japanese banks in California through increased demand for banking services on the part of Japanese-owned commercial firms that have set up operations in California. As in the case of the "banks follow trade" argument, banks also may follow investment since Japanese investors probably prefer banking services provided by Japanese-owned banks with which they already have established business relationships in Japan.

Other Factors

The strength of the California economy is another factor that may have influenced Japanese bank expansion. In its own right, California is a large market. Its GDP ranks with the top eight countries in the world. Its large size, good location for international trade, and diversified base of production offer banks an attractive market. In recent years, the State's economy has outperformed the U.S. economy, with more rapid growth and greater resistance to downturns, potentially making California more attractive than other U.S. locations to foreign banks.

Thus, if California's attractiveness as a market in its own right were a factor stimulating the growth of Japanese banking in the State, one would expect to see Japanese-owned banks and agencies and branches growing more rapidly in California than in the U.S. generally or in the New York and Chicago banking markets. Despite the obvious Japanese interest in California, a comparison of growth rates for Japanese-owned banking institutions from 1982 to 1988 indicates that Japanese-owned institutions in the U.S. generally, and in New York and Illinois particularly, grew at slightly *faster* rates than did Japanese-owned banks in California.[17]

Likewise, if California were particularly attractive as a banking market in its own right, one might expect foreign banks in general to grow rapidly in California. However, this pattern is not observed. As discussed above, Japanese-owned banking institutions have grown much more rapidly than other foreign institutions. Charts 1A and 1B illustrate the impact that differential growth rates have had on market share. While the Japanese-owned banks have been growing rapidly, other foreign-owned banks have been leaving the market. In several cases, the Japanese have acquired foreign-owned banks. The pattern also extends to the agencies and branches, where the Japanese institutions have grown much more rapidly than the non-Japanese institutions. Given these observations, the attractiveness of the California market relative to other U.S. markets does not appear to have been a major factor in the rapid growth of Japanese-owned banks.

Diversification of geographic risks and access to U.S. markets also may have been a stimulus for the growth of Japanese banks in California. Specifically, entry into the California market would provide access to the U.S. money markets and diversify an international institution's funding base by allowing it to raise funds in the large U.S. financial markets. Similarly, operations in California provide access to major corporate borrowers in the U.S. and an opportunity to diversify lending risks across countries. However, this may not be a particularly strong argument, since diversification may be attained without access to California, or even the U.S., for that matter.

One final explanation that has been offered for the rapid growth of Japanese banks has to do with potential competitive advantages. Some argue, for example, that Japanese-owned banks have access to funding and/or capital from their parent banks, which, because of their size and strong credit ratings, can borrow at lower costs than can the subsidiary (or than domestic banks).[18] This advantage, moreover, may be reinforced by the availability of funds associated with Japan's large external surpluses. Thus, borrowing from an overseas parent could provide a funding advantage for Japanese-owned subsidiary banks, agencies, and branches. However, the parent must be willing to

forsake alternative open market returns on the funds in favor of subsidizing the operations of its California affiliates.

In any event, Japanese banks are unlikely to have any significant funding advantages over their domestic rivals in *domestic* funding markets. It seems clear that within California, Japanese banks price their retail deposits competitively to survive in the retail market. And in the wholesale markets, Japanese banks offer competitive rates on large CDs, federal funds, and eurodollars.

In sum, there are a number of factors that potentially have stimulated the growth of Japanese banks in California. Based on the evidence considered in this section, it appears that the growth in U.S. trade with Japan, the increase in Japanese direct investment in the U.S., and possibly, competitive advantages associated with using Japanese parents as a funding source have been the major reasons for the growth of Japanese banks in California and in the U.S. In the next section, I compare the portfolios of Japanese-owned banks with those of domestically-owned banks in California to determine whether investment and/or funding patterns reflect these influences.

III. A Comparison of Portfolios and Cost Structures

As discussed above, the dramatic increase in trade with Japan and the growth in Japan's trade surpluses likely have been key reasons for the increase in the Japanese banking presence in California. Trade financing is an area where Japanese banks may have a competitive edge in light of this growth in trade and trade surpluses. Therefore, one might expect to find that Japanese banks have a larger market share and extend more of this type of credit as a proportion of assets than do domestic banks. Since trade financing should appear on commercial banks' balance sheets as business lending, commercial and industrial loans, commercial letters of credit, and standby letters of credit (SLCs) provide useful measures of market presence.[19]

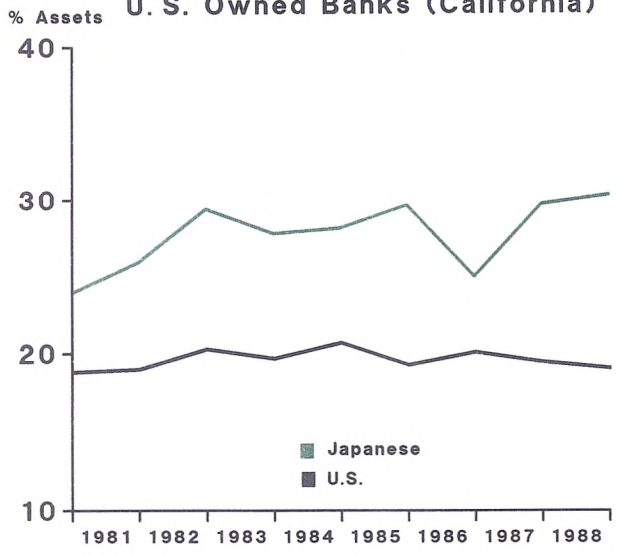
Data on outstanding balances of commercial and industrial loans and letters of credit show that Japanese-owned banking institutions in California have, in fact, gained a large share of these major commercial lending markets. In business lending, Japanese-owned banking institutions held 30.1 percent of the California market at year-end 1988. Their share of commercial letters of credit was even higher, nearly 32 percent. They controlled a 44 percent share of the rapidly growing SLC market, which is dominated by foreign banks with strong credit ratings.[20] Clearly, then, Japanese banks in California have a strong position in the markets for commercial lending and letters of credit. This is consistent with the view that the growth in Japanese-owned banks is associated with their trade orientation.

Aggregate Portfolio Measures

Other indications of Japanese banks' trade orientation potentially may arise in comparisons of Japanese- and domestically-owned banks' portfolios; that is, if the growth in Japanese-owned banks largely is the result of increased trade, one might expect to see differences between the composition of the portfolios of Japanese-owned and domestically-owned banks in California. Specifically, Japanese-owned banks probably extend proportionately more business-oriented credit, including commercial real estate loans, and proportionately less consumer-oriented credit, including residential mortgage loans, than do domestically-owned banks. Likewise, if direct investment is a factor in Japanese-owned banks' growth, there could be differences in the composition of Japanese-owned and domestically-owned banks' liabilities. Specifically, Japanese-owned banks may rely proportionately more on borrowings from their parents and proportionately less on retail-oriented deposits than do domestically-owned banks.

Chart 3

Business Loans as Percentage of Total Assets Japanese Banks vs. U. S. Owned Banks (California)



Comparisons of ratios of various categories of loans to total assets and ratios of various types of liabilities to total assets are made. Percentages for aggregate data on all Japanese-owned banks are compared with percentages for aggregate data on all domestic banks. These percentages are tracked over time, and presented in Charts 3 through 7. The aggregate data provide a measure of portfolio differences between the bank groups, as well as a measure of portfolio trends over time for each group. (However, these are relative portfolio measures, scaled by assets; they obscure differences in the actual growth rates of the asset and deposit categories across bank groups. For example, even though small time and savings deposits at Japanese-owned banks have grown more rapidly than at domestic banks, Chart 7 shows that the even more rapid expansion of Japanese bank assets has reduced the relative reliance on small time and savings deposits as a funding source for the Japanese banks.)

Aggregate data indicate that Japanese banks *do* have a much higher proportion of commercial loans than domestic banks have. While Japanese-owned banks held nearly 30 percent of their assets in business loans in 1988, domestic banks held only 19.5 percent. Chart 3 indicates that the difference between the two groups grew over the period when trade with Japan was soaring. It also is interesting to note that there are no Japanese-owned savings and loan associations or savings banks in California at present. While this may be due in part to regulatory restrictions, it also provides support for the argument that Japanese banks follow trade and thus are trade/business-oriented. Thrift institutions in California traditionally have not engaged in business finance and instead concentrate primarily on household finance, an area in which Japanese banks do not have a comparative advantage, according to the "banks follow trade" argument.

Chart 4

Real Estate Loans as Percentage of Total Assets Japanese Banks vs. U. S. Owned Banks (California)

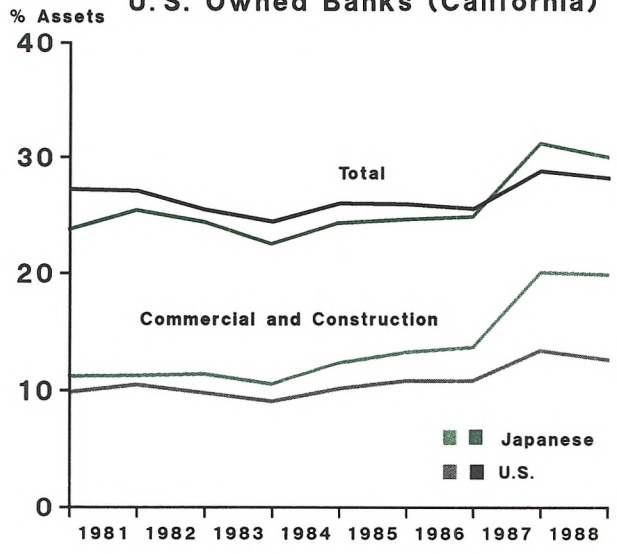
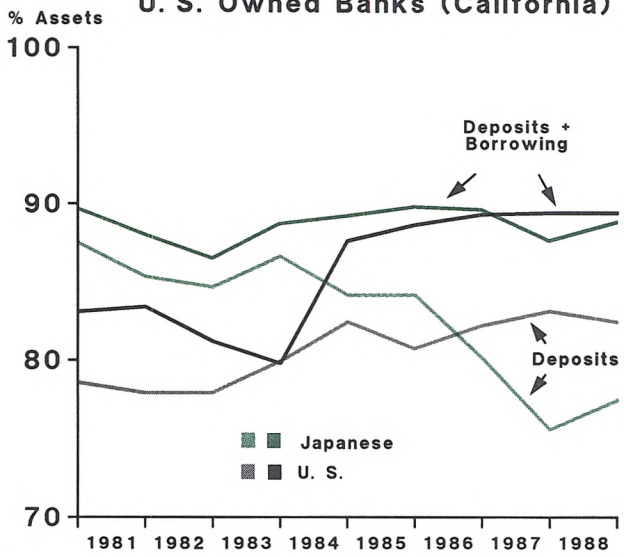


Chart 5

Funding as Percentage of Total Assets Japanese Banks vs. U. S. Owned Banks (California)



In the aggregate, we also find that Japanese-owned banks have a higher proportion of commercial real estate loans than domestic banks have. At year-end 1988, Japanese banks had 10.4 percent of their assets in commercial real estate loans, versus only 6.7 percent for domestic banks.

It is also interesting to note that while Japanese banks have a higher proportion of business and commercial real estate lending, there appear to be no significant differences in their relative proportions of total real estate lending (as shown in Chart 4), single family real estate lending, or consumer loans. Rather, as shown in Table 1, they have a higher proportion of loans to assets, which is offset by a smaller proportion of federal funds and repurchase agreement lending, securities holdings, and other assets, which mostly includes cash and balances due from other banks.

Deposit and liability data also tend to support the view that Japanese banks are more wholesale-business oriented than are their domestic counterparts. As can be seen in Chart 5, in the aggregate, Japanese-owned banks primarily are funded by domestic deposits, like their domestic bank competitors. However, from Chart 6, it is clear that

Japanese-owned banks in California rely more heavily on jumbo CDs ($100,000 and over) than do domestic banks. Moreover, Chart 6 shows that other borrowings, which may include federal funds, repurchase agreements, and eurodollar borrowing, as well as borrowing from parent banks, have been a more important source of funds for Japanese-owned banks than for their domestic counterparts. Nonetheless, at present, as a percent of assets, funding from parent banking organizations is not a particularly large funding source for Japanese subsidiary banks in California. According to recent bank holding company data, only about five percent of assets were funded this way, and only one of the eight subsidiaries had a significantly greater amount of borrowing from its parent.[21] One reason is that most of the subsidiary banks view such borrowing as a backup, rather than a primary, source of funds. Finally, Chart 7 indicates that retail time and savings deposits account for just over one-third of Japanese-owned bank funding, versus closer to fifty percent for domestic banks.

Thus, there are significant funding differences between Japanese-owned banks and domestic banks. Japanese-owned banks rely more on wholesale deposits and borrowings and less on retail deposits, consistent with the view that they are more trade- and business-oriented.

Taken together, then, the aggregate data on lending and funding patterns roughly are consistent with the trade patterns, lending support to the view that increased trade and increased direct investment have been important stimuli to the growth of Japanese-owned banks in California.

Comparisons of Individual Bank Portfolios

However, these results could arise from individual banks' portfolio decisions, and could be unrelated to the

Table 1

Loans and Investments as a Percentage of Assets

(California Banks, Fourth Quarter Averages, 1987)

	Parameter Estimates								
Dependent Variable: As a percent of assets	Intercept	Assets	Japanese-owned Dummy	Other-foreign Dummy	Number of branches	Observations	Adjusted R^2	F Value	Prob.>F
Total Securities	12.570***	−0.599	−4.163	0.280	0.029	435	−0.0039	0.577	0.6793
Federal Funds Sold and Repurchase Agreements	7.512***	0.310	−4.678*	−1.333	−0.023	435	0.0017	1.187	0.3160
Total Loans+	62.604***	0.521	14.420***	2.279	−0.020	435	0.0194	3.148	0.0144
Total Real Estate+	26.841***	−0.175	2.613	2.262	−0.014	435	−0.0057	0.379	0.8236
Single Family Real Estate	9.275***	−0.489	−1.711	0.189	0.039	435	0.0007	1.079	0.3666
Commercial Real Estate	7.719***	−0.129	6.775***	1.609	−0.010	435	0.0166	2.839	0.0241
Business Loans	21.768***	1.086	10.183***	1.083	−0.069	435	0.0160	2.768	0.0271
Consumer Loans	12.024***	−0.153	−3.159	−3.053	0.033	435	−0.0020	0.783	0.5365
Other Assets	17.313***	−0.232	−5.579*	−1.226	0.013	435	−0.0001	0.987	0.4145

* *Significant at 10% level.*
** *Significant at 5% level.*
*** *Significant at 1% level.*
\+ *Includes components not shown separately.*

individual banks' ownership status. Thus, it is important to determine whether the difference is significant at the individual bank level after controlling for other factors that might influence portfolio composition. Analysis of the individual bank data also may be necessary because the sample of Japanese-owned banks is small, and the larger institutions might skew the aggregate numbers.

Therefore, cross-sectional OLSQ regressions on individual bank data are employed to identify statistically significant portfolio differences between Japanese-owned banks and other banks. Financial statement data are available from the December 1987 Call Reports for all commercial banks in the state.[22] A description of the regression model is presented in the Appendix, and the results of the regressions are presented in Tables 1 and 2.

At the individual bank level, the regression results are consistent with the aggregate portfolio data. Controlling for size and branch differences, Japanese banks have 10.2 percent more business loans on average than domestic banks have. Moreover, that difference is statistically significant at the one-percent level, as shown in Table 1.

Similarly, the cross-sectional regressions indicate that commercial real estate lending at Japanese-owned banks accounts for nearly seven percent more of the asset portfolio than at domestic banks, and that the difference is statistically significant at the one-percent level. As shown in Table 1, these findings are consistent with the view that increases in trade and Japanese direct foreign investment in California played a part in the expansion of Japanese bank activity in the State.

