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INTERNATIONAL MONETARY FUND

Research Department

The Effect of Updating the Trade Matrix on MERM Weights and Calculated Effective Exchange Rates

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Authorized for Distribution by Malcolm Knight

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Abstract

The sensitivity of Multilateral Exchange Rate Model (MERM) weights for calculating effective exchange rates is examined with respect to more recent trade data. Existing weights, using 1977 trade flows, are compared to weights calculated using data for the years 1980, 1981, 1982 and 1983. The results indicate no large differences, nor does the comparison of existing MERM exchange rates with those calculated from weights based on average 1980-83 trade flows.

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I. Introduction

The MERM model was originally created as a vehicle for understanding the effects of changes in exchange rates, at the beginning of the period of generalized floating of exchange rates (Artus and Rhomberg, 1973). The model is a general equilibrium model of the demand and supply of goods, where goods are differentiated by type as well as by the country producing them. The elasticities of substitution between pairs of goods are imposed on the basis of existing empirical knowledge, but the model itself is not estimated directly. In addition, it is a static model, as it is intended to capture the long-term consequences of exchange rate changes, after the relevant lags have worked themselves out.

The model was updated and respecified by Artus and McGuirk (1981): more recent data were used, and, in addition, the model was further disaggregated, both by adding country detail and by distinguishing further between categories of goods. The current version of the model contains 18 industrial countries and two non-industrial regions--OPEC and the remaining countries taken together. There are six categories of goods in the model: agricultural commodities (SITC 0-1), raw materials (SITC 2 and 4), mineral fuels (SITC 3), semifinished manufactures (SITC 5 and 6), finished manufactures (SITC 7-9), and non-traded goods. The structure of the model depends importantly on the matrix of bilateral trade flows between pairs of countries, on the inter-industry relations for each country (input/output tables), and on feedback parameters that describe how domestic wages, rental prices of capital, and taxes respond to the prices of goods.

The current version of the model (Artus and McGuirk 1981) uses trade flows for the year 1977, and input/output tables are based on published tables that were available at the time for the various countries. For the purposes of establishing the weights for calculating effective exchange rate indices ("MERM weights"), a uniform set of feedback parameters were used ("low" feedbacks, implying that 50 percent of cost of living increases are reflected in nominal wages). The present paper describes the result of updating the trade matrix to reflect more recent data, in particular trade flows over the period 1980-83. No attempt was made to update other parts of the model, however.

II. Recalculation of MERM Weights

The nonavailability of disaggregated data for some countries made it impossible to construct a complete trade matrix for any year more recent than 1983. In order to evaluate the variability of weights from year to year, we also constructed trade matrices for the years 1980, 1981, and 1982. In the end, a trade matrix that summed trade flows over the four years 1980-83 was used in order to recalculate the MERM weights.

A set of figures (Figure 1-18) gives the weights of all partner countries in the calculation of each country's effective exchange rate and also how the weights change depending on the trade matrix used. The six bars in each figure correspond to the original weights (1977 trade matrix); the weights calculated for years 1980, 1981, 1982, and 1983; and the weights calculated from average trade flows for 1980-83. It can be seen that the variation in the weights for any given country is typically greatest for those partner countries that are largest in world trade: the United States, the Federal Republic of Germany, and Japan. The weight of Germany in the effective exchange rate calculation for Austria, for instance, is considerably greater from 1980 onward than it is in the existing, 1977-based weights (Figure 1). Nevertheless, the ranking of partner countries is broadly unaffected: for each set of weights, Germany and the United States are the most important countries for Austria, and they are both far more important than any other country in Austria's calculation. It can be seen from the other figures that the variation of weights from year to year is also very slight for most of the remaining countries, with the possible exceptions of Belgium, Denmark, the Netherlands and Switzerland. It is generally the case that the importance of Germany in those countries' calculations has increased in recent years.

It is also the case that there is little discernible pattern in the year-to-year fluctuations since 1980. In those circumstances, it was decided to choose the average 1980-83 weights to calculate new effective exchange rates, instead of any individual year. Table 1 presents the existing MERM weights, Table 2 the new weights based on 1980-83, and Table 3 the matrix of differences between them. It can be seen from the latter table that only a few of the weights (96 out of the 306 non-diagonal elements) differ by more than 0.01, that is, one percentage point.

III. Effect on the Calculated Effective Exchange Rates

Comparison of weights gives little intuition as to whether differences are actually significant; this depends also in part on the extent exchange rates have had divergent movements. In order to gauge the importance of changing the weights, nominal effective exchange rates were calculated using the old weights (this is the official series given in International Financial Statistics) and using the new average weights. These series are plotted monthly over the period 1978-86 in Figures 19-36. The most divergence between the old and new effective exchange rates occurs for Austria, Japan, and (especially) the Netherlands. For all except the latter country, the divergence in any month does not exceed 5 percent; furthermore, the divergence does not widen continually. Instead, it is greatest early in 1985, when the dollar was at its peak. This is not surprising since the major difference in weights for the Netherlands is a much lower weight given to the United States in the new set, compensated by higher weights for other European countries. Over the period considered, the most significant exchange rate movement