Table 2

Liabilities and Net Worth as a Percentage of Assets

(California Banks, Fourth Quarter Averages, 1987)

Dependent Variable: As a percent of assets	Parameter Estimates					Observations	Adjusted R^2	F Value	Prob.>F
	Intercept	Assets	Japanese-owned Dummy	Other-foreign Dummy	Number of branches				
Total Deposits & Borrowings	88.802***	−0.551	−0.887	−3.089	0.034	435	−0.0026	0.713	0.5832
Borrowings	1.112***	1.281***	7.351***	1.356	−0.067	435	0.0706	9.258	0.0001
Deposits	87.691***	−1.831**	−8.238**	−4.445*	0.101*	435	0.0201	3.232	0.0125
Transaction+	32.578***	−0.900	−7.559**	−6.779***	0.054	435	0.0285	4.187	0.0025
Now	9.782***	−0.788**	−3.808**	−2.485**	0.045	435	0.0242	3.701	0.0056
Small Time	39.954***	−1.887**	−12.895***	−6.57***	0.112	435	0.0544	7.251	0.0001
Savings	7.785***	−1.228***	−2.188	−1.578	0.078	435	0.0222	3.467	0.0084
MMDAs	18.853***	0.566	−5.710**	−3.986***	−0.037	435	0.0230	3.558	0.0072
Certificates	13.316***	−1.224**	−4.998*	−1.011	0.071**	435	0.0098	2.072	0.0835
Large Time	15.159***	0.956	12.216***	8.908***	−0.066*	435	0.0830	10.843	0.0001
Equity Capital	9.497***	0.226	−2.231	1.223	−0.021	435	−0.0033	0.639	0.6351

* *Significant at 10% level.*
** *Significant at 5% level.*
*** *Significant at 1% level.*
\+ *Includes components not shown separately.*

Finally, at the individual bank level, differences in funding patterns are statistically significant, and in some cases these differences are also quite sizeable. For example, as shown in Table 2, on average, Japanese-owned banks were 12.2 percent more dependent on large CDs and 7.4 percent more dependent on other borrowing for funding than were domestic banks.

Chart 6

Purchased Funds as Percentage of Total Assets Japanese Banks vs. U. S. Owned Banks (California)

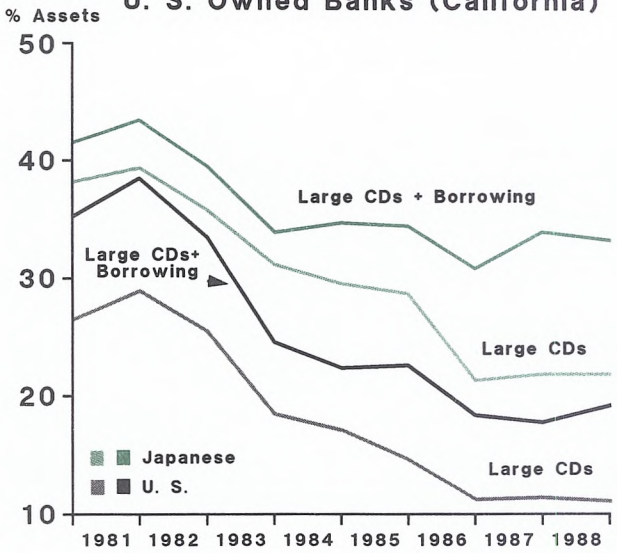
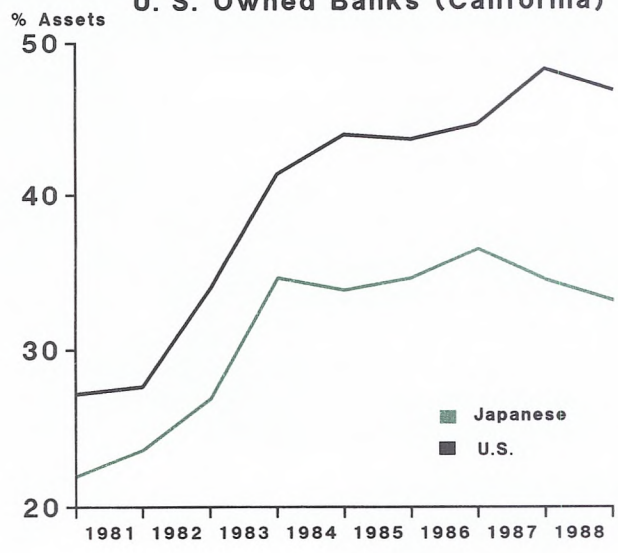


Chart 7

Consumer Time & Savings as Percentage of Total Assets Japanese Banks vs. U. S. Owned Banks (California)



Cost Structures

This greater reliance on borrowed funds potentially confers a cost advantage to Japanese-owned banks to the extent that they can borrow more cheaply than can domestically-owned banks, either because their parents in Japan are subsidizing them or because their affiliation with their highly-rated parents enables them to borrow directly at a lower cost. In the aggregate, the small proportion of parent funding probably dilutes any potential advantage significantly. Still, these portfolio measures do not rule out the possibility that a "small" advantage might exist.

We cannot rule out the possibility of a funding advantage from the portfolio data. However, if parent banks were willing to "subsidize" their California subsidiary banks,

Table 3

Cost of Funds Estimates for 1988

Dependent Variable:	**Cost of Interest-Bearing Funds**	
Independent Variable	**Parameter Estimate**	**Standard Error**
Intercept	0.06170***	0.00076
Assets (millions of $)	−0.00487	0.00310
Japanese-owned	−0.00314	0.00453
Other foreign-owned	0.00548*	0.00293
1 Year Growth Rate	0.00002	0.00002
Number of Branches	0.00006	0.00010
Equity Capital (mil. $)	0.06743*	0.03563
Number of Observations	360	
Adjusted R-squared	0.0113	
F Value	1.687	
Probability>F	0.1231	
Dependent Variable:	**Cost of Other Borrowing**	
Independent Variable	**Parameter Estimate**	**Standard Error**
Intercept	0.08011***	0.00996
Assets (millions of $)	−0.01417	0.01474
Japanese-owned	0.01225	0.03229
Other foreign-owned	−0.00013	0.02250
1 Year Growth Rate	−0.00010	0.00056
Number of Branches	0.00035	0.00049
Equity Capital (mil. $)	0.17513	0.17103
Number of Observations	69	
Adjusted R-squared	−0.0593	
F Value	0.356	
Probability>F	0.9035	

*** *Significant at the 1 percent level.*
* *Significant at the 10 percent level.*

we would expect Japanese-owned banks to have a lower cost of funds than their competitors.

Thus, it is useful to compare Japanese-owned and domestically-owned banks' average cost of funds for two categories of liabilities. The overall average costs of interest-bearing funds and of other borrowings were estimated using cross-sectional OLSQ regressions for 1988 to control for other factors that might influence banks' cost of funds, such as size, number of branches, equity capital, and growth over the past year. The results, presented in Table 3, show no significant difference between Japanese-owned banks and domestic banks in either the overall cost of interest-bearing funds or the cost of other borrowings (which includes the subsidiary banks' borrowing from parents). These results tend to refute the argument that Japanese banks have a funding advantage over domestic banks as a result of their ability to rely on low cost funding from their parents.

Related to potential funding advantages, it could be argued that Japanese banks have advantages arising from differential capital standards between Japan and the U.S. However, recent agreements on international capital standards for banks should eliminate or reduce any potential differences across countries.[23]

IV. How Will Japanese-Owned Banks Fare in the Future?

If the Japanese banks have an obvious competitive advantage in California, it is in the area of providing trade-related and commercial banking services. In this market they can provide services that are tailored to the needs of Japanese multinational business firms in California. Japanese banks' knowledge of Japan's markets, customs, and operations likely is superior to that of their other California competitors.

Using this advantage, the assets of Japanese-owned banks, agencies, and branches have grown from under 11 percent of the California total in 1982 to over one-quarter of the state's banking assets and over thirty percent of commercial loans at year-end 1988.

Japanese-owned banks especially have grown rapidly during this period. Acquisitions of other foreign banks accounted for a large part of that growth. Prospects for future acquisitions may be reduced somewhat by the limited number of "independent" medium-sized banks in the State as well as the opening of banking in California to institutions headquartered anywhere in the country. Japanese-owned commercial banks thus may find more competition for acquisitions after 1991. Thus, they also may find it difficult to continue increasing their market share at the rapid pace of the last six years.

A slowdown in trade with Japan or direct Japanese investment also could reduce the demand for the services of Japanese-owned banking institutions and limit their growth. And they will always be limited by the reality that trade-related lending is only a small portion of the State's total banking business.

Over time, a move in the retail direction could minimize these limitations. It also would tend to minimize portfolio differences with domestic banks, if other factors remained constant. However, unlike financing trade and the activities of foreign firms, there is no compelling evidence that Japanese commercial banks have an advantage in providing retail banking services in California.

Nonetheless, Japanese banks in California, as distinct from the agencies and branches, have demonstrated an interest in the "traditional retail banking field." A recent *American Banker* review of Japanese banking in the State suggests that the Japanese banks in California have broadened their customer bases over time, expanding their provision of banking services to include a wider segment of the market than just trade or the Japanese community.[24] Moreover, the article suggests that many Japanese banks are planning to extend their retail and middle market commercial lending business.

Japanese-owned commercial banks already have a significant investment in the "bricks and mortar" necessary for a retail banking presence in the State. Over the last five years, the number of branches has grown, although not as fast as assets. Japanese-owned banks had 424 branches in December 1988, up from 247 in 1982. Their expanded branch network gives them a "delivery system" for retail deposit services as well as for real estate lending, consumer finance, middle market commercial lending, and even agricultural lending.

This progression from trade finance to provision of banking services for the domestic market *per se* is not unusual. Terrell noted such a trend in his 1979 article, finding that it is consistent with Caves' theoretical framework concerning foreign investment.

Thus, to remain competitive in the State in the future, Japanese banks increasingly will need to compete directly with the large domestic banks. And their future, like that of

their competitors, will be greatly influenced by the State's economic conditions and international economic developments.

California, and the U.S. generally, are obviously important markets to Japanese banks. It should be noted that the opportunity to increase their size and market share has come about as the result of acquisitions of other foreign-owned banks disillusioned with their retail banking experience in the Golden State. Despite the "warning" provided by the departing British, the Japanese banks have made a sizable long-term commitment to the California banking market, and they are likely to be an important factor in its future. Moreover, to the extent that trade and direct investment remain at high levels, the Japanese banks will have a base for operations that the British apparently lacked.

Appendix

The dependent variables in Tables 1 and 2 are the individual asset or liability categories as a percentage of assets. The regressions are estimated across banks, controlling for ownership by using dummy variables for Japanese ownership and for other foreign ownership. Two other control variables and an error term also are included in the model. The model appears robust, in that similar results are generated by adding a control variable for bank growth over the prior year and by dropping the size and branch control variables altogether.

Asset size is included as a control variable because banks in the State range from very large multinationals to very small local banks, and size may affect their asset and liability composition. For example, only large banks are likely to be able to borrow directly in the money markets or to be involved in major corporate financing. Furthermore, differences in the size mix also may be important across ownership groups, especially since the Japanese subsidiary banks are relatively large compared to most domestic banks.

The number of branches for each bank is also included as a control variable because of possible portfolio differences arising from branch structure. California is a statewide branching state, and the State's 442 banks operate around 5,000 offices. These branch networks generate retail deposits and retail lending opportunities and considerable overhead expenses. Different branching patterns between the ownership groups could account for some of the variation between groups, especially in terms of access to retail deposits and retail lending.

NOTES

1. Principal Accounts of Overseas Branches of Japanese Banks, at year-end, 1981 through 1987. *Japan Financial Statistics,* Federation of Bankers Associations of Japan, 1989, page 26.

2. Includes total foreign and domestic assets of Japanese-owned banks, subsidiary banks, agencies, and branches (including Edge Act Corporations). Year-end 1988 data from the December 31, 1988, Call Report.

3. Year-end 1988 Call Report data for California banks.

4. Japanese banks have made a significant financial commitment to penetrating the California market. Together, Bank of Tokyo, Mitsubishi, and Sanwa have invested upwards of $1.3 billion in California acquisitions. California First (owned by Bank of Tokyo) paid $750 million to acquire Union Bank in October 1988. Sanwa Bank of California paid $263 million to acquire Lloyds Bank California in 1986. Mitsubishi paid $242.5 million to acquire BanCal Tri-State Corp. in 1984. *American Banker,* 6-20-84, 1-20-87, and 7-20-88.

5. As of 12-31-88, Mitsui Manufacturers Bank ranked twelfth in the State with $1.6 billion in assets and Tokai Bank of California, with $939 million in assets, ranked twentieth. Tokai had ranked tenth through much of 1988. Two other banks are subsidiaries of Japanese banks, Dai-Ichi Kangyo Bank, $353 million in assets at year-end 1988, and Kyowa Bank of California, $114 million in assets. American Pacific State Bank, $165 million in assets, and Los Angeles National Bank, $60 million in assets, are also Japanese-owned, but are not owned by banks.

6. International Banking Facility (IBF) assets, which are limited to transactions with foreign residents, account for nearly half of the total foreign agency and branch assets nationally. See *Federal Reserve Bulletin,* Assets and Liabilities of U.S. Branches and Agencies of Foreign Banks, June 30, 1988, page A78.

7. For example, see Richard W. Wright and Gunter A. Pauli's *The Second Wave: Japan's Global Assault on Financial services,* St. Martin's Press, New York, 1987, page 1.

8. See footnote 2 for the market definition.

9. The market share of the non-Japanese foreign-owned banking institutions fell from 20.1 percent in 1982 to 6.5 percent at year-end 1988, primarily as a result of the British retreat from California. British banks controlled about 15 percent of the assets of banking institutions in the State at the beginning of the period.

10. Terrell's (1979) study analyzes international banking on a bilateral basis. He examines the growth of foreign branch and subsidiary activities of both Japanese and American banks in the context of foreign investment. Data for these countries lend themselves to comparisons of banking and trade in local markets because most of the banking activities of these two countries are primarily either for the local market or are trade related.

11. Terrell's interpretation of Caves' basic assumption.

12. See Terrell, (1979), page 18.

13. See Terrell, (1979), page 26.

14. This process, in fact, closely parallels the expansion of U.S. banks overseas a generation earlier, when U.S. multinational firms were experiencing rapid overseas growth. See Terrell (1979).

15. Source: Commerce Department. *Foreign Trade Statistics Report: Waterborne Trade,* year-end totals. Imports: Report SM305, Exports: Report SM705.

16. From "Japan's Expanding U.S. Manufacturing Presence: 1987 Update," *JEI Report,* Japan Economic Institute, December 16, 1988, page 3.

17. Total assets of Japanese-owned banks, agencies and branches in the U.S. increased by 216.0 percent over the period from 1982 to 1988. The increase in New York was 226.3 percent. In California, the increase was only 170.1 percent.

18. Testimony presented at a Special Joint Hearing on Foreign Investment in California: Banking and Real Estate, California Legislature, January 25, 1989.

19. SLCs are essentially financial guarantees sold by large, creditworthy banks. Commercial and industrial loans provide a potentially cleaner measure of market share than assets because interbank transactions may bias assets upwards and inflate market shares.

20. For example, of the ten largest SLC-issuing Japanese-owned agencies in California in May 1988, eight held Moody's best rating, Aaa, for long-term and senior debt. The two remaining Japanese-owned agencies had third highest ratings of Aa2. In contrast, of the top four domestic banks in the State in May 1988, none had the highest rating. One had the next highest, Aa1, two had the third highest, Aa2, and the fourth had a rating of Baa2. *Moody's Credit Opinions,* Moody's Investors Service, New York, May 1988.

21. Source: Federal Reserve Bank of San Francisco, BHC Reports, December 31, 1987. Y-8 Report.

22. 1987 data were used because the late-1988 acquisition of Union Bank (British-owned) by Japanese-owned California First Bank may have distorted the "Japanese" bank portfolio. Union Bank's assets were equal to nearly one quarter of all Japanese bank assets at the time the merger took place, and to the extent that Union's portfolio was determined by the former British owners, portfolio measures would tend to reflect British ownership rather than Japanese ownership.

23. Also, all banks chartered in the U.S., including foreign subsidiary banks, are subject to U.S. capital standards.

24. *American Banker,* "Japanese Banks Tackle California Middle Market," September 10, 1987, and "Bank of Tokyo Targets California's Middle Market," February 19, 1988.

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Reagan Fiscal Policy and the Dollar

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Research assistance by Eric McCluskey, Jerry Metaxas, and Panos Bazos is gratefully acknowledged. Editorial committee members were Frederick Furlong, Jack Beebe, and Hang-Sheng Cheng.

Whether fiscal policy, monetary policy, or other factors contributed more to the large swings in the value of the dollar and the U.S. trade balance in the 1980s is the subject of ongoing debate. Using a simulation from the macroeconomic model developed at the Federal Reserve Bank of San Francisco, I find that the fiscal expansion under the Reagan Administration was the most important reason for the dollar's appreciation from 1980 to 1985, but that monetary conditions at home and abroad were primarily responsible for the dollar's subsequent depreciation through 1987.

During the 1980s, the real exchange value of the dollar gyrated markedly. From 1980 through early 1985, it appreciated 55 percent. Then through 1987, it depreciated just as sharply, before enjoying a mild rebound in 1988. Coupled with these swings in the value of the dollar, the U.S. budget balance worsened very significantly, U.S. interest rates rose and fell dramatically, and the U.S. external balance moved sharply into deficit. The reasons for the dollar's rise and fall have been the subject of considerable debate. This debate focuses on whether the Reagan fiscal expansion or the changes in monetary policy—or still other factors—during the 1980s are more to blame for the movements in the dollar and interest rates and the resulting decline in the U.S. trade balance.

Econometric modeling is necessary to sort out the relative contributions of fiscal and monetary policies. This article reports the results of such an exercise using a macroeconometric model developed at the Federal Reserve Bank of San Francisco.[1] This model is used to simulate the economy's path as if there had been no change in fiscal policy after 1980. The differences between the actual and simulated values of the dollar, interest rates, and the trade balance measure the effects of the Reagan fiscal policy on these variables.

The article is organized as follows. Section I briefly describes the debate concerning the causes of the movements in the dollar. In Section II, the various dimensions of the Reagan fiscal policy are quantified and the meaning of an unchanged fiscal policy is discussed. Then in Section III, the simulation results from the FRBSF model are presented. Finally, Section IV provides a summary and some conclusions.

I. The Debate

The Reagan years have provided almost a laboratory experiment on the effects of fiscal expansion in an open economy. The Reagan Administration's fiscal program comprised planned reductions in both taxes and spending to stimulate saving, investment, and work effort in an economy suffering from low growth and high inflation. The most prominent feature of this program was the Economic Recovery and Tax Act of 1981, which cut tax rates for both businesses and households. Personal tax cuts were designed to stimulate personal saving by reducing marginal tax rates. The tax changes for business were aimed at directing an increasing share of the anticipated expansion in personal and business saving into investment in plant and equipment. However, since 1980, the private saving rate has either fallen or at best remained unchanged, depending on the measure of saving used.

Total federal receipts as a proportion of GNP dropped through 1984 and then rose to the same level as in 1980, but only because of rising Social Security taxes. Most importantly, a buildup in defense spending and continued growth in spending on entitlement programs, such as Social Security and Medicare, combined to overwhelm cuts that were made in other nondefense spending. As a result, the deficit in the federal government's budget rose from approximate balance in 1980 to four percent of high-employment GNP in 1986, before declining to 2.4 percent by 1988.[2] Moreover, growing interest payments have added to this deficit, so that it now absorbs nearly half of net private saving in the U.S. economy.[3]

If the U.S. economy had been closed to international flows of capital, the growth in federal borrowing would have tended to "crowd out" domestic private capital formation. Because the U.S. economy is highly open, however, there was a quite different tendency. U.S. interest rates rose, large capital inflows were attracted from abroad to finance the federal deficit, the real value of the dollar rose, and the U.S. trade balance moved significantly into deficit.

Whether the fiscal expansion is solely, or even primarily, responsible for the rise in interest rates and the value of the dollar, as well as the decline in the trade balance, has been the subject of lengthy debate, however. At about the same time that the U.S. budget deficit was increasing, the Federal Reserve was attempting to reduce inflation through tighter monetary policy. Some argue that it was the tightening of monetary policy that pushed up interest rates and primarily was responsible for the dollar's rise in the early to mid-1980s. A similar debate arises regarding the causes of the dollar's decline after 1984. Some argue that the U.S. budget deficit as a percent of high employment GNP began to turn down after 1986, tending to put downward pressure on U.S. interest rates and the dollar in this period. But at the same time, others suggest that the declines in interest rates and the dollar were primarily the result of the easing in monetary policy that took place during this period as the Federal Reserve's disinflationary goals were achieved.

II. Dimensions of Reagan Fiscal Policy

To shed some light on this debate, the FRBSF macroeconometric model is used to simulate the economy's path as if there had been no change in fiscal policy after 1980, and the results are compared to the actual path of the economy. To perform such an exercise, it is useful to evaluate the components of the Reagan fiscal expansion to determine what it did and did not change in the economy.

For our purposes, fiscal policy is defined in terms of its macroeconomic effects, as opposed to specific legislative changes. Thus, fiscal policy may be altered even when there are no legislated changes. One such example is the increase in both marginal and average tax rates that is generated by inflation when taxes are not indexed to changes in the price level. Conversely, legislative changes may be required just to keep the effects of fiscal policy from changing when, for example, taxes have to be cut in order to keep revenues from rising as a fraction of GNP.

From a macroeconomic point of view, there are two dimensions to the measurement of an unchanged federal fiscal policy. First, there should be no change in federal marginal tax rates that would alter economic incentives. For example, in the FRBSF model the average marginal tax rate for households significantly affects their after-tax mortgage rate and, therefore, influences expenditures on housing. Similarly, business taxes influence the cost of capital for nonresidential investment and rental housing. An unchanged fiscal policy is defined as one that does not alter the marginal tax rates that affect these expenditures, and therefore does not cause the IS curve to shift.

Second, an unchanged fiscal policy requires federal outlays and receipts not to change as a fraction of GNP at high employment. Unchanged receipts would prevent disposable income, and hence consumption, from changing on account of fiscal policy. With unchanged government

receipts and outlays, as well as unchanged marginal tax rates, there should be no shift in the IS curve and, thus, no change in aggregate demand due to changes in fiscal policy.[4]

Marginal Tax Rates

As shown in Table 1, the Economic Recovery and Tax Act of 1981 and the Tax Reform Act of 1986 reduced the average marginal federal tax rate on individual income from 30 percent in 1980 to 23 percent by 1988. In the counterfactual simulation that removes the effects of Reagan fiscal policy, the average federal marginal tax rate for households is held constant at 30 percent from 1980 through 1988, instead of being allowed to fall. As a result, after-tax interest rates for households are reduced relative to their historic values. This has the effect of *raising* expenditures on consumer durables such as owner-occupied housing relative to the actual expenditures during this period.

The Tax Act of 1981 also reduced effective tax rates on business investment by shortening depreciable "tax lives" and increasing the investment tax credit for purchases of equipment. The Tax Equity and Fiscal Responsibility Act of 1982 took back part, but by no means all, of these tax cuts for business as part of a package to reduce the size of the federal budget deficit. Then in 1986, the Tax Reform

Table 1

Marginal Tax Rates During Reagan Fiscal Expansion

	Average Marginal Tax Rate for the Individual Federal Income Tax	Effective Federal Tax Rate on Equity Financed Investment[1]		
		Equipment	Structures	Rental Housing
1960	.23	.29	.60	.35
1970	.24	.31	.69	.38
1980	.30	.13	.62	.44
1981	.31	.08	.54	.41
1982	.29	.06	.44	.40
1983	.28	.03	.40	.36
1984	.27	.02	.40	.39
1985	.27	.01	.39	.39
1986	.27	.07	.32	.31
1987	.25	.14	.29	.29
1988	.23	.14	.29	.29

[1]The effective tax rate is (1-uz-k)/(1-u), as discussed in the box.
Sources: Board of Governors of the Federal Reserve System and Data Resources

Effective Cost of Capital Investment

The combined effect of taxes, real interest rates, and other factors on the cost of capital investment are summarized in a measure known as the "rental," or "user" cost of capital. This is simply the required payment per period for the use of a capital good, analogous to the wage rate for labor. The formula for the rental cost of business fixed capital, as derived by Hall and Jorgenson (1967), is:

$$c = q\frac{(1-k-uz)}{(1-u)}[b(1-u)i + (1-b)e - \dot{p} + d]$$

where: c = rental cost;
q = price of capital good;
k = investment tax credit;
u = corporate tax rate;
z = present value of one dollar's worth of depreciation allowance;
b = proportion of debt finance;
i = nominal bond rate;
$1-b$ = proportion of equity finance;
e = required nominal return to equity;
$\dot{p}$ = expected long-term inflation rate;
d = exponential rate at which the capital good depreciates.

As is evident from this formula, the rental cost of business fixed capital is equal to some fraction of the price of the capital good. This fraction is determined by the real cost of debt and equity capital and, central to our inquiry, a multiplicative factor that depends upon the corporate tax rate, the present value of depreciation and the investment tax credit. (The investment tax credit was positive for equipment until 1986 and always has been zero for commercial and industrial structures and rental housing.) This multiplicative factor equals one plus the effective tax rate on the cost of equity-financed investment. The Reagan program initially reduced the cost of business investment by increasing the present value of depreciation (z) and the investment tax credit (k), thereby reducing this multiplicative factor.

Act reduced the corporate income tax rate from 46 percent to 34 percent, but at the same time eliminated the investment tax credit for equipment and lengthened the tax lives for residential and nonresidential structures. The net result of these changes was that by 1988, the effective tax rate on investment in equipment was about the same as in 1980, but effective tax rates on rental housing and nonresidential structures were lower. (See Table 1 and the accompanying Box.) In the counterfactual simulation, these effective tax rates are held at their 1980 values, on balance *reducing* the incentive for business investment, and thus its contribution to aggregate demand, compared with the actual path of business investment.

Government Spending and Disposable Income

Observed movements in federal outlays and receipts are partly due to changes in spending that are automatically triggered by changes in the level of economic activity. The federal budget measured on a high employment basis removes these cyclical variations in outlays and receipts caused by the economy's deviations from its path of high employment. In contrast, changes in high-employment outlays and receipts that deviate from a constant proportion of high-employment GNP constitute a real change in the direction of fiscal policy.[5] As shown in Table 2, the federal high-employment budget deficit rose from 0.3 percent of high-employment GNP in 1980 to 4.0 percent in 1986, and then dropped back to 2.4 percent of GNP by 1988.

Looking at the components of that deficit, the most permanent contributor was an increasing ratio of federal transfer payments to GNP. In contrast, purchases of goods and services as a proportion of high-employment GNP rose a little more than one percentage point through 1985, but returned almost to their 1980 level by 1988. On the revenue side, there was little net change in the ratio of total federal tax receipts to GNP between 1980 and 1988. Although the ratio of total income tax receipts to GNP declined by two percentage points, a rise in Social Security taxes offset this decline. In the FRBSF model, the impact of policy-induced changes in total federal receipts and transfer payments on household disposable income, and hence consumption, is captured by the ratio of cyclically-adjusted federal taxes less transfer payments to high-employment GNP.[6] As shown in Table 2, this ratio declined from 9.7 percent in 1980 to around 7.0 percent in 1985, with no discernible trend since then.

Also, part of the Reagan fiscal package was a reduction in the amount of grants-in-aid to state and local governments as shown in Table 2. These governments were able to absorb the grant reductions and maintain approximately the same level of services by raising taxes toward the end of the 1981–82 recession (see Weicher [1987]). The change in the federal high-employment budget captures the overall impact, with the reduction in grants-in-aid acting as a proxy for the fiscal restraint achieved through higher state and local taxes. But the ratio of cyclically-adjusted federal taxes less transfer payments to high-employment GNP overstates the *total* reduction in net taxes and transfers due to the Reagan program. Consequently, in the simulation, the reduction in the level of federal taxes less transfer payments is adjusted for the increase in state and local taxes.

In the counterfactual simulation of no change in fiscal policy, the ratios of the high employment values of the federal budget deficit, federal purchases of goods and services, and federal taxes net of transfer payments to high-employment GNP are all maintained at their 1980 levels, after taking into account the effects of reduced grants-in-aid and higher state and local taxes. This has the effect of *reducing* the contribution to aggregate demand of both government purchases of goods and services and personal consumption expenditures from what they were historically, but the impact of these factors is slightly offset by the effect of the Reagan Administration's policy with respect to grants-in-aid to state and local governments.

Table 2

Federal Spending and Revenues During Reagan Fiscal Expansion

(Percent of High Employment GNP)

	Cyclically Adjusted Federal Budget Balance[1]	Federal Purchases of Goods and Services	Cyclically Adjusted Federal Taxes Net of Transfer Payments[1]	Grants-in-Aid to State and Local Governments
1960	1.7	10.5	11.7	1.2
1970	0.4	9.7	10.7	2.4
1980	−0.3	7.6	9.7	3.2
1981	0.0	7.9	10.1	2.9
1982	−1.4	8.6	8.6	2.5
1983	−2.2	8.3	7.6	2.4
1984	−2.8	8.2	7.2	2.5
1985	−3.8	8.8	6.9	2.5
1986	−4.0	8.6	6.5	2.6
1987	−2.8	8.4	7.1	2.4
1988	−2.4	7.8	7.0	2.4

[1] Counts erosion in real value of federal debt due to inflation as a federal receipt. See Footnote 2.

III. Simulated Effects of Reagan Fiscal Policy

A key feature of the FRBSF macroeconometric model that is used for the simulation presented below is that it treats the real value of the dollar expected in the long run as an endogenous variable determined by expectations of future fiscal policy. As a result, current fiscal policy influences the dollar through two channels. The first channel is the current level of interest rates, or more specifically, the differential between real interest rates at home and abroad. Assuming, as quite a few macroeconometric models do, that 1) capital is perfectly mobile internationally in the sense that there are no significant transaction costs, capital controls, or other impediments to the flow of capital between countries, 2) domestic and foreign financial assets are perfect substitutes, and 3) trade flows are slow to adjust, then exchange rates are determined in the short run by equilibrium in the market for financial assets, rather than by equilibrium between current international flows of goods and capital. This implies that a rise in long-term interest rates at home relative to those abroad, which is produced by an expansionary fiscal policy at home, will cause the value of the home currency to appreciate until the difference between its current level and its expected long-run level (that is, its expected depreciation) is equal to the interest rate differential.

In addition to this short-run asset equilibrium view embedded in the FRBSF model, the model also incorporates a rational expectations view of the determination of the expected long-run level of the exchange rate. This second channel arises because changes in current fiscal policy alter expectations of future fiscal policy which, in turn, alter the expected long-run real exchange rate. As analyzed in detail in Throop (1989b), if market participants view U.S. and foreign assets as close substitutes, then an expectation of future U.S. budget deficits is likely to increase the expected real value of the dollar. But if they believe that U.S. and foreign securities are relatively imperfect substitutes, then a depreciation in the expected real value of the dollar is more likely. Thus, the magnitude of the effect operating through this additional channel depends on 1) the degree to which changes in current fiscal policy alter expectations of future fiscal policy, and 2) the size and direction of the effect of future fiscal policy on the expected real value of the dollar.

In the exchange rate equation in the FRBSF model, the budget deficit influences the exchange rate through both channels, but simulations indicate that the second channel is more important than the first one. (See Throop [1989b].) With regard to the first channel, a sustained one-percentage point change in the real short-term interest rate differential is estimated to produce a 10 percent change in the real trade-weighted value of the dollar in the same direction. The magnitude of this effect is consistent with an average horizon for investors in the foreign exchange market of ten years.