FIGURE 1 : AUSTRIA
EFFECTS OF DIFFERENT TRADE DATA ON MERM EXCHANGE RATES

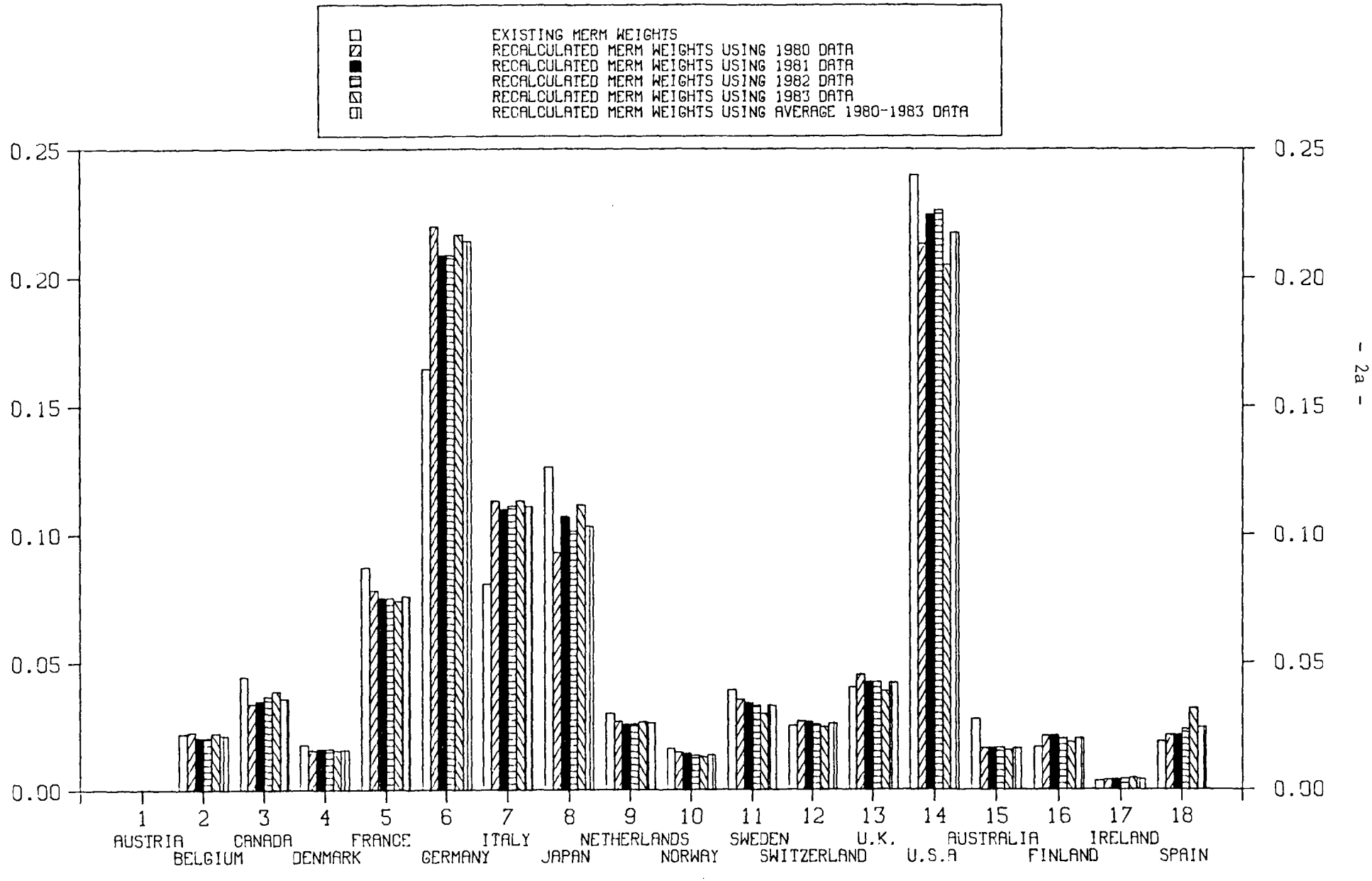

FIGURE 2 : BELGIUM
EFFECTS OF DIFFERENT TRADE DATA ON MERM EXCHANGE RATES