With regard to the second channel of influence, the exchange rate equation in the FRBSF model indicates that market participants view U.S. and foreign assets as close substitutes and changes in structural budget deficits as being relatively permanent. Thus, a one-percentage point reduction in the current U.S. structural budget surplus as a percent of high-employment GNP produces a six percent *appreciation* in the expected real trade-weighted value of the dollar, while a similar reduction in the weighted average of foreign budget surpluses *depreciates* the dollar by eight percent.[7] These expectational effects are relatively large. In the FRBSF model, it takes about a nine percent appreciation in the real value of the dollar to produce an effect on the trade balance that fully offsets the effect on aggregate demand from a one-percentage point reduction in the U.S. budget surplus. The estimated six percent appreciation generated by the expectational effects of a budget surplus is fully two-thirds of this.

In modeling the exchange rate and the trade balance, one needs to take into account the reaction of foreign central banks to changes in U.S. interest rates. Floating exchange rates have diminished the short-run monetary linkages among national real interest rates. Nonetheless, foreign central banks continue to pursue macroeconomic stabilization and so continue to respond to changes in U.S. interest rates, though to a lesser degree than before. For example, foreign central banks tend to allow their countries' interest rates to rise in response to a rise in U.S. rates to prevent capital outflows and a depreciation of their currencies that would result in an increase in aggregate demand and higher output and inflation. However, matching the rise in U.S. interest rates exactly would have a deflationary impact on foreign economies. As a result, foreign central banks have tended to match some, but not all, of the changes in U.S. real interest rates so as to stabilize aggregate demand. The reaction function in the FRBSF model indicates that foreign central banks tend to match about 55 percent of the change in U.S. real short-term interest rates on average.

A final important factor in the simulated effects of Reagan fiscal policy is the impact of the real exchange rate on the real stock of money through its influence on the price level in the FRBSF model. In the FRBSF model, a 10 percent appreciation in the real trade-weighted value of the

dollar reduces prices by 0.8 percent over a period of about two years through competitive effects on domestic prices of exports and import substitutes. Because of this, a fiscal expansion in the FRBSF model causes the real value of the dollar to appreciate, prices to drop, and the real stock of money to expand—relieving some of the pressure on interest rates and allowing real GNP to expand more than it otherwise would.

The simulated effects of the Reagan Administration's fiscal policy are shown in Table 3. Column A gives the actual values of the dollar, net exports, real GNP, and other variables of interest during the period of the Reagan Administration's fiscal expansion. The results from a simulation that assumes no fiscal expansion and uses the actual path for M2 after 1980, are given in column B. The effect of the Reagan fiscal policy on any variable is then equal to column A less column B.

Effects on the Dollar

This simulation sheds light on the relative contributions of U.S. fiscal policy and other factors to the sharp 55 percent appreciation in the real trade-weighted value of the dollar between 1980 and 1985. As shown in the Table and Chart 1, the real trade-weighted value of the dollar would have appreciated 30 percent from 1980 to 1985, even if fiscal policy had not been expansionary.

The Reagan fiscal program caused the dollar to appreciate an additional 25 percent, by far the largest single contributor to the dollar's rise. Chart 2 shows the relative

Table 3

Simulated Effect of Reagan Fiscal Policy

(Historical Path of Nominal M2 Assumed Unchanged)

	Net Exports (Billions of 1982 Dollars)			Real Trade-Weighted Dollar (1973 = 100)			U.S. Less Foreign Real Bond Rate (Percent)		
	A	B	C	A	B	C	A	B	C
1980	57.1	57.1	0.0	74.9	74.9	0.0	3.07	3.07	0.00
1981	49.3	48.1	1.2	88.2	89.2	−1.0	3.41	3.42	−0.01
1982	26.4	26.8	−0.4	97.7	94.6	3.1	4.21	4.21	0.0
1983	−19.9	−3.0	−16.9	103.5	93.7	9.8	4.28	4.21	0.07
1984	−84.1	−41.0	−43.1	113.3	98.1	15.2	4.23	4.11	0.12
1985	−104.3	−31.7	−72.6	116.2	95.7	20.5	3.80	3.64	0.16
1986	−137.5	−42.1	−95.4	91.7	73.4	18.4	2.48	2.32	0.16
1987	−128.8	−28.1	−100.7	80.4	67.9	12.5	1.20	1.20	0.00
1988	−99.0	−13.5	−85.3	78.1	70.6	7.5	0.65	0.91	−0.26

	U.S. Real Bond Rate (Percent)			Real GNP (Billions of 1982 Dollars)			GNP Price Index (1982 = 100)		
	A	B	C	A	B	C	A	B	C
1980	4.49	4.49	0.0	3187.2	3187.2	0.0	86.1	86.1	0.0
1981	6.42	6.46	−0.04	3248.8	3250.3	−1.5	94.2	94.1	0.1
1982	6.69	6.64	0.05	3166.0	3159.4	6.6	100.0	99.9	0.1
1983	5.75	5.54	0.21	3279.2	3262.8	16.4	104.1	104.4	−0.3
1984	7.68	7.60	0.08	3501.4	3468.6	32.8	108.2	109.1	−0.9
1985	7.41	7.25	0.16	3618.8	3544.8	74.0	111.9	113.3	−1.4
1986	5.79	5.55	0.24	3721.5	3646.5	75.0	115.0	116.9	−1.9
1987	6.06	6.09	−0.03	3846.9	3797.0	50.0	119.1	121.3	−2.2
1988	6.27	6.69	−0.42	3995.0	3957.5	37.5	124.1	125.7	−1.6

A - Reagan Fiscal Policy
B - Unchanged Fiscal Policy
C - Difference Due to Reagan Fiscal policy

contributions of the underlying determinants of the real trade-weighted value of the dollar with and without the Reagan fiscal stimulus. Of particular interest is that the real interest rate differential would have been little different from its historical path even if the Reagan fiscal expansion had not occurred. Given the historical path of M2, the Reagan fiscal package is estimated temporarily to have increased the U.S. real bond rate only 21 basis points, and the differential between the U.S. and foreign real bond rate only 16 basis points. Taking out these movements in interest rates associated with the Reagan fiscal package, the dollar's appreciation would have been only 1.7 percent less than it actually was.[8] And even if the simulation had not assumed the historical path for M2 and instead had assumed a path for monetary policy that kept real GNP on its historical path, the Reagan fiscal package would be estimated to have increased the real bond rate differential only marginally. Thus, the lion's share of the 25 percent appreciation in the dollar caused by the Reagan fiscal program was the result of the expectational effects of the budget deficit, not the rise in the interest rate differential.

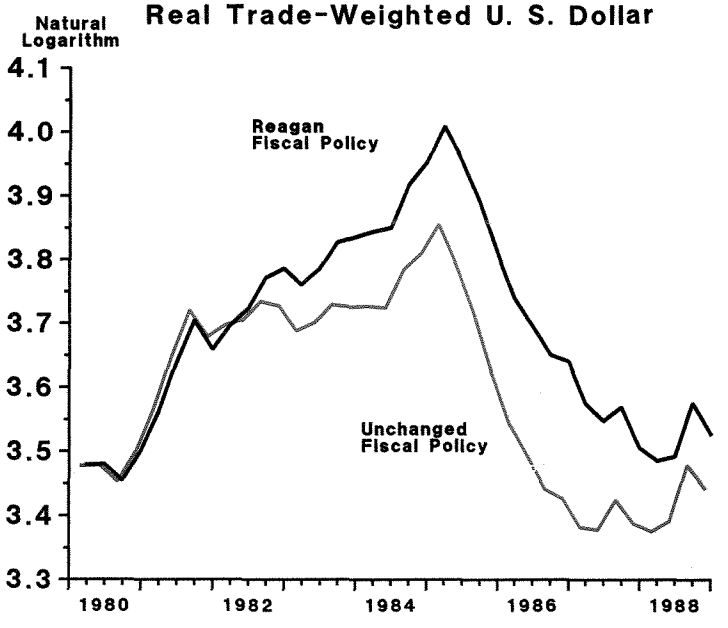
Of the 30 percent appreciation in the real value of the dollar that would have occurred in the absence of any change in fiscal policy, about equal contributions can be assigned to a tightening in domestic monetary conditions, fiscal tightening in the U.S.' major trading partners, and unexplained speculative factors that appear to have been present in 1985. Primarily as a result of the Federal Reserve's attempt to reduce inflation, the U.S. real bond rate rose between 1980 and 1984. And although foreign countries also were pursuing policies that raised interest rates (to counter the inflationary effects of a strong dollar on their economies), foreign real rates did not rise by as much as those in the U.S. These monetary factors—rather than fiscal factors—accounted for most of the rise in the real interest rate differential.

After 1985, the effects of the Reagan fiscal program on changes in the value of the dollar were relatively small. In the absence of the Reagan fiscal expansion, the dollar would have declined by about as much as it actually did, but starting from a lower level. In this period, a decline in the real interest rate differential from about four percentage points in 1985 to less than one percentage point in 1988 accounts for close to 80 percent of the dollar's depreciation. The decline in this differential primarily was the result of two developments. During this period, the U.S. real bond rate declined as the Federal Reserve's disinflationary goals were achieved and monetary policy eased. At the same time, foreign real bond rates continued to rise as foreign central banks tightened policy in response to the inflationary effects of the strong dollar on their economies. The strong dollar tended to create inflation abroad both directly through higher prices of tradable goods and indirectly through the boost to aggregate demand from increased exports to the U.S.

Thus, fiscal conditions at home and abroad were relatively more important than any other single factor in raising the real value of the dollar through 1985. But U.S.

Chart 1

Real Trade-Weighted U. S. Dollar



fiscal policy contributed relatively little to the decline in the real value of the dollar from 1985 to 1988.

Effects on the Trade Balance

Working through its effect on the dollar and incomes, the Reagan fiscal program accounted for $85.3 billion, or about 85 percent, of the deficit in real net exports of $99 billion by 1988. In the absence of any change in fiscal policy, real net exports would have dropped approximately $100 billion between 1980 and 1986, due to the economy's rebound from the 1980 and 1982 recessions and the 30 percent appreciation of the dollar. That would have occurred between 1980 and 1985 even if fiscal policy had not been expansionary. However, the subsequent depreciation would have tended to restore net exports. In fact, by 1988, the deficit in net exports would have been only $13.5 billion, or near its average level in the decade of the 1970s if the fiscal expansion had not occurred.

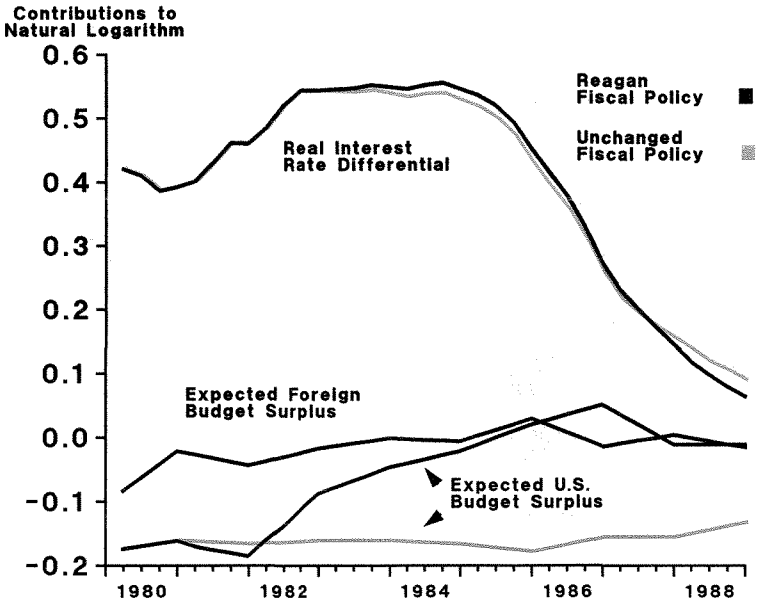
Reagan fiscal policy is estimated to have raised real GNP by $75.0 billion and reduced the civilian unemployment rate nearly one percentage point by 1986. However, because of the gradual crowding out of net exports and, to a lesser extent, interest-sensitive expenditures, as well as the modest tightening in fiscal policy after 1986, by 1988, the overall gain to real GNP totalled only $37.5 billion, and the civilian unemployment rate was only about one-half percentage point less than it would have been without the Reagan program.

Finally, because the Reagan fiscal package caused the dollar to appreciate dramatically, it also had a dampening effect on the price level. On balance, there was a 1.6 percent reduction in the price level by 1988, as the effects of the dollar's appreciation overwhelmed those from reduced slack in the economy. The dollar's dampening effect on prices also increased the real stock of M2, and thereby helped to keep interest rates lower than they otherwise would have been.

IV. Summary and Conclusions

The Reagan Administration's fiscal policies have provided close to a laboratory experiment on the effects of fiscal expansion in an open economy. Simulation of the FRBSF macroeconometric model shows that significant effects from this expansionary fiscal policy began to be felt on the dollar and the U.S. trade balance after 1982. The Reagan fiscal package accounted for nearly one-half of the 55 percent appreciation in the real trade-weighted value of the dollar between 1980 and 1985, and about 70 percent of the peak value of the deficit in real net exports in 1986, assuming an unchanged path for M2. The dollar would have appreciated about 30 percent between 1980 and 1985 even in the absence of the Reagan Administration's fiscal package, however, because tightening monetary conditions

Chart 2
Contributions of Various Factors to Real Trade-Weighted U.S. Dollar



in the U.S. raised the differential between U.S. and foreign real long-term interest rates. Also, even if the Federal Reserve had reduced interest rates to the extent necessary to stabilize real GNP in the absence of a fiscal expansion, the path of the dollar would not have been much lower.

When capital is highly substitutable internationally, and investors adjust their expectations of the long-run equilibrium value of the dollar relatively quickly, an expansive fiscal policy has relatively little impact on real interest rates. Because of this, the increase in the differential between U.S. and foreign real interest rates between 1980 and 1985 primarily was due to a growing disparity between monetary conditions at home and abroad, rather than to the expansive Reagan fiscal policy. The contribution of this difference in monetary conditions to the strong dollar was temporary, however, and had disappeared by 1988. In contrast, although the U.S. budget deficit on a high-employment basis declined somewhat after 1986, U.S. fiscal policy continued to expand income and boost the real value of the dollar. As a consequence, in 1988, the Reagan fiscal policy still was contributing $85 billion (in 1982 dollars) to the trade deficit.

NOTES

1. The complete FRBSF macroeconometric model is fully described in Throop (1989a).

2. The measure of the deficit used here counts the erosion in the real value of the federal debt due to inflation as a tax revenue.

3. For more detail on these points, see Modigliani (1988).

4. Some might argue that these dual criteria for an unchanged fiscal policy are mutually inconsistent. For example, if marginal tax rates are higher than average rates, as in fact they generally are, normal growth in the economy with fixed marginal rates would tend to raise tax receipts as a proportion of GNP. However, an unchanged fiscal policy that meets both criteria could be maintained by reducing average tax rates without changing marginal rates. In the case of personal income taxes, this could be done by increasing the standard deduction. The extent of progressivity in the tax structure is much less for corporations, but here too, the average tax rate could be reduced without changing the marginal tax rate on the cost of new investment.

5. For this purpose, I use the U.S. Department of Commerce's "mid-expansion" measure of high employment. See de Leeuw, *et al.* (1980), de Leeuw and Holloway (1982), and Holloway, Reeb, and Dunson (1986).

6. Taxes on corporate profits are given a weight of only 0.5 because corporations on average retain approximately half of their earnings. Thus, only half of any given change in taxes on corporate profits will affect disposable income.

7. The budgetary data used in the exchange rate equation on an inflation-adjusted basis are combined federal, state, and local balances compiled by the OECD. Sources of these data are Price and Muller (1984) and recent issues of the *OECD Economic Outlook*.

8. This contrasts with the conventional view of the effects of fiscal policy in which a budget deficit's only channel of influence on the exchange rate is through the real long-term interest rate differential. When expectational effects are taken into account, as in the FRBSF model, the impact of a fiscal expansion on the interest differential is very much reduced. See Throop (1989b).

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Fiscal Policy, the Dollar, and International Trade: A Synthesis of Two Views

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In most macroeconometric models, a larger budget deficit leads to an appreciation of a nation's currency and a rise in its trade deficit only to the extent that it drives up the differential between interest rates at home and abroad. In contrast, Mundell's pioneering work suggests that a rise in the budget deficit does these things without any change in the interest rate differential because market expectations adjust instantaneously to the effects of the larger budget deficit. The FRBSF macroeconometric model synthesizes these two approaches by making the expected real value of the dollar a function of current fiscal policies both at home and abroad. The result is that budget deficits have a significantly larger influence on the exchange rate, and a smaller impact on interest rates, than in most macro models. Consequently, expansionary fiscal policy tends to crowd out net exports more than interest-sensitive expenditures.

There are two distinct views in the literature on the causal nexus between fiscal policy and the real value of the dollar. The view that has gained ascendancy in recent years is that expansionary U.S. fiscal policy appreciates the real value of the dollar only to the extent it puts upward pressure on U.S. real interest rates and increases the differential between U.S. and foreign real interest rates. According to this view, the long-run equilibrium value of the dollar does not change, and the real value of the dollar is bid up in the short-run to the point where the real interest rate differential compensates for the dollar's expected depreciation in the future. Because it causes interest rates and the dollar to rise, expansionary fiscal policy crowds out both interest-sensitive expenditures and net exports. Most multicountry econometric models incorporate this view. However, recent simulations of these models suggest that this view can explain only about one-half of the dollar's rise after 1980.[1]

An alternative view consistent with the pioneering work of Robert Mundell (1963) stresses that because of an adjustment in expectations, capital inflows can be attracted to finance a U.S. budget deficit even with no increase in the real interest rate differential. Assuming the market regards the U.S. budget deficit as lasting more than temporarily, the market's longer-run expectation of the real value of the dollar will rise. This change in expectations, in turn, produces an appreciation in the real value of the dollar. The higher dollar, then, creates a "twin deficit" in the trade balance, which allows actual capital inflows to take place without there being any increase in the differential between U.S. and foreign real interest rates. Except to the extent that the fiscal expansion also raises the world level of interest rates, only net exports would be crowded out according to this view.[2]

A synthesis of these two views is possible. By embedding a rational expectations model of the dollar's longer-run equilibrium into the short-run dynamics of asset equilibrium, these two distinct linkages among fiscal policy, the dollar, and trade imbalances can be captured. Such a synthesis is modeled empirically in the international sector of the FRBSF macroeconometric model, which is used for forecasting and policy simulations at the

Federal Reserve Bank of San Francisco.[3] This paper describes the international sector of the FRBSF model and assesses the relative quantitative importance of each of these two linkages.

The paper is organized as follows. Section I reviews the conventional approach to modeling the effects of fiscal policy on the dollar and the trade balance. Section II discusses the unique features of the international sector of the FRBSF macroeconometric model and the determinants of the real value of the U.S. dollar during the 1980s in this model. Section III contrasts the simulated effects of a sustained shift in fiscal policy on the dollar and the trade balance obtained from the FRBSF model with those obtained from a conventional model. Finally, Section IV provides a summary and conclusions.

I. Conventional Model of Fiscal Policy in an Open Economy

Most macroeconometric models, including the FRBSF model, are disaggregated, dynamic versions of the basic IS-LM model on the demand side, with gradual wage and price adjustments on the supply side. In addition, most models assume the degree of international capital mobility is relatively high, so that interest rates have a direct and significant effect on the exchange rate. The most direct approach assumes perfect capital mobility and perfect asset substitutability between domestic and foreign bonds, so that *expected* yields—including the portion due to expected changes in exchange rates—are equalized at any moment in time. The available evidence suggests that this is a reasonably good approximation to reality for major industrialized countries.[4] Although not all macroeconometric models assume perfect asset substitutability, the interest rate differential and expected rate of appreciation or depreciation in the exchange rate are among the important explanatory variables determining the level of the exchange rate in most of them.[5]

Perfect capital mobility and the trade account's slow adjustment to changes in exchange rates, in turn, imply that exchange rates are determined in the short run by equilibrium in the market for financial assets, rather than by equilibrium between current international flows of goods and capital.[6] Assuming securities at home and abroad are perfect substitutes for one another, the asset theory of the exchange rate requires that the difference between the nominal returns on securities of a given maturity at home and abroad is equal to the expected percentage change in the nominal exchange rate over that period. This is called the "open interest parity condition." If, for example, the rate differential exceeded the expected depreciation in the exchange rate, market arbitrage would bid the value of the exchange rate up until its expected depreciation over the relevant time horizon equaled the rate differential. It is easily shown that this arbitrage condition also holds in real, or price-adjusted terms.[7] Thus,

$$lnEXCH - lnEXCH^e = n[(i - \dot{p}^e) - (i^* - \dot{p}^{e*})] \qquad (1)$$

where: $EXCH$ = current real value of the dollar, defined as units of foreign currency per unit of domestic currency deflated by the ratio of foreign prices to domestic prices

$EXCH^e$ = real value of the dollar expected n years in future

i = U.S. nominal interest rate on security maturing in n years

i^* = foreign interest rate on security maturing in n years

$\dot{p}^e$ = expected U.S. (annualized) inflation rate over n years

$\dot{p}^{e*}$ = expected foreign (annualized) inflation rate over n years

The difference between the current real exchange rate and its expected future value—that is, the expected change in the real value of the currency—is thus proportional to the real interest rate differential. A central aspect of this theory is the importance of term structure effects. For example, assuming n is 10, a one-percentage point rise in the one-year U.S. real interest rate relative to the foreign one-year rate would cause the 10-year rate in the U.S. to increase by 0.1 percentage points (assuming future one year interest rates are not expected to change as well), and the real value of the dollar to go up only one percentage point. In contrast, a one percentage-point increase in the U.S. one-year rate that is expected to last for ten years would cause the 10-year U.S. bond rate to rise by one percentage point and the real exchange value of the dollar to rise by 10 percentage points. So the same movement in the one year rate generates different movements in the exchange rate depending on the change in the 10 year rate. Thus, if movements in long- and short-term interest rates are not perfectly correlated, the movement in the long-term real interest rate differential controls movements in the real exchange rate. In the short run, the expected real long-run equilibrium value of the dollar does not change, and the current exchange rate moves in proportion to the long-term

interest rate differential. In the longer run, however, the expected real exchange rate tends to be consistent with the long-run equilibrium value of the exchange rate, so that with perfect asset substitutability, real interest rates at home and abroad tend to be equalized.

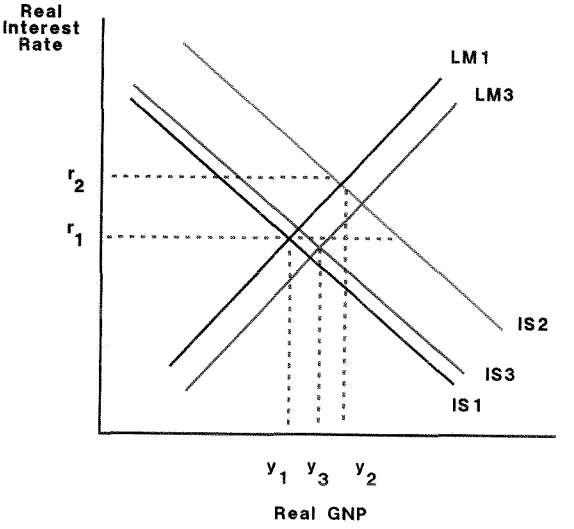
The implications of using the open interest parity condition to determine the exchange rate in the short run can be illustrated in the basic IS-LM framework. For this short-run analysis, fixed wage rates are assumed, but changes in the real value of the dollar are allowed to have an impact on the price level. For the moment, the foreign real interest rate is assumed to be fixed. The conventional approach assumes that the expected real value of the dollar in the long run is a constant, determined by the condition of purchasing power parity. This implies that the current real value of the dollar can be expressed as a simple function of the U.S. long-term real interest rate. The result is that the absolute value of the slope of the IS schedule (locus of equilibrium in the goods market) is less than it would be in a closed economy on account of the indirect response of net exports to the real interest rate occurring through the real exchange rate.

A further aspect of the open interest parity condition is the effect on the slope of the LM schedule (locus of equilibrium in the money market). An appreciation in the real value of the dollar reduces prices both directly through the lower relative price level of foreign goods and indirectly through the competitive pressures placed on domestic producers of tradable goods. Therefore, as the real interest rate and real value of the dollar rise, the price level falls and the *real* stock of money rises. This effect tends to reinforce the reduction in the quantity of money demanded at the higher rate of interest, resulting in a less steeply sloped LM schedule than in a closed economy.

The effect of a fiscal expansion in this conventional framework is illustrated in Figure 1. Assume that U.S. and foreign real interest rates are initially at r_1, with the equilibrium U.S. real GNP at y_1. A fiscal expansion, due to either an increase in government spending or a cut in taxes, would shift the IS schedule from IS_1 to IS_2, raising the U.S. real interest rate to r_2 and U.S. real GNP to y_2. Real GNP would rise through an increase in the velocity of money produced by higher interest rates. However, the rise in interest rates would offset a portion of the initial effects of fiscal expansion by contracting domestic investment, and possibly also consumption, and also by contracting net exports through the associated appreciation in the real value of the dollar.

The conventional exchange rate analysis, based on interest differentials alone, implicitly assumes that any

Figure 1
Effects of Fiscal Expansion



change in fiscal policy is not expected to last, so that the expected long-run real value of the dollar is not affected. Thus, fiscal policy affects the real value of the dollar *only* through its influence on the current differential between U.S. and foreign real interest rates. A U.S. fiscal expansion opens up a positive interest rate differential which appreciates the exchange value of the dollar so as to equate expected yields. Moreover, fiscal crowding out in these models *always* falls partly on interest-sensitive domestic expenditures since a positive interest rate differential would not be sustained if the dollar were to rise by enough to place all the crowding out on net exports.

One problem with this approach is that changes in fiscal policy generally are fairly long lasting. As a consequence, expectations that the exchange rate will return to its original level will continually be disappointed. Specifically, the actual real exchange value of the dollar will exceed the expected value as long as the fiscal expansion lasts. That is, as long as the fiscal expansion lasts, the expected depreciation will not occur. Thus, it seems logical that the market eventually would begin to revise its expectation of the long-run exchange rate upward. In doing so, the current real value also would rise and the positive real interest differential in favor of the U.S. would fall until the longer-run equilibrium of no differential between U.S. and foreign real interest rates eventually would be reached.

This process is depicted in Figure 1. The rise in the expected real value of the dollar has the effect of shifting the IS schedule downward (through a reduction in net exports at any given interest rate), and the LM schedule downward also (through the increase in the real stock of

money caused by an appreciating dollar). As long as the U.S. real interest rate exceeds the foreign real interest rate, the current exchange rate will continue to exceed the expected exchange rate, and the IS and LM schedules will continue to shift down through an adaptive adjustment of expectations until a full equilibrium at r_1, and y_3 is reached at the intersection of LM_3 and IS_3.[8]

II. International Sector of the FRBSF Macroeconometric Model

A key feature of the FRBSF macroeconometric model is that it treats the expected real value of the dollar in the long run ($EXCH^e$) as an endogenous variable determined by expectations of future fiscal policy. As a result, current fiscal policy influences the dollar through another channel besides the current level of interest rates. By altering expectations of future fiscal policy, it also influences the real value of the dollar through its effect on the expected real value of the dollar. The magnitude of the effect operating through this additional channel depends upon: 1) the size of the effect of changes in current fiscal policy on expectations of future fiscal policy, and 2) the size and direction of the effect of expected future fiscal policy on the expected real value of the dollar.

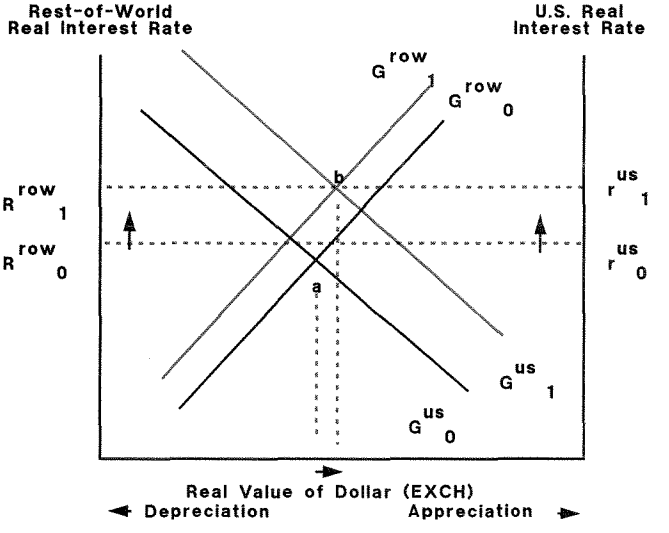
The effect of future fiscal policy on the real value of the dollar can be modelled in a two-country (the U.S. and the rest of the world), long run, or full employment, equilibrium framework. Dornbusch (1983) and Dornbusch and Blanchard (1984) have suggested a useful diagrammatic approach, shown in Figure 2. The locus of full employment equilibrium in the United States is given by G_0^{US}. This schedule slopes downward because at full employment an increase in the real value of the dollar reduces net exports, and so must be offset by the higher U.S. spending brought about by a lower U.S. real interest rate. Similarly, the locus of full employment equilibrium for the rest of the world slopes upward. A rise in the dollar expands net exports abroad and so must be offset by a higher real interest rate abroad to produce an offsetting change in aggregate demand. Assuming perfect capital mobility and perfect asset substitutability, real interest rates will equalize in the long run, and full employment equilibrium will occur at the intersection of these two schedules, at point *a*. At this intersection, real interest rates in the two countries are equal, and the real exchange rate produces trade balances that are consistent with full employment. Equilibrium capital flows, in turn, are mirror images of the trade balances.

A U.S. fiscal expansion increases domestic demand for U.S. goods and services. This shifts the U.S. schedule to the right from G_0^{US} to G_1^{US} because, for any given real exchange rate, higher U.S. real interest rates are needed to offset the rise in domestic spending and restore equilibrium. Since some of the increase in U.S. domestic demand is spent on imports, the U.S. fiscal expansion also shifts up the locus of full employment equilibrium for the rest of the world, G^{row}, through the increased demand for rest-of-the-world net exports. But most of the rise in world aggregate demand falls on U.S. output, so G^{US} shifts up by more than G^{row}. The larger increase in demand in the U.S. appreciates the real value of the dollar, which in turn diverts private demand away from U.S.-produced goods towards foreign-produced goods. A general equilibrium is restored at point *b*, where the higher level of world interest rates dampens the excess world aggregate demand created by the U.S. fiscal stimulus, and the dollar *appreciation* dampens the relative excess demand for U.S.-produced goods.[9]

However, it is possible for the dollar to *depreciate* if investors come to think that at some point, foreigners will demand a higher return on U.S. assets to absorb an increasingly large share of U.S. debt in foreign portfolios. Thus, in explaining current movements in the dollar, a fundamental issue is whether the market believes U.S. and foreign assets are, and will continue to be, close to perfect

Figure 2

Effects of U.S. Fiscal Expansion When U.S. and Foreign Assets Are Perfect Substitutes

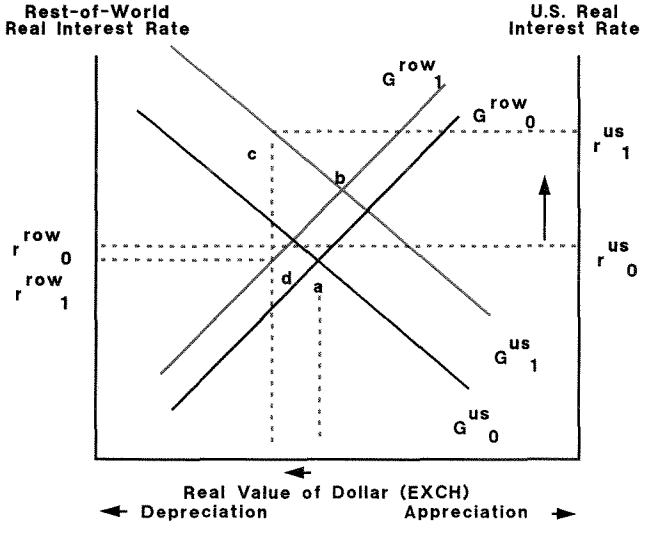


substitutes. If markets come to expect imperfect substitution between U.S. and foreign assets, a risk premium for holding U.S. assets (that is, a real yield differential) would have to be included in equation (1) and also in Figure 2.