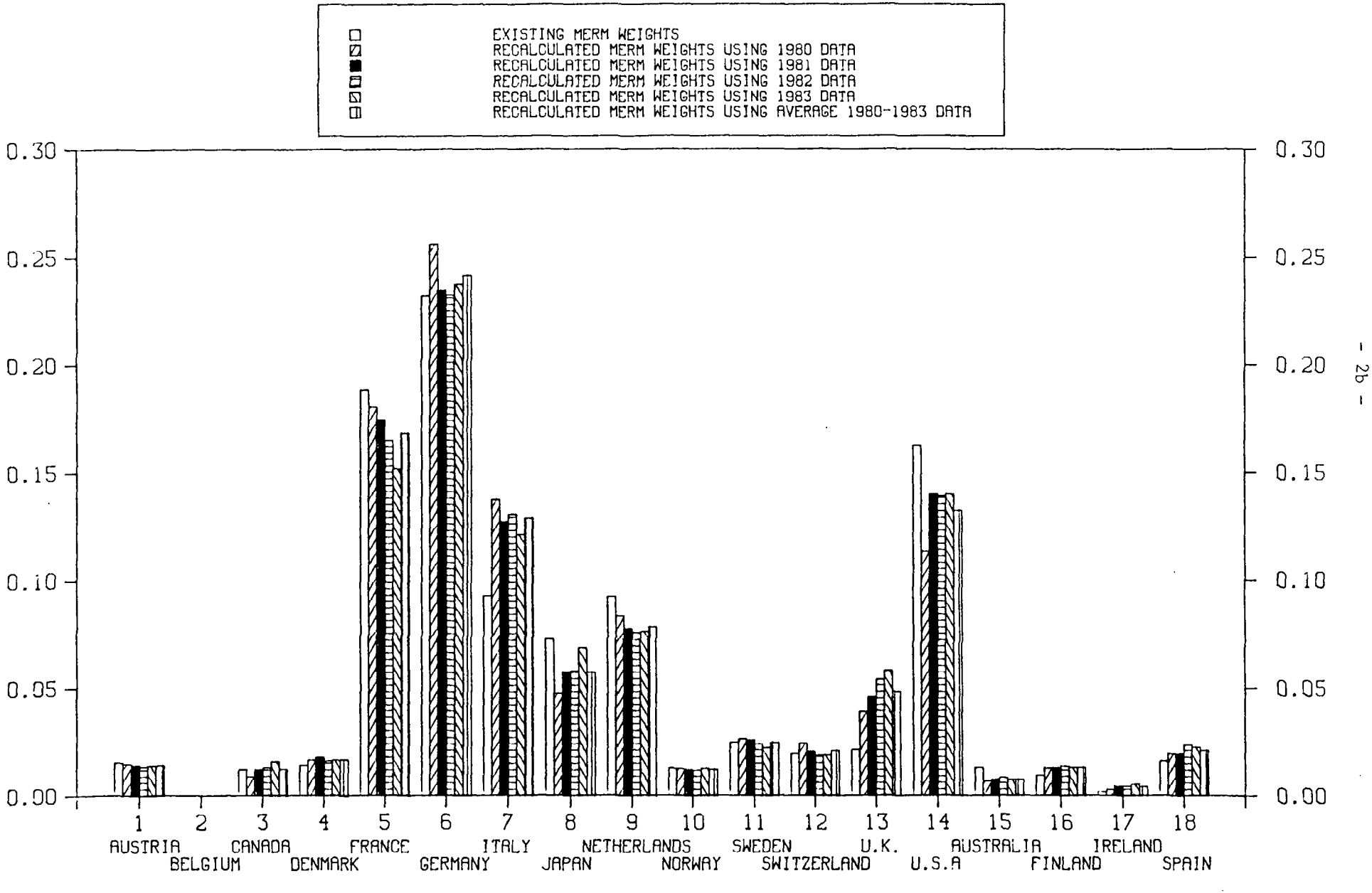

FIGURE 3 : CANADA
EFFECTS OF DIFFERENT TRADE DATA ON MERM EXCHANGE RATES

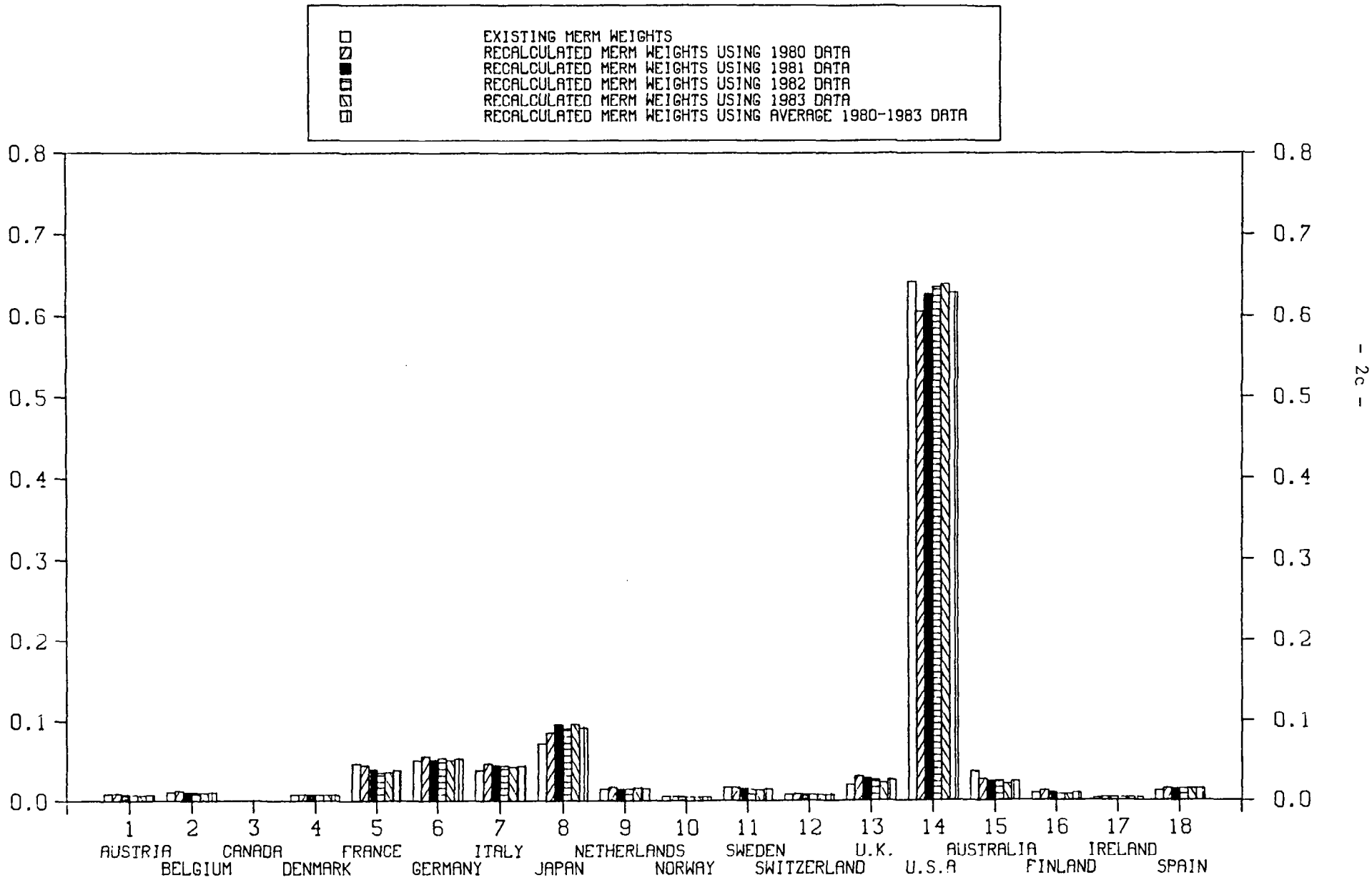

FIGURE 4 : DENMARK