Figure 3 shows the long-run effect of a fiscal expansion in this case. Assume there is no risk premium initially because portfolios are balanced, with the initial equilibrium at point *a* in Figure 3. The U.S. fiscal expansion shifts the G^{US} and G^{row} schedules upward as in Figure 2. But as the risk premium, or yield differential, grows with the accumulation of U.S. debt by foreigners, it drives a wedge (equal to *cd*) between real interest rates in the U.S. and abroad. The new equilibrium is no longer at point *b*, but rather at a lower value for the dollar. Indeed, a stable long-run equilibrium in this case requires an increase in the risk premium by enough to *depreciate* the real value of the dollar. If the risk premium grew by only enough to leave the real exchange rate unchanged, this still would not be a stable equilibrium because capital inflows would be needed to service the interest on the accumulation of U.S. external debt, resulting in a further increase in the risk premium. Thus, servicing the accumulated debt without capital inflows (as required for a stable equilibrium in this case) requires that the risk premium rise enough to cause the real value of the dollar to depreciate, thereby generating an increase in U.S. net exports to balance the current account. This is illustrated in Figure 3.[10]

Figure 3

Effects of U.S. Fiscal Expansion When U.S. and Foreign Assets Are Imperfect Substitutes



Exchange Rate Equation in the FRBSF Model

In summary, then, movements in the exchange rate depend, in part, on the market's expectation of the real value of the dollar in long-run equilibrium, or the long-run "anchor" for the dollar in equation (1). The market's expectation of the dollar's long-run anchor, in turn, is shaped by expectations of the impact of future domestic and foreign fiscal policies.[11] To the extent investors alter their expectations of future fiscal policy in response to current changes in fiscal policy, the dollar's anchor will be affected and the current value of the exchange rate will change. Under the assumption of perfect asset substitutability, or at least a constant risk premium, expectations of a sustained U.S. fiscal expansion will cause the long-run anchor for the dollar to rise and the dollar to appreciate. However, if investors expect that within their investment horizon the fiscal expansion will significantly increase the risk premium between foreign and domestic assets, the long-run anchor for the dollar could fall and the current value of the dollar could tend to depreciate.

The exchange rate equation in the FRBSF macroeconometric model enables us empirically to examine these important expectational effects. High employment, or structural, budget balances as a percent of high-employment GNP are used as an approximate measure of the overall impact of fiscal policy. Structural budget balances are preferable to actual (non-cyclically-adjusted) balances because they isolate better the goods market pressures associated with fiscal policy shifts.[12]

How *expectations* of these budget balances are formed is an open question. The conventional approach assumes that future budget balances are independent of current budget balances, so that the expected real value of the dollar is a constant determined by a condition of purchasing power parity, possibly modified by a time trend.[13] In contrast, the approach taken here allows for the possibility that a rational expectation of budget balances at home and abroad over the relevant investment horizon should depend, at least in part, on current budget balances. Specifically, the effects of anticipated budget surpluses or deficits are modeled as a function of a four-quarter moving average of current budget balances.[14]

The logarithm of the expected real value of the dollar in the long run is thus assumed to vary with the current U.S. budget balance (B), and a weighted average of current foreign budget balances (B*).[15] The signs of the coefficients on the budget balances depend upon the length of the market's investment horizon and whether the market regards U.S. and foreign assets as perfect or imperfect

substitutes within that investment horizon. The magnitudes of the coefficients on the budget balances depend, in part, upon the size of the response of expected budget balances to changes in current budget balances.

$$lnEXCH^e = a_0 + a_1B + a_2B^* \quad (2)$$

Substituting, equation (2) into equation (1) yields the exchange rate equation to be estimated as:

$$lnEXCH = a_0 + n[(i-\dot{p}^e) - (i^*-\dot{p}^{e*})] + a_1B + a_2B^* \quad (3)$$

As pointed out earlier, the differential on long-term real interest rates has a more stable impact on movements in the real exchange rate. This real bond rate differential can be decomposed into the nominal bond rate differential and an expected inflation differential. The nominal bond rate differential is modeled as a distributed lag on current and past differentials in nominal short-term interest rates, following the standard expectations model of the term structure of interest rates. The expected inflation differential is similarly modeled as a distributed lag on current and past values of the differential in quarterly inflation rates, but with separately estimated weights to allow for the possibility that the process of expectation formation may differ for nominal interest rates and inflation. The sum of the weights on the inflation differential is constrained to be the same as the sum of the weights on the nominal interest rate differential, but with an opposite sign. Both foreign interest rates and foreign inflation are measured on a trade-weighted basis.

The Board of Governors' index of the trade-weighted value of the dollar is used, and the foreign interest rates and budget balances are for the ten countries in this index.[16] The resulting equation for the real value of the dollar, estimated over the entire floating rate period, is:

$$lnEXCH = 3.44 + \sum_{i=0}^{18} a_i(i_s - i_s^*) + \sum_{i=0}^{18} b_i(\dot{p} - \dot{p}^*) \quad (4)$$
$$- .0574B + .0773B^* + 1.02e_{-1} - .373e_{-2}$$

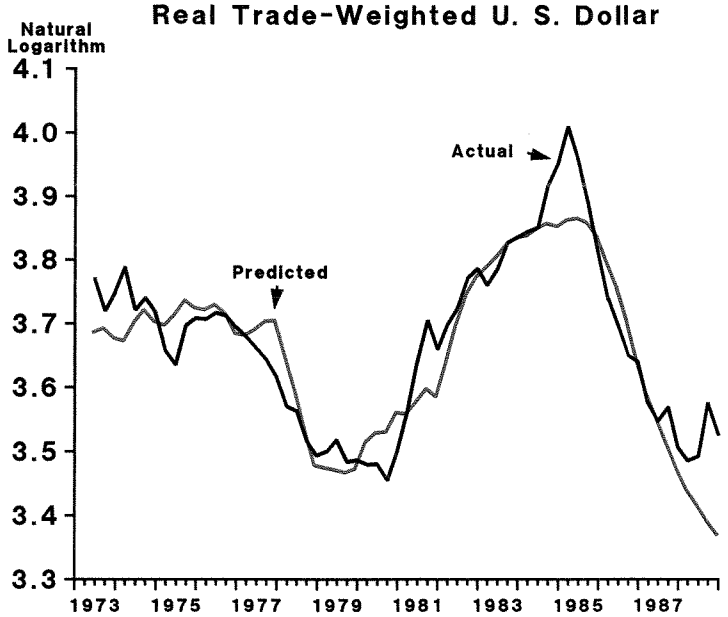
where: $\sum_{i=0}^{18} a_i = .104 \qquad \sum_{i=0}^{18} b_i = -.104$

Individual coefficients, t statistics, summary statistics, and exact estimation periods for this and other estimated equations are shown in the Appendix. The real interest rate differential is found to have a highly significant influence upon the real exchange rate, in accordance with the conventional view of exchange markets. A *sustained* one-percentage point change in the real short-term interest rate differential is estimated to produce a 10 percent change in the real trade-weighted value of the dollar in the same direction. The magnitude of this effect is consistent with an average horizon for investors in the foreign exchange market of 10 years.[17]

Signs of the estimated coefficients on U.S. and foreign budget deficits indicate that market participants view U.S. and foreign assets as *close substitutes*. Their magnitudes suggest that they view changes in structural budget deficits

Chart 1

Real Trade-Weighted U. S. Dollar



as being relatively *permanent*. Thus, a one-percentage point reduction in the current U.S. structural budget surplus as a percent of high-employment GNP is estimated to produce a six percent *appreciation* in the expected real trade-weighted value of the dollar, while a similar reduction in the weighted average of foreign budget surpluses *depreciates* the dollar by nearly eight percent. The difference in these coefficients is not surprising, given that the combined GNP of the foreign countries exceeds that of the United States. Moreover, these expectational effects are relatively large. In the FRBSF model, it would take about a nine percent appreciation in the real value of the dollar to reduce the trade balance sufficiently to fully offset the effect on aggregate demand from a one-percentage point reduction in the U.S. budget surplus, or in other words, to result in a full crowding out through the trade balance. The six percent appreciation generated by the expectational effects of a U.S. budget surplus is fully two-thirds of this.

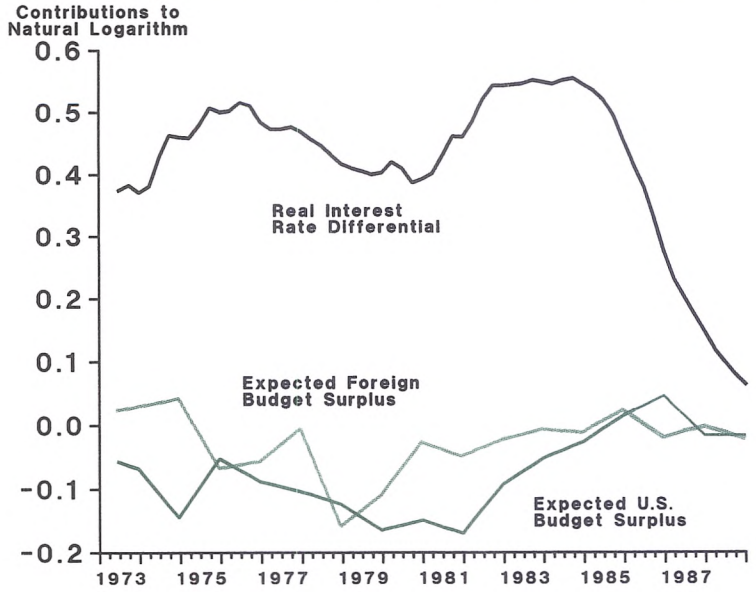
A plot of actual and predicted values from this equation for the whole period of floating exchange rates since 1973 (excluding serial correlation terms in predicted values) is shown in Chart 1. The overall fit is quite good. Although the variables in the equation do not explain the strength of the dollar in 1985 very well, this was a period when short-term speculative factors appear to have been particularly important. It is of particular interest that the equation tracks the major movements in the dollar quite well even though it ignores the potential effects of central bank interventions in the exchange market, except insofar as the latter influence interest rates. This result is consistent with the exchange rate model's basic premise of highly substitutable private capital.

Chart 2 decomposes the predicted real value of the dollar into its various components. From 1973 to 1980, the real value of the dollar dropped by 25 percent. The effects on expectations of the shift in the U.S. government budget toward surplus and the shifts in foreign government budgets toward deficits account for practically all of this depreciation.[18] The differential between U.S. and foreign real long-term interest rates rose until 1975, tending to push the real value of the dollar up during this period, but by 1980, the differential had returned to its 1973 level, reinforcing the tendency for the dollar to fall.

Between 1980 and 1985, the real value of the dollar appreciated sharply by 55 percent. The effect of the U.S. budget deficit on market expectations was the largest contributor to this appreciation. The change in expectations arising from the growing budget deficit accounts for about 40 percent of the total increase in the real value of the dollar in this period. Foreign budgets generally were moving from deficit into surplus, with the associated expectational effects contributing about 20 percent of the increase in the dollar's value. Finally, a rising real interest differential accounts for about 20 percent of the dollar's appreciation, with the remaining appreciation apparently due to speculative factors.

Chart 2

Contributions of Various Factors to Real Trade-Weighted U. S. Dollar



During the period from 1985 to 1988 when the dollar depreciated sharply, the combined effect of changes in the U.S. and foreign budget deficits on the long-run expectation of the dollar contributed only 10 percent of the total depreciation in the real value of the dollar. In contrast to the preceding period, the declining real long-term interest rate differential accounted for nearly 75 percent of the total decline in the real value of the dollar. The declining real interest rate differential, in turn, was primarily due to both the decline in the U.S. real bond rate that followed monetary disinflation in the United States and a rising trade-weighted foreign real bond rate. Foreign central banks raised their interest rates in response to the effects of the persistently strong dollar. These movements in real interest rates were conducive to a better domestic macroeconomic equilibrium and were consistent with the Plaza Agreement of September 1985, in which the Group of Five agreed to cooperate in reducing the value of the dollar.

Other Aspects of the International Sector of the FRBSF Model

The remainder of this section briefly discusses the response of the trade balance and inflation to changes in the exchange rate, as modelled in the FRBSF macroeconometric model. These equations are similar to those in most large-scale econometric models, although this model is relatively small in size.[19] Since the model is fully documented elsewhere (Throop [1989]), only the most pertinent aspects of the international sector are described here.

Reactions of Foreign Central Banks

In modelling the exchange rate and the trade balance, one needs to take into account the reactions of foreign central banks to changes in U.S. interest rates. Floating exchange rates have diminished the short-run monetary linkages among national real interest rates. Nonetheless, foreign central banks continue to pursue macroeconomic stabilization and so, continue to respond to changes in U.S. interest rates, though to a lesser extent than before. For example, foreign central banks tend to allow foreign interest rates to rise in response to a rise in U.S. rates, to prevent capital outflows and a depreciation of their currencies that would result in an increase in aggregate demand and higher output and inflation. However, matching the rise in U.S. interest rates exactly would have a deflationary impact on foreign economies. As a result, foreign central banks have tended to match some, but not all, of the changes in U.S. real interest rates in an effort to stabilize aggregate demand.

The estimated response function of the trade-weighted foreign real short-term interest rate to changes in the U.S. real short-term interest rate in the FRBSF model is:

$$\Delta(i_s^* - \dot{p}_s^{e*}) = .235\Delta(i_s - \dot{p}_s^e) + .143\Delta(i_s - \dot{p}_s^e)_{-1} + .160\Delta(i_s - \dot{p}_s^e)_{-2} + .009\Delta(i_s - \dot{p}_s^e)_{-3} + .222e_{-1} \quad (5)$$

The short-term inflationary expectations that enter into short-term real interest rates at home and abroad are modeled by a four-quarter moving average of the inflation rate. Summing the coefficients on the lagged real interest rates suggests that foreign central banks have matched about 55 percent of the change in U.S. real short-term interest rates after three quarters on average.

Exports and Imports

Real exports (GEX82) are modeled as a function of real GNP in the U.S.' ten major industrial trading partners (ROWGNP82) and the real trade-weighted value of the dollar (EXCH). The equation for exports is:

$$lnGEX82 = -.811 + \sum_{i=0}^{2} a_{-i}\, lnROWGNP82_{-i} + \sum_{i=2}^{9} b_{-i}\, lnEXCH_{-i} + .774e_{-1} \quad (6)$$

where: $\sum_{i=0}^{2} a_{-i} = 1.75 \qquad \sum_{i=2}^{9} b_{-i} = -.523$

Real nonpetroleum imports (NPM82) are related in a similar fashion to U.S. GNP and the real trade-weighted value of the dollar.[20] Real imports of petroleum (PM82) historically have been subject to a number of special factors, including for a time, a complex system of controls on U.S. production. But after 1974, the ratio of petroleum imports to GNP has been significantly and negatively related to the real price of oil (POIL), as theory would suggest under stable domestic supply conditions. Oil imports have not been significantly related to the real exchange rate in the expected direction, however, partly because imports are priced in dollars, and so are not immediately affected by changes in the value of the dollar. Moreover, in the longer run, the response of foreign oil suppliers to the movement in the real value of the dollar has been quite erratic. The two import functions are:

$$lnNPM82 = -20.1 + \sum_{i=0}^{2} a_{-i}\, lnGNP82_{-i} + \sum_{i=0}^{9} b_{-i}\, lnEXCH_{-i} + .797e_{-1} \quad (7)$$

where: $\sum_{i=0}^{2} a_{-i} = 3.01 \qquad \sum_{i=0}^{9} b_{-i} = +.384$

$$ln(PM82/GNP82) = \quad (8)$$
$$-.291 + .897\, ln(PM82/GNP82)_{-1}$$
$$-.137 lnPOIL - .251 e_{-1}$$

The overall fit of the export and import equations is quite good, as shown in plots of actual and predicted values in Charts 3 and 4 (excluding serial correlation terms from the predicted values). The absolute value of the price elasticity of demand for exports exceeds that for nonpetroleum imports, consistent with other recent work.[21] The lags on the real exchange rate are much longer than on GNP in the case of both exports and imports. Also, the elasticity of U.S. nonpetroleum imports with respect to U.S. GNP is 3.01, substantially exceeding the 1.75 elasticity of U.S. exports with respect to foreign GNP. This difference may be due to pure income effects; or it may be capturing the effect of different rates of productivity growth in tradable goods at home and abroad.[22]

Inflation and the Dollar

In the FRBSF macroeconometric model, movements in the real value of the dollar have a significant impact on the price level. The inflation equation in the model may be characterized as an expectations-augmented Phillips curve that includes the effects of "supply shocks" from changes in the real price of oil and the real value of the dollar. The civilian unemployment rate (LHUR), adjusted for changes in the natural rate of unemployment due to demographics (U*), is used to measure excess demand, and the expected rate of inflation is measured by a distributed lag on past inflation. Changes in the real value of the dollar influence prices both directly through prices of imports, and indirectly through competitive effects on domestic prices of exports and import substitutes. The Phillips curve equation captures these relationships by including a distributed lag on current and past changes in the real trade-weighted value of the dollar. A second type of "supply shock" to the price level comes from the real price of oil. Changes in the real price of oil alter the mark-up of prices over unit labor costs by changing the price of an important non-labor input. A distributed lag on the percentage change in the real price of oil captures this effect. The estimated inflation equation is:

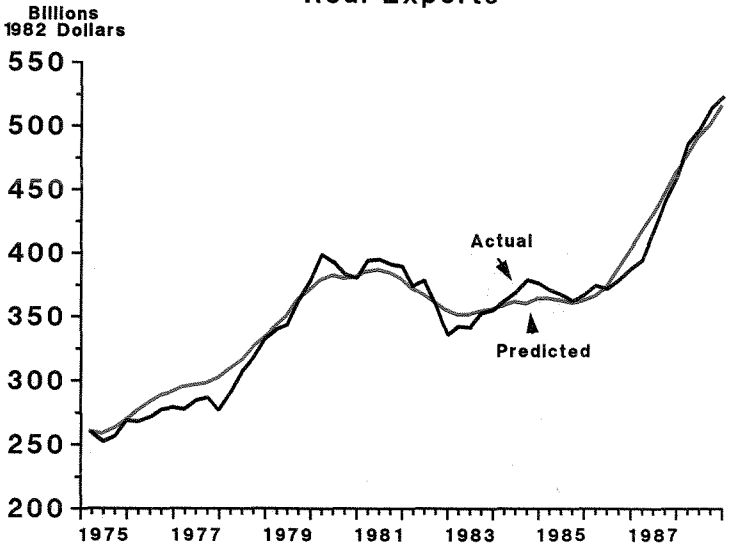
$$\dot{GDF} = .0847 - .600(LHUR - U^*) + \sum_{i=2}^{11} a_i \dot{GDF}_{-i} \quad (9)$$
$$+ \sum_{i=0}^{4} b_i \dot{POIL}_{-1} + \sum_{i=0}^{6} c_i \dot{EXCH} + .388 e_{-1}$$

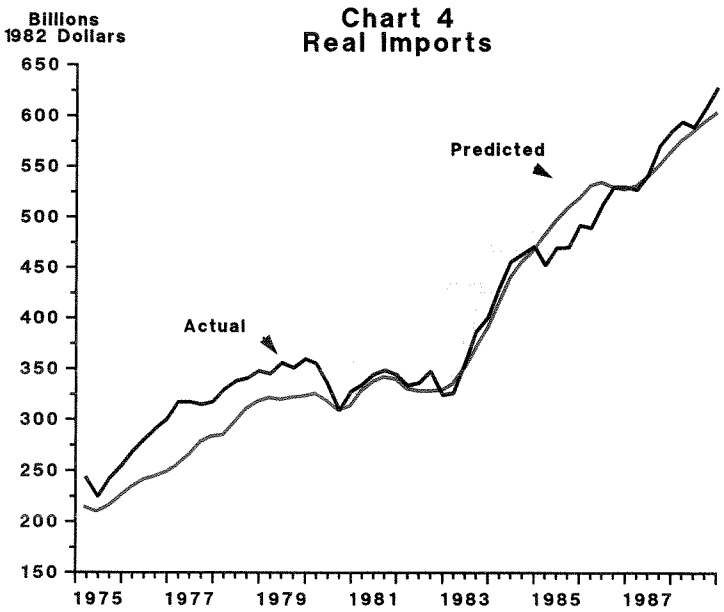
where: $\sum_{i=2}^{11} a_{-i} = 1.0 \quad \sum_{i=0}^{4} b_i = .0389 \quad \sum_{i=0}^{6} c_i = -.0794$

The sum of the estimated coefficients on past inflation is not significantly different from one, and so it is constrained to that value. The lag on past inflation extends about three years. These results imply a vertical long-run Phillips curve in which, absent supply shocks, the rate of inflation at full employment is equal to the rate of inflation inherited from the past. Equivalently, they reflect an accelerationist view that excess demand, or an unemployment rate below

Chart 3

Real Exports





full employment, leads to a continuing acceleration in the inflation rate.[23]

A 10 percent change in the real price of oil is estimated to change the U.S. price level by 0.4 percent in the same direction over five quarters; and a 10 percent change in the real trade-weighted value of the dollar moves the price level by 0.8 percent in the opposite direction over seven quarters. Because of the role of the dollar in the inflation equation, a fiscal expansion in the FRBSF model causes the real value of the dollar to appreciate, prices to drop, and the real stock of money to expand—relieving some of the pressure on interest rates and allowing real GNP to expand by more than it otherwise would.

III. Effects of a Fiscal Expansion

This section compares the estimated responses of interest rates, the dollar, and the trade balance to a fiscal expansion obtained from the FRBSF model with those obtained from the more conventional framework in which the market's expectation of the future real value of the dollar is unaffected by current fiscal policy. To represent the conventional framework, the coefficients on the budget balances in the FRBSF model's exchange rate equation are set equal to zero. I assume for a baseline the actual path of the economy from 1981 through 1988. Monetary policy is defined in terms of the actual path of nominal M2, which I initially assume is unaffected by the fiscal expansion. A simple fiscal change is examined, namely a permanent increase in government spending equal to one percent of high-employment GNP.

For simulating this fiscal expansion with the complete FRBSF model, only two exogenous variables are changed from their historical paths. These are the value of government spending itself and the ratio of the cyclically-adjusted budget balance to high-employment GNP that appears in the exchange rate equation. The results of this simulation are compared with those from the conventional framework which, effectively, changes only the first of these variables from its historical path.

Table 1 shows the results of these simulations as deviations from the historical baseline path. In all of the simulations, real government spending is increased by $32 billion in the first quarter, with this increment growing to $38.8 billion by the 32nd quarter. Simulation A shows the results from the conventional framework. After two quarters, real GNP rises to a maximum of $44.8 billion, but then turns down as the lagged effects of higher interest rates and an inventory adjustment produce a cyclical downturn. The U.S. real bond rate rises steadily because of persistent pressure from higher government spending on short-term interest rates. After 32 quarters, the U.S. real bond rate has risen 151 basis points, and the differential between U.S. and foreign real bond rates has increased by 64 basis points. As a consequence, the real trade-weighted value of the dollar has appreciated 6.9 percent above its

baseline path. This produces a $16.3 billion decline in real net exports. At this point, interest rates have nearly peaked, and the impact of the fiscal expansion on the dollar and the trade balance is near its maximum. Even so, only 40 percent of the crowding out occasioned by increased government spending falls on net exports.

The response of the real exchange rate and net exports to a fiscal expansion in the complete FRBSF model, which includes the effects of changes in the expected long run real value of the dollar, is quite different. As shown in Column B of Table 1, after four quarters, the size of the increase in the real bond rate, and the differential between it and the foreign real bond rate, is about the same as in Column A. But the dollar appreciates significantly more in Simulation B—7.3 percent, versus 1.2 percent—because of the expectations effect. This stronger appreciation, in turn, produces larger reductions in net exports and actual declines in domestic prices in subsequent quarters. The larger increase in the real stock of money from lower prices combines with the larger decrease in net exports to pull the

Table 1

Sensitivities to a Change in Real Government Spending Equal to One Percent of High-Employment Real GNP

(Deviations from Historial Path of 1981-88)

A - M2 exogenous, and unchanged long-run expectation of real exchange rate
B - M2 exogenous, and changed long-run expectation of real exchange rate
C - M2 path to stabilize real GNP, and changed long-run expectation of real exchange rate

Quarter	Government Spending (Billions of 1982 Dollars)	Net Exports (Billions of 1982 Dollars)			Real Trade-Weighted Dollar (Percent)		
	A,B, and C	A	B	C	A	B	C
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	32.0	−4.8	−5.1	−5.1	0.2	1.6	1.7
2	32.2	−10.4	−11.0	−11.0	0.7	3.7	3.7
4	32.6	−11.3	−14.5	−14.4	1.2	7.3	7.5
8	33.4	−12.1	−21.5	−21.6	1.8	8.1	8.5
12	34.2	−14.3	−27.5	−27.7	2.2	7.7	8.4
16	35.1	−14.5	−29.1	−29.9	3.1	7.2	8.0
20	36.0	−14.1	−27.6	−28.5	3.5	6.4	7.4
24	36.9	−13.8	−26.7	−27.7	3.6	5.4	6.7
28	37.8	−15.2	−28.4	−27.2	4.8	5.4	6.8
32	38.3	−16.3	−30.0	−31.0	6.9	5.9	7.6

Quarter	U.S. Less Foreign Real Bond Rate (Basis Points)			U.S. Real Bond Rate (Basis Points)			Real GNP (Billions of 1982 Dollars)			GNP Price Index (Percent)		
	A	B	C	A	B	C	A	B	C	A	B	C
0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
1	2	2	3	7	7	11	30.2	30.0	29.9	0.0	0.0	0.0
2	7	7	8	30	31	36	44.8	44.0	43.6	0.1	0.1	0.1
4	12	13	15	46	51	58	35.2	30.7	29.4	0.2	0.1	0.1
8	18	19	23	41	27	35	33.3	21.4	19.2	0.5	−0.2	−0.2
12	21	16	22	31	12	21	27.3	15.4	12.3	1.0	−0.2	−0.3
16	29	11	19	65	25	39	17.6	12.7	8.8	1.6	−0.2	−0.4
20	33	4	14	71	23	42	10.0	12.2	6.9	2.2	0.0	−0.3
24	34	−4	7	61	3	25	4.4	13.8	6.6	2.8	0.3	−0.3
28	45	−5	8	102	−1	25	−2.2	14.9	5.8	3.4	0.6	−0.1
32	64	0	15	151	9	40	−16.4	10.5	0.0	3.9	1.1	−0.1

U.S. real bond rate back to the baseline path by 28 quarters. The real value of the dollar remains high, supported by expectational effects, even though the U.S. real bond rate and the differential between it and the foreign real bond rate return to their baseline levels.

Between four and 32 quarters in Simulation B, the real trade-weighted value of the dollar fluctuates between 8 percent and 5½ percent above its baseline path. As a result of the higher dollar, net exports fall rapidly, reaching close to their maximum amount of decline after only 16 quarters. Thus, in Simulation B, real net exports decline by $27.7 billion after 12 quarters and by $31.0 billion after 32 quarters, compared with $14.3 billion and $16.3 billion, respectively, in Simulation A. By incorporating the expectational effect in Simulation B, not only does the dollar appreciate much faster, but also after the first year there is much less pressure on real interest rates. This outcome puts a significantly higher proportion of the crowding out from a fiscal expansion on net exports. In the period from 12 to 32 quarters after the fiscal expansion, 80 percent of the crowding out associated with the increment to government spending falls on net exports in the FRBSF model, compared with only about 40 percent in the conventional framework.

After 32 quarters, real GNP in Simulation B is still $10.5 billion higher than the baseline path, due to both the interest elasticity of money demand and the increase in real M2 produced by the dollar's appreciation. In the long run, however, the economy will tend to return to full employment as domestic prices adjust, so that fiscal policy will affect only the composition of output. Simulation C approximates this longer-run solution in the context of the complete FRBSF model by raising the path of nominal interest rates about 11 basis points above that in Simulation B, so that after 32 quarters real GNP returns to its baseline path.

In this long-run solution, there is an extra 31 basis point increase in the U.S. real bond rate and an extra 1.7 percentage point appreciation in the real value of the dollar compared with Simulation B. But the incidence of crowding out does not change significantly. About 80 percent of the crowding out from higher government spending continues to fall on net exports, with the remainder falling on interest-sensitive consumption and investment. I estimate that the real value of the dollar would have to appreciate by nine percent to make crowding out fall entirely on net exports. It actually appreciates by 7½ percent in this longer-run simulation. Roughly six percentage points of the appreciation are due to the expectational effect of the fiscal expansion, while the remaining 1½ percentage points are caused by the rise in the real bond rate differential. Thus, in the longer run, expectational effects continue to be more important than interest rate effects in appreciating the dollar, and the stronger dollar continues to be more important than interest rates in determining which components of aggregate demand will bear the brunt of crowding out.

IV. Summary and Conclusions

This paper synthesizes two major strands in the literature on open-economy macroeconomics that deal with the linkages among fiscal policy, the dollar, and international trade. Assuming perfect capital mobility and perfect asset substitutability, as well as an instantaneous adjustment of expectations, Mundell (1963) showed that a fiscal expansion can attract net capital inflows without any increase in the differential between domestic and foreign real interest rates. Under the same assumptions with regard to capital mobility and asset substitutability, the conventional short-run dynamic analysis of asset equilibrium, expounded by Dornbusch (1976), Frankel (1979) and others, implies that a fiscal expansion will attract net capital inflows only insofar as it increases the differential between domestic and foreign real interest rates. My analysis suggests that both the interest rate differential and expectations matter. The international sector of the FRBSF macroeconometric model provides a synthesis by embedding a rational expectations model of the dollar's longer-run equilibrium into the short-run dynamics of asset equilibrium. This is done by including expected fiscal balances for the U.S. and other countries along with the interest rate differential in the exchange rate equation.

My econometric estimates suggest that expected budget balances are significant determinants of long-run expectations of the exchange rate. These estimates also indicate that market participants believe that an expansionary fiscal policy will appreciate, rather than depreciate, the real value of the dollar in the long run, suggesting that they do not expect risk premia to be significantly affected by the change in U.S. fiscal policy. Thus, the economy's adjustment to a fiscal expansion is similar to that originally proposed by Mundell. Interest rates rise by less, and the value of the dollar rises faster and farther than in conventional macroeconometric models, where the real value of the dollar is determined solely by the differential between U.S. and foreign real interest rates. As a result, a fiscal expansion rapidly crowds out a relatively large amount of net exports.