EFFECTS OF DIFFERENT TRADE DATA ON MERM EXCHANGE RATES

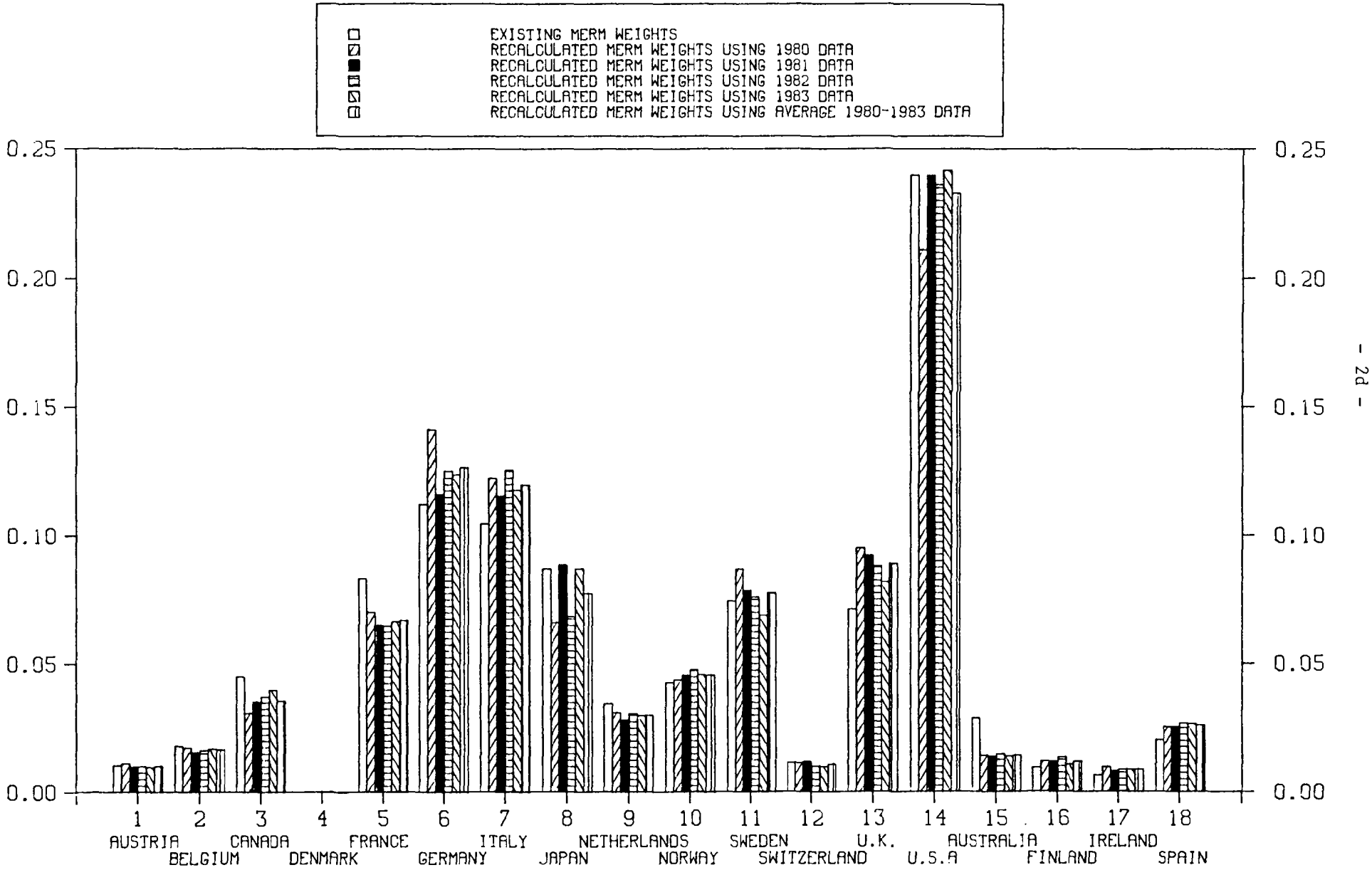

FIGURE 5 : FRANCE
EFFECTS OF DIFFERENT TRADE DATA ON MERM EXCHANGE RATES

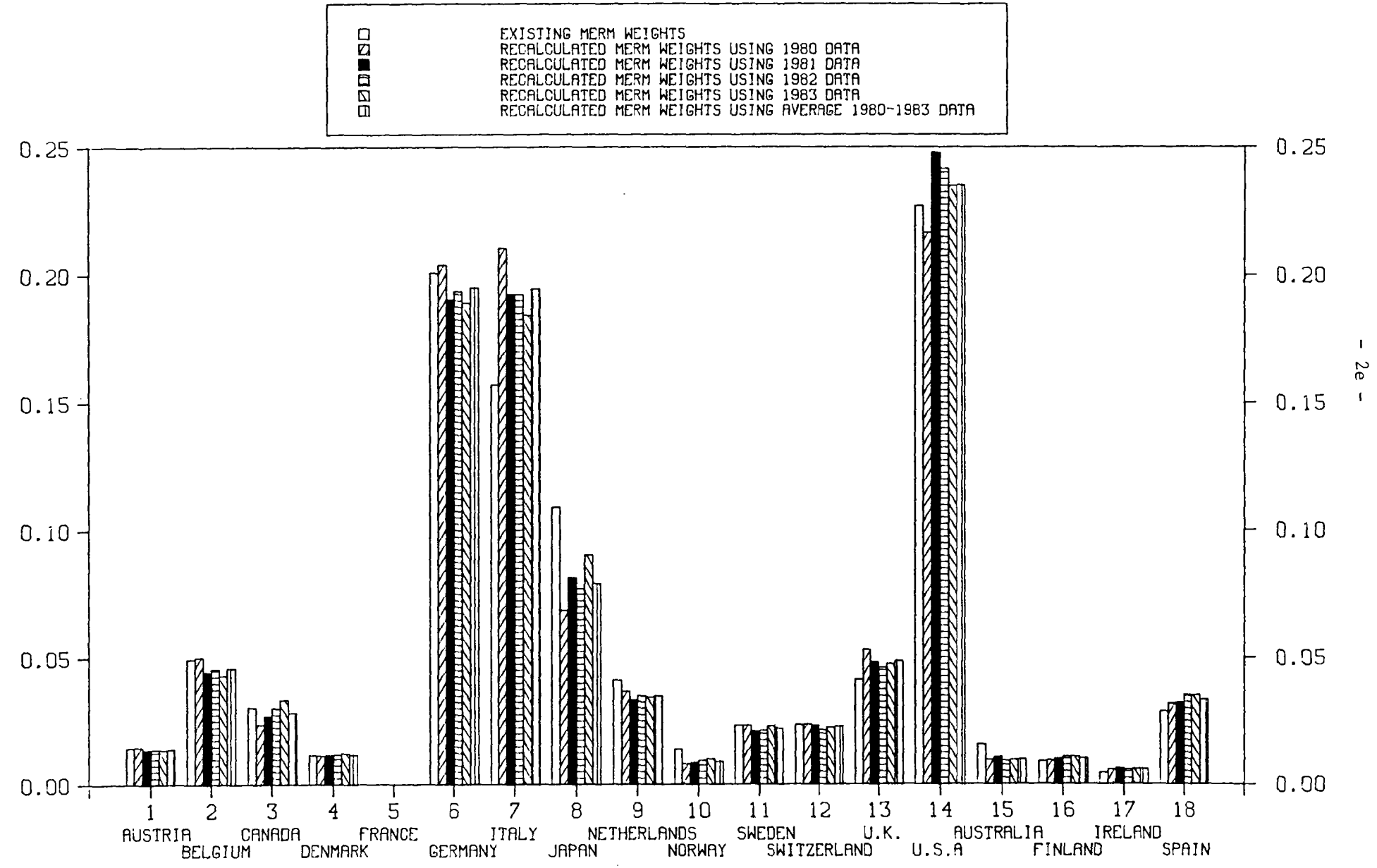