APPENDIX
Selected FRBSF Econometric Model Equations

A. REAL EXCHANGE RATE

$$lnEXCH = \underset{(6.66)}{3.44} + \sum_{i=0}^{18} a_i (i_s - i_s^*)_{-i} + \sum_{i=0}^{18} b_i (\dot{p} - \dot{p}^*)_{-i}$$

$$\underset{(-3.09)}{-.0574B} + \underset{(2.06)}{.0773B^*} + \underset{(7.50)}{1.02e_{-1}} - \underset{(-2.75)}{.373e_{-2}}$$

LAG	a_i	b_i
0	.00849	−.00279
1	.00829	−.00756
2	.00806	−.00716
3	.00781	−.00780
4	.00754	−.00781
5	.00724	−.00775
6	.00692	−.00761
7	.00658	−.00741
8	.00621	−.00713
9	.00582	−.00678
10	.00541	−.00636
11	.00497	−.00587
12	.00450	−.00531
13	.00402	−.00467
14	.00351	−.00396
15	.00298	−.00318
16	.00242	−.00233
17	.00184	−.00141
18	.00123	−.00041
SUM	.104 (5.74)	−.104 (−5.87)

R^2 = .943
R.E. = .0354
D.W. = 2.00

Sample Period: 1973.Q2 - 1988.Q4

EXCH = real trade-weighted value of the dollar
i = U.S. short-term interest rate
*i** = foreign trade-weighted short-term interest rate
$\dot{p}$ = U.S. inflation rate
$\dot{p}^*$ = trade-weighted foreign inflation rate
B = 4 quarter moving average of U.S. budget balance
*B** = 4 quarter moving average of weighted foreign budget balance

B. FOREIGN REAL SHORT-TERM INTEREST RATE

$$\Delta(i_s^* - \dot{p}_s^{e*}) = \underset{(3.32)}{.235}\,\Delta(i_s - \dot{p}_s^e) + \underset{(1.99)}{.143}(i_s - \dot{p}_s^e)_{-1}$$

$$+ \underset{(2.23)}{.160}\,\Delta(i_s - \dot{p}_s^e)_{-2} + \underset{(0.13)}{.009}\,\Delta(i_s - \dot{p}_s^e)_{-3} + \underset{(1.69)}{.222}e_{-1}$$

$\bar{R}^2$ = .263
S.E. = .754
D.W. = 1.90

Sample Period: 1973:Q2-1987:Q4

C. EXPORTS

$$lnGEX82 = \underset{(-1.28)}{-.811} + \sum_{i=0}^{2} a_{-i}\, lnROWGNP82_{-i} + \sum_{i=2}^{9} b_{-i}\, lnEXCH_{-i} + \underset{(8.28)}{-.774}e_{-1}$$

LAG	a_i	b_i
0	0.591	
1	1.071	
2	0.084	−.126
3		−.107
4		−.089
5		−.072
6		−.055
7		−.039
8		−.024
9		−.010
SUM	1.75 (13.9)	−.523 (−5.75)

$\bar{R}^2$ = .988
S.E. = .0213
D.W. = 1.76

Sample Period: 1972:Q4 - 1987:Q4

GEX82 = exports in billions of 1982 dollars
ROWGNP82 = GNP in 1982 dollars of 10 major industrial trading partners
EXCH = real trade-weighted value of dollar

D. NONPETROLEUM IMPORTS

$$lnNPM82 = \underset{(-15.0)}{-20.1} + \sum_{i=0}^{2} a_{-i}\, lnGNP82_{-i} + \sum_{i=0}^{9} b_{-i}\, lnEXCH_{-i} + \underset{(8.85)}{-.797}e_{-1}$$

LAG	a_i	b_i
0	1.67	.054
1	1.16	.051
2	0.17	.047
3		.044
4		.040
5		.037
6		.033
7		.029
8		.026
9		.022
SUM	3.01	.384
	(16.2)	(2.61)

$\bar{R}^2$ = .994
S.E. = .0266
D.W. = 1.81

Sample Period: 1972.Q4 - 1987:Q4

NPM = *nonpetroleum imports in 1982 dollars*
GNP82 = *GNP in 1982 dollars*
EXCH = *real trade-weighted value of dollar*

E. PETROLEUM IMPORTS

$$ln(PM82/GNP82) = \underset{(-1.61)}{-.291} + \underset{(17.2)}{.897}ln(PM82/GNP82)_{-1} - \underset{(-2.06)}{.137}\, lnPOIL - \underset{(-1.72)}{.251}e_{-1}$$

$\bar{R}^2$ = .843
S.E. = .113
D.W. = 2.16

Sample Period: 1975.Q1 - 1987.Q4

PM82 = *petroleum imports in 1982 dollars*
GNP82 = *GNP in 1982 dollars*
POIL = *real price of crude petroleum*

F. INFLATION[a]

$$\dot{GDF} = \underset{(0.41)}{.0847} - \underset{(-3.86)}{.600}(LHUR - U^*) + \sum_{i=2}^{11} a_i\, \dot{GDF}_{-i} + \sum_{i=0}^{4} b_i\, POIL_{-i} + \sum_{i=0}^{6} c_i\, EXCH + \underset{(4.01)}{.388}e_{-1}$$

LAG	a_i	b_i	c_i
0		.00976	−.0057
1		.00733	−.0097
2	.061	.00634	−.0124
3	.155	.00679	−.0138
4	.148	.00867	−.0140
5	.138		−.0129
6	.126		−.0106
7	.112		
8	.095		
9	.077		
10	.056		
11	.032		
SUM	1.00	.0389	−.0794
		(2.60)	(−2.69)

$\tilde{R}^2$ = .809
S.E. = 1.26
D.W. = 2.00

Sample Period: 1958:Q2 - 1987:Q4

GDF = *annualized percent change in GNP fixed-weighted price index*
LHUR = *civilian unemployment rate*
*U** = *measure of variation in the civilian unemployment rate due to demographics*
POIL = *annualized percent change in real price of crude oil*
EXCH = *annualized percent change in real trade-weighted value of dollar*

[a] *The personal consumption deflator is used to deflate the nominal stock of M2 in the FRBSF model. However, its rate of change is a function of the rate of inflation in the GNP fixed-weighted price index.*

NOTES

1. For an overview of these simulation results, see Helkie and Hooper (1988) and Bryant and Holtham (1988).

2. Mundell (1963) assumed static expectations with regard to the exchange rate in the sense that the exchange rate in the future is expected to be the same as today's exchange rate. As discussed below, however, a rational adjustment of the market's long run expectation of the dollar to changes in the current budget deficit has a similar effect on the incidence of the fiscal change. The most forceful recent proponents of this view have been Dornbusch (1983) and Blanchard and Dornbusch (1984). For an earlier comparison of these two alternative views, see Hutchison and Throop (1985). For recent surveys that put Mundell's contribution into historical perspective and further discuss some of the issues covered in this paper, see Frankel and Razin (1987) and Marston (1985).

3. The FRBSF macroeconometric model is fully described in Throop (1989).

4. In technical terms, previous research indicates that risk premia on internationally-traded assets are small, vary with time, and are difficult to associate systematically with structural variables. See Danker, *et. al.* (1984), Frankel (1982), and Hutchison and Throop (1985).

Although Mundell (1963) implicitly took perfect mobility to require perfect substitutability, current writers generally take perfect capital mobility to mean only an absence of substantial transaction costs, capital controls, or other impediments to the flow of capital between countries. This definition of perfect capital mobility implies that the exchange rate would adjust instantaneously to equilibrate the international demand for stocks of national assets, as opposed to the more traditional view of adjusting to equilibrate the international demand for flows of goods and capital. But it leaves open the question whether domestic and foreign assets are perfect or imperfect substitutes. See Dornbusch and Krugman (1976) and Frankel (1983).

5. For a survey of the most important multicountry econometric models, see Bryant, *et. al.* (1988), especially Chapters 3 and 5. Additional detail on these models may be found in Part I of the *Supplemental Volume*.

6. The asset theory of exchange markets was pioneered by Dornbusch (1976a) and Frankel (1979). See also Hooper and Morton (1982) and Hutchison (1982) for applications of the asset view. A useful general survey of modern exchange rate theory is Shafer and Loopesko (1983).

7. The open interest parity condition in nominal terms is:

$$ln s - ln s^e = n(i - i^*)$$

where s is the nominal value of the dollar, defined as units of foreign currency per unit of domestic currency, and s^e is the expected value of the nominal exchange rate. By definition

$$s = EXCH \frac{p^*}{p}$$

and

$$s^e = EXCH^e \frac{p^*(1 + \dot{p}^{e*})^n}{p(1 + \dot{p}^e)^n}$$

where EXCH is the real exchange rate and p and p^* are the U.S. and foreign price levels, respectively. Taking logarithms and substituting into the arbitrage equation in nominal terms gives equation (1) in the text.

In theory, the relevant interest rate differential should be after taxes. Although marginal tax rates on real interest income differ among industrial countries, no estimates of these rates are available. For a survey of and some background papers on what is known about how interest income and foreign exchange gains and losses are taxed in various countries, see Tanzi (1984).

8. The ultimate equilibrium at LM_3 and IS_3 is similar to that in Mundell's (1963) classic analysis, in which the dollar appreciates without any increase in the equilibrium real interest rate differential. Mundell assumed static expectations with respect to the exchange rate (meaning that the exchange rate expected in the future is the same as today's exchange rate), allowing this short-run equilibrium to be reached immediately. Also, he ignored the effect of the currency appreciation on the LM schedule, so that the IS schedule shifted all the way from IS_2 to IS_1, leading to a full crowding out of net exports by the fiscal expansion.

9. Because real interest rates equalize in the long run, the dollar appreciates without any increase in the equilibrium real interest rate differential, just as in Mundell's classic analysis of a small country with fixed prices. The difference in this two-country, full-employment case is that because the world interest rate rises, there is some crowding out of U.S. domestic investment, and possibly consumption, in addition to net exports. However, the smaller is the country with the fiscal expansion relative to the rest of the world, the greater is the crowding out of net exports. Crowding out from fiscal expansion in a country small enough to have no significant impact on world interest rates would fall entirely on net exports, just as in Mundell's small country case with fixed prices.

A further point is that the crowding out of world-wide capital formation by a U.S. fiscal expansion gradually shifts up the locus of full-employment equilibrium in both countries as capital becomes scarcer, thus raising real interest rates at full employment in both countries. Since this shifts up the schedules of both countries, there is no necessary impact on the real value of the dollar. However, if consumption spending is a function of net wealth, as is commonly believed, the increase in the relative wealth position of the foreign country would shift up its full-employment equilibrium relatively more, thus tending to *depreciate* the dollar. To the extent that investors expected the fiscal expansion to have such an impact within their investment horizon, the current value of the dollar could be affected. Whether this is in fact the case is an empirical matter.

10. Branson (forthcoming) and Sachs (1985) have constructed formal models in which the risk premium in an open-interest parity condition varies over time in proportion to relative debt positions. Krugman (1985, 1988) correctly points out, however, that risk premiums should also enter into the expected long-run value of the dollar, consistent with Figure 3. But he suggests in addition that the market has not correctly assessed the limit to absorption of dollar-denominated assets by the rest of the world. The implication that expectations in the foreign exchange market are irrational, is hard to accept.

Rather, it is more realistic to assume there is a relatively large potential world demand for dollar assets. The dollar is universally accepted as a means of international payment and serves as an international store of value to an extent unmatched by any other asset. Moreover, the breadth, depth, and resilience of U.S. financial markets provide a degree of liquidity not available in other assets. As a result, only a small increase in the U.S. real interest rate relative to the foreign real interest rate likely would be required to ensure continued external financing of the U.S. payments deficit. As a consequence, over relatively long time horizons, the expectation of a relatively permanent U.S. budget deficit is more likely to lead to an *increase* in the expected long-run equilibrium in the real value of the dollar than a decrease, consistent with the empirical results discussed below. For a further defense of this view, see Cheng (1988).

11. The analysis shown in Figures 2 and 3 makes it clear that the expected real value of the dollar also should depend on the expected rate of private saving at home and abroad. Although the U.S. private saving rate declined significantly in the 1980s, prior to that it had been stable over a long period of time. (See Denison [1958] and David and Scadding [1974].) The question whether expectations of long-run private saving rates have changed significantly is beyond the scope of this article.

12. They are only approximate because the marginal effects of government spending, transfer payments, and various taxes on aggregate demand are not exactly the same. The budgetary data are combined federal, state, and local balances compiled by the OECD. Sources of these data are Price and Muller (1984) and recent issues of the *OECD Economic Outlook*.

Both inflation-adjusted and unadjusted structural budget balances were tried. Unadjusted structural budget balances count the inflation premium in interest paid on government debt as an outlay, but do not count the corresponding erosion in the real value of this debt due to inflation as a receipt. The inflation-adjusted structural budget balance corrects this by including the erosion in the value of the debt as tax revenue. These two measures performed equally well in the exchange rate equation.

But evidence from the consumption function in the FRBSF econometric model, as well as empirical work by Eisner and Peiper (1984) and Price and Muller (1984) that shows real growth in the United States and Europe to be more closely related to movements in inflation-adjusted budget balances than to unadjusted ones, supports using the adjusted measure. The inflation-adjusted measure is consistent with households' behaving rationally and therefore saving (and reinvesting) inflation premiums in the interest on government debt.

Because of this behavior, the private saving rate as conventionally measured should tend to rise and fall with the inflation rate. This response of the private saving rate to inflation is particularly evident in European countries that have experienced sharp changes in inflation. However, it is obscured in the U.S. data by simultaneous movements in the ratio of real wealth to income, which also influence the saving rate in a life-cycle model of consumption. For further discussion of the inflation-adjusted measure, see Jump (1980), Siegel (1979), and Tanzi, Blejer, and Teijero (1987).

13. See, for example, Bryant, *et. al.* (1988), Bryant and Holtham (1988), and Helkie and Hooper (1988).

14. The alternative of budget balances over four quarters ahead did not perform as well. Neither did distributed lags on current and past budget balances.

15. Trade-weights clearly are appropriate for combining the rest of the world's real interest rates since that is the way the exchange rate is constructed. However, in the case of the structural budgets, the relative size of the country also is important. The larger the country, the smaller trade generally will be as a proportion of GNP, and the flatter will be its full employment locus in Figures 2 and 3. Therefore, the impact of a one-percentage point change in the country's structural budget on its real bilateral exchange rate with the U.S. would be greater the larger is the size of that country's economy. Thus, the weight for the foreign budget balances that I used is the trade-weight times the relative GNP-weight.

Since the relative effects of domestic and foreign budget balances on the real exchange rate depend upon the relative size of the U.S. and the rest of the world, there is no reason that the coefficients on the two budget balances should be constrained to be of equal absolute value, as is the case with U.S. and foreign interest rates.

16. Multilateral trade weights are used. See Board of Governors of the Federal Reserve System (1978). The nominal index is deflated by the ratio of trade-weighted foreign consumer prices to the U.S. GNP fixed-weight price index.

17. Hooper (1985, 1987) estimates a six percent change in the real exchange rate for a one-percentage point change in the real interest rate differential. He uses interest rates on securities with maturities that are usually 10 years, but sometimes less.

18. Although the standard measure of the U.S. federal fiscal deficit as a percent of high-employment GNP rose and the state and local government balance was about unchanged, there was a larger increase in the inflation "tax" on government debt. Hence, the U.S. inflation-adjusted structural budget balance rose. See footnote 12.

19. The FRBSF model has only 28 behavioral equations,

compared with 124 in the Federal Reserve-MIT-Penn model (Brayton and Mauskopf, 1987), for example.

20. Weighted averages of domestic spending and domestic output also were tried as scale variables, on the theory that imports depend upon spending as well as production, but they gave inferior results compared with real GNP.

21. See Feldman (1982) and Warner and Kreinin (1983).

22. The measured difference in income elasticities would imply a need for the real value of the dollar to decline secularly unless there is an offsetting difference in growth rates of income at home and abroad. A classic study on income elasticities in world trade, originally pointing out the need for a secular decline in the real value of the dollar, is Houthakker and Magee (1969). Subsequent literature on income elasticities is surveyed in Goldstein and Kahn (1985). A recent discussion of the effect of income elasticities and productivity growth on the trend in the real value of the dollar is provided in Krugman and Baldwin (1987). A negative time trend to account for the possible effect of the difference in elasticities initially was included in the equation for the exchange rate (equation (4)), but it proved to be statistically insignificant.

23. The full employment rate of unemployment, at which inflation tends neither to accelerate nor decelerate, is estimated at 5¾ percent in the U.S. economy at present.

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