FIGURE 6 : GERMANY
EFFECTS OF DIFFERENT TRADE DATA ON MERM EXCHANGE RATES

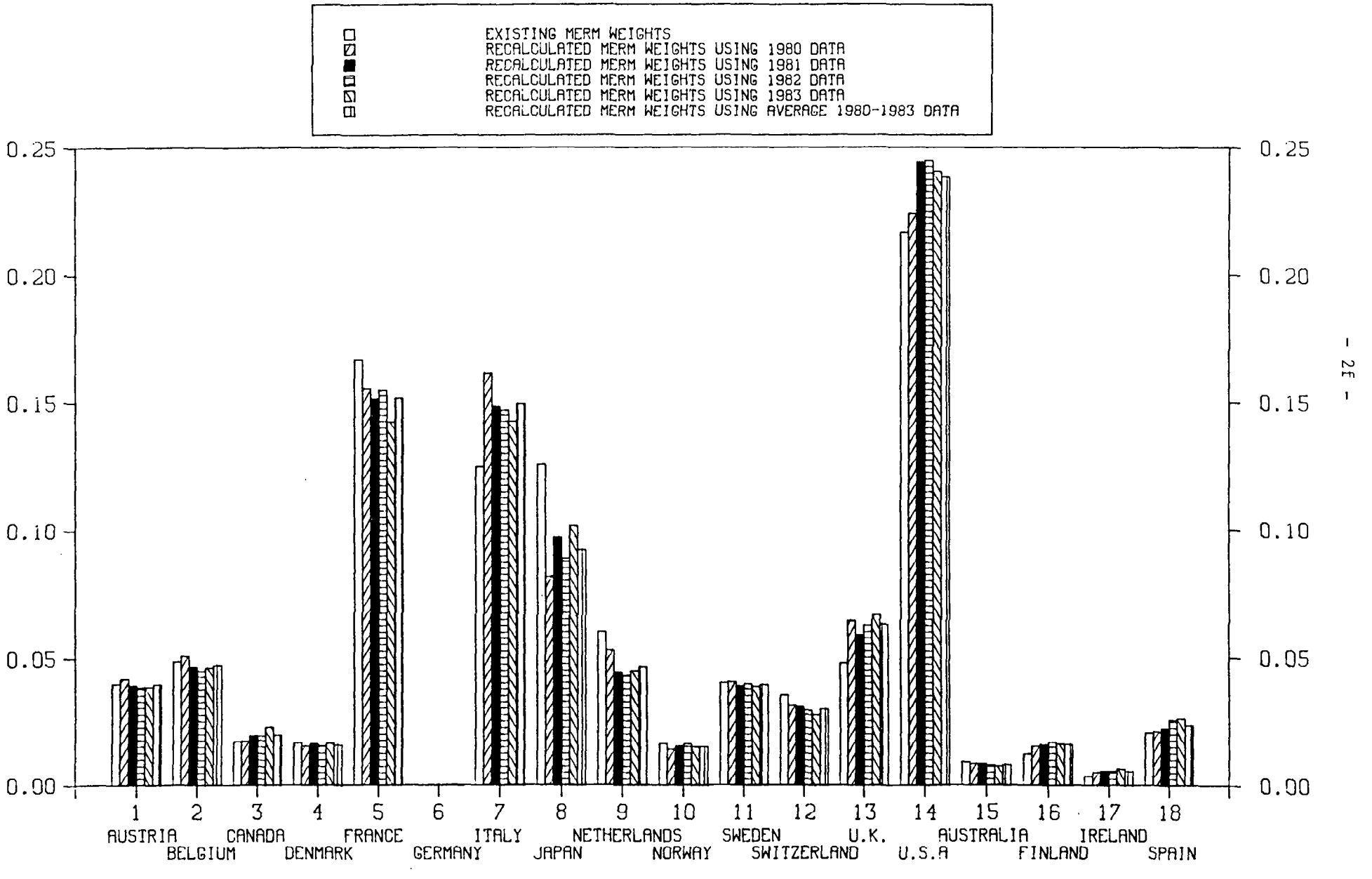

FIGURE 7 : ITALY
EFFECTS OF DIFFERENT TRADE DATA ON MERM EXCHANGE RATES

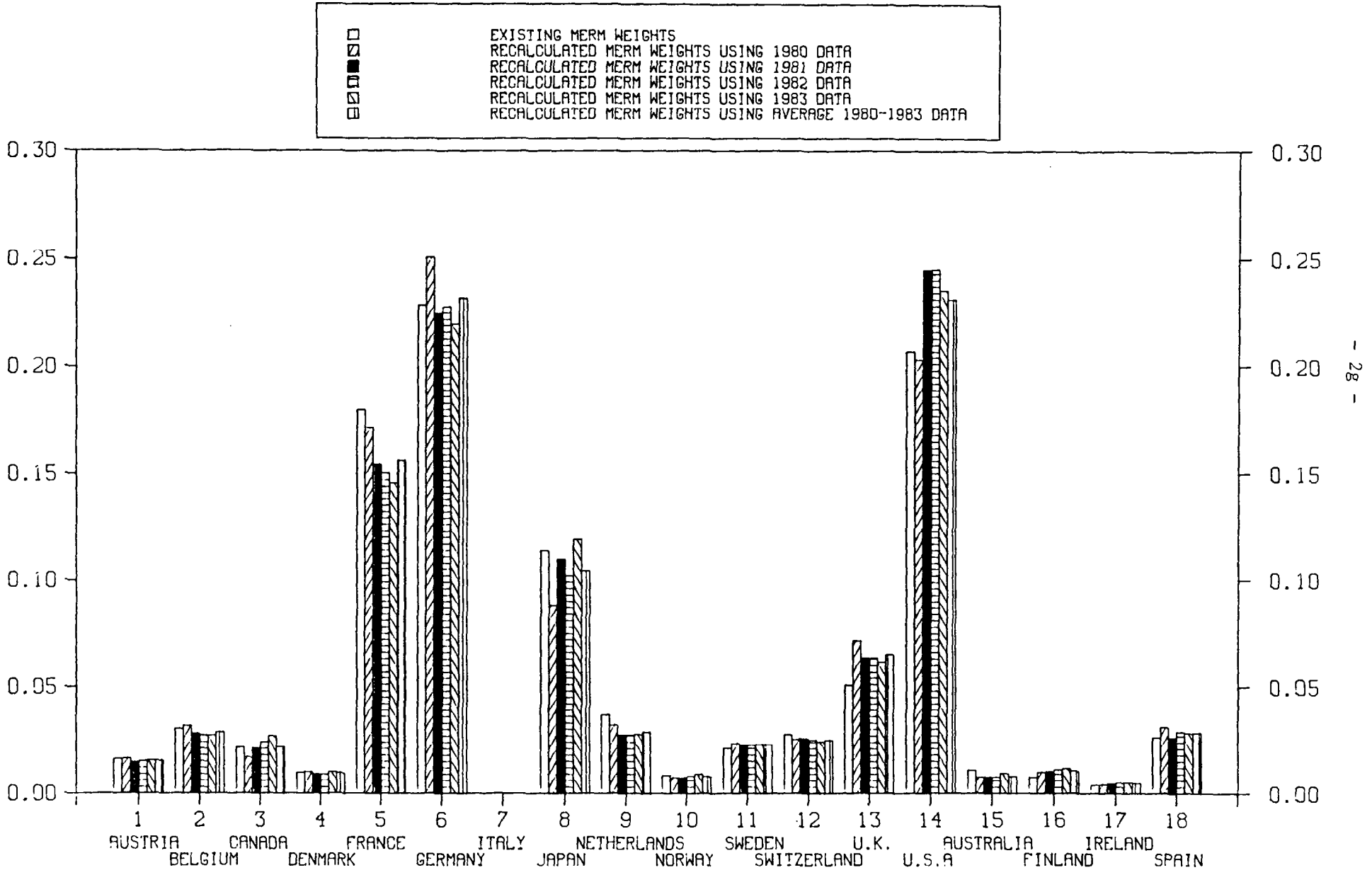

FIGURE 8 : JAPAN
EFFECTS OF DIFFERENT TRADE DATA ON MERM EXCHANGE RATES

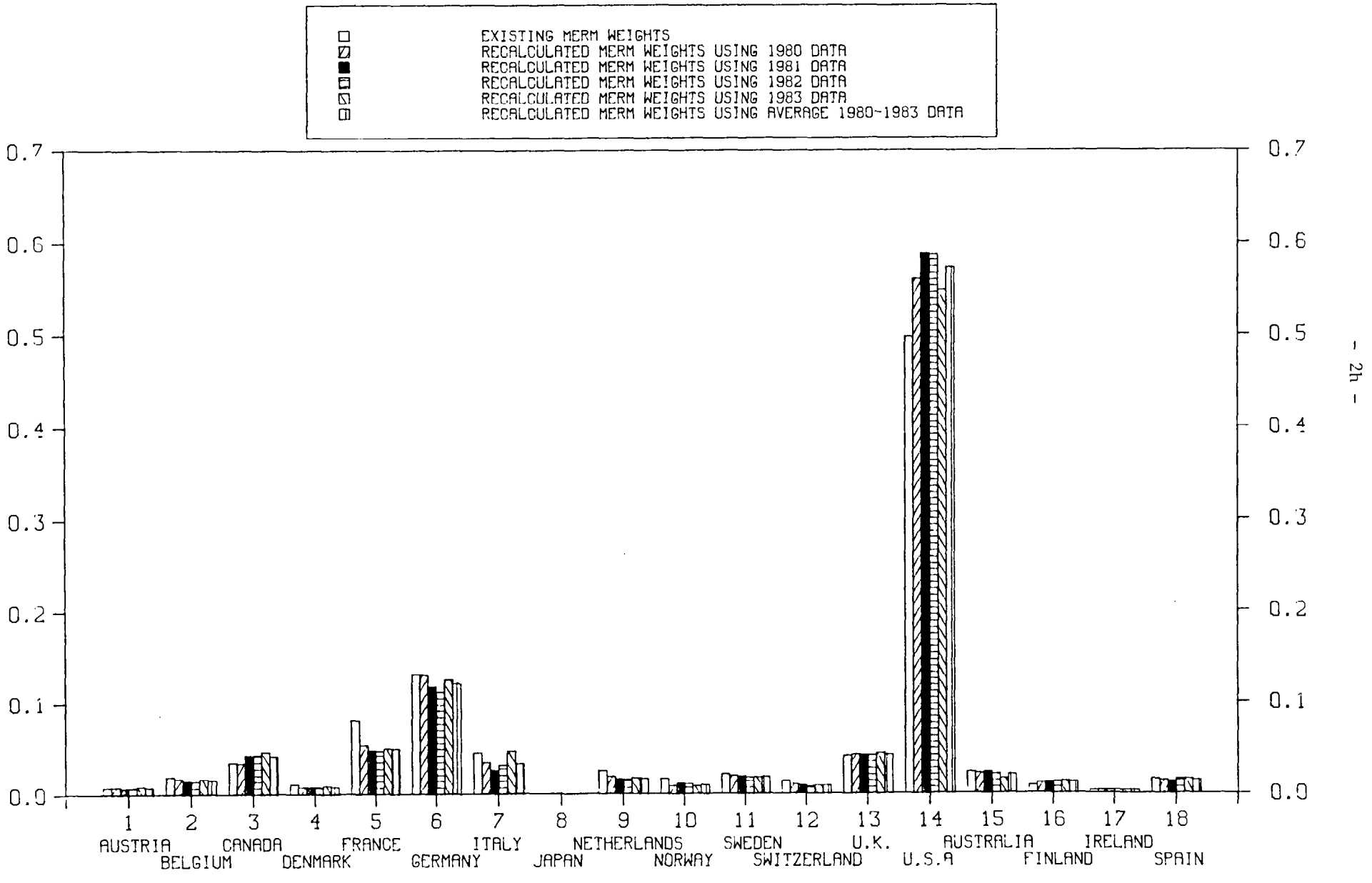

FIGURE 9 : NETHERLANDS
EFFECTS OF DIFFERENT TRADE DATA ON MERM EXCHANGE RATES

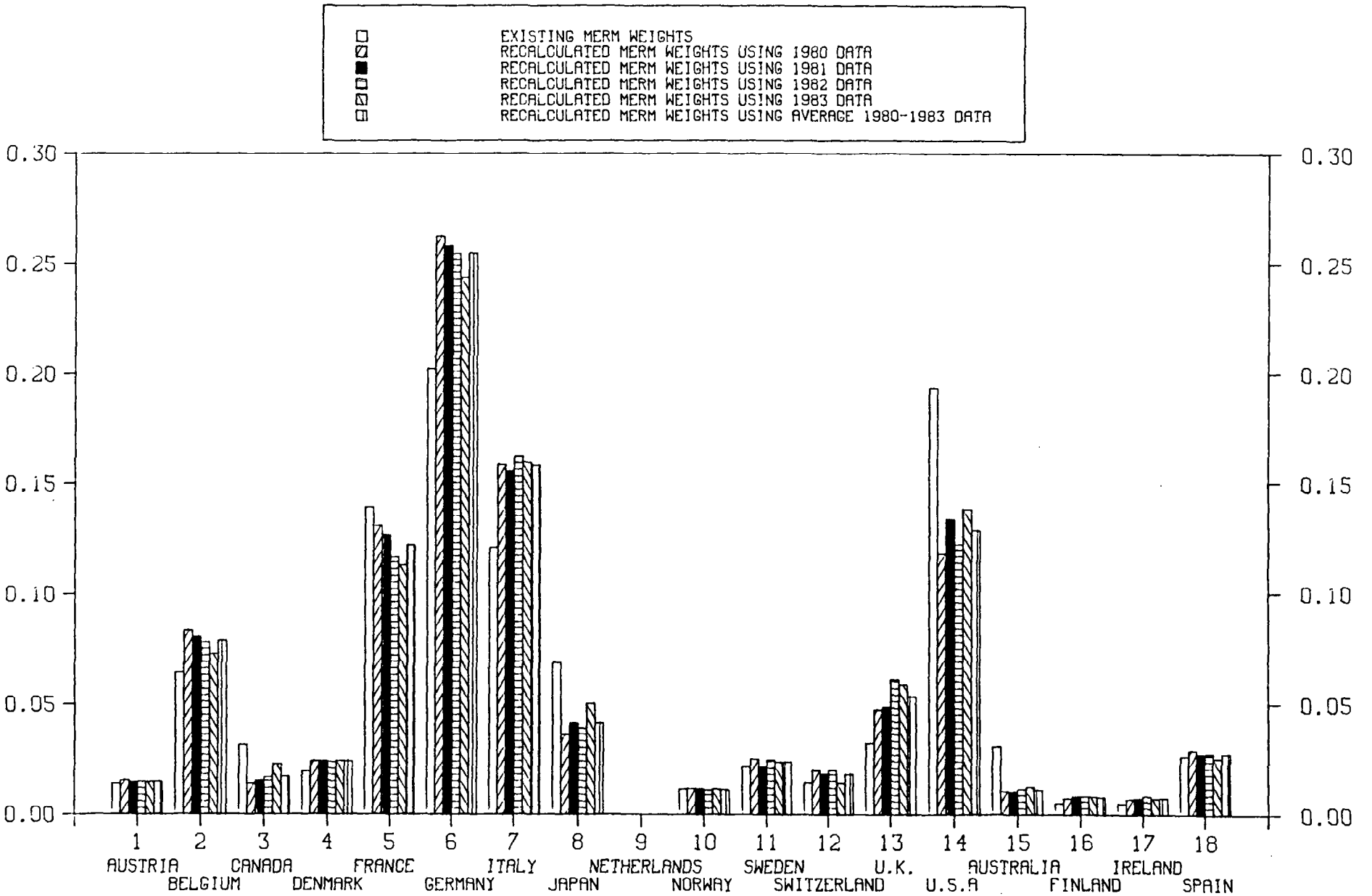

FIGURE 10 : NORWAY
EFFECTS OF DIFFERENT TRADE DATA ON MERM EXCHANGE RATES

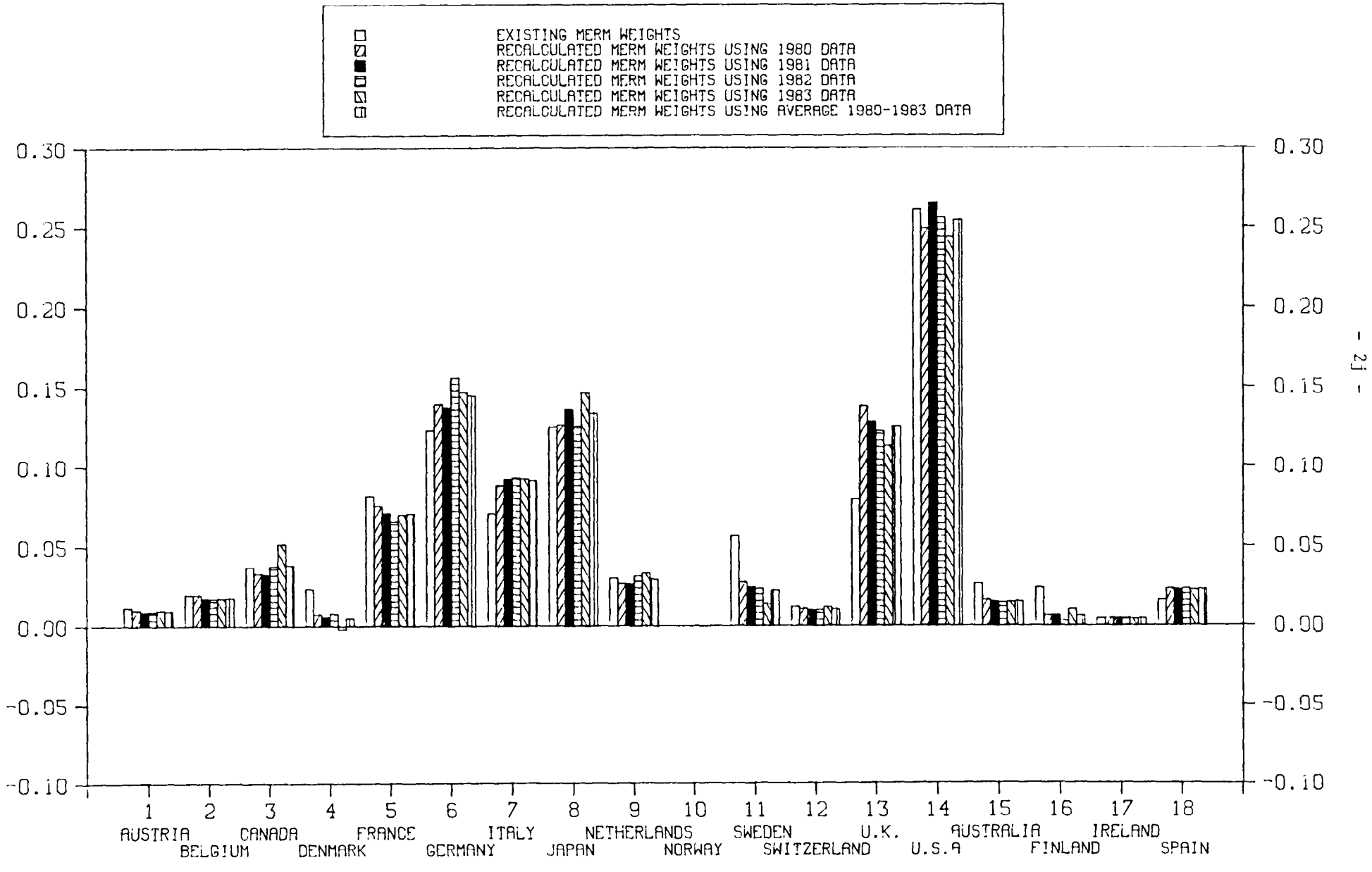

FIGURE 11 : SWEDEN
EFFECTS OF DIFFERENT TRADE DATA ON MERM EXCHANGE RATES

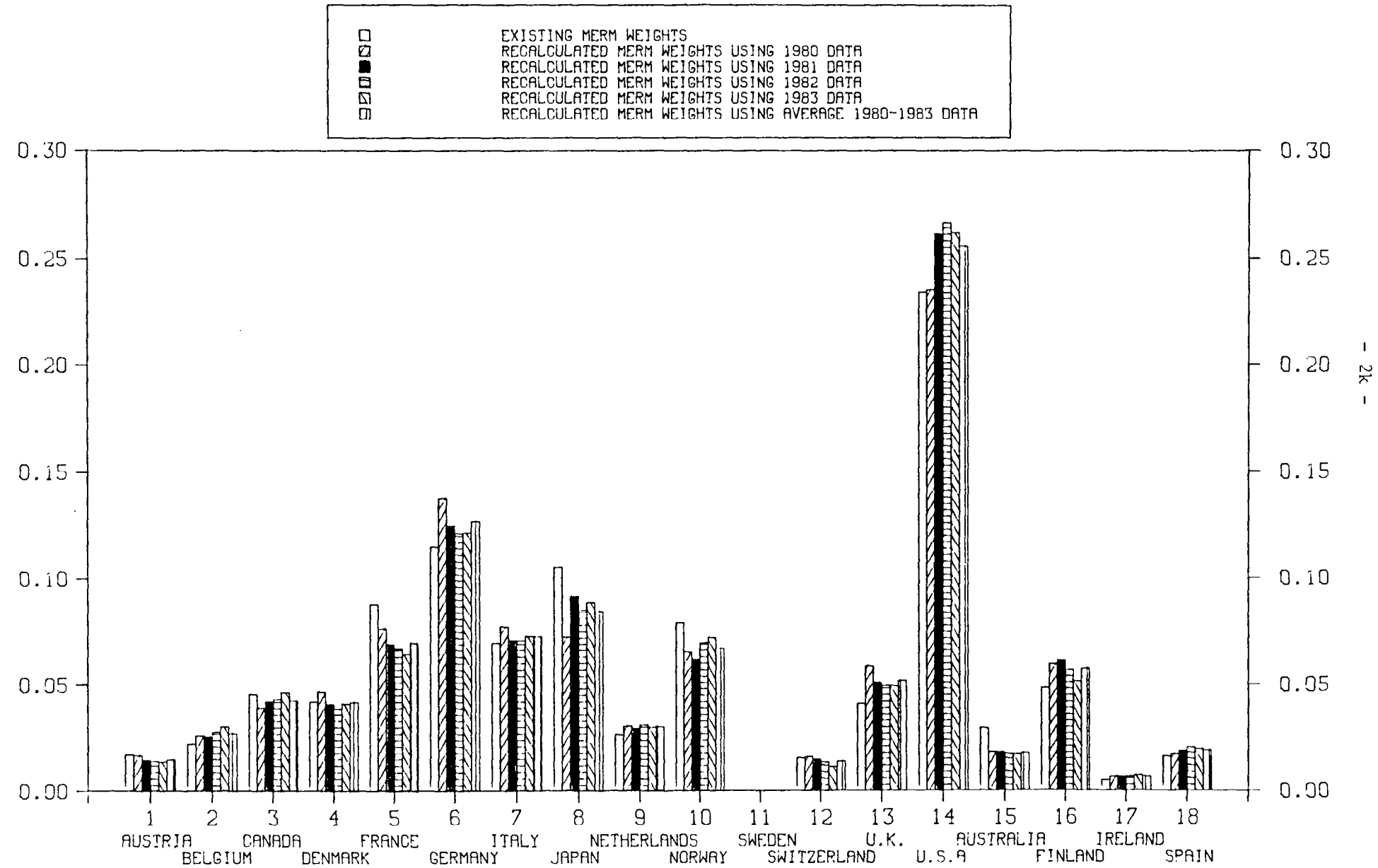

FIGURE 12 : SWITZERLAND
EFFECTS OF DIFFERENT TRADE DATA ON MERM EXCHANGE RATES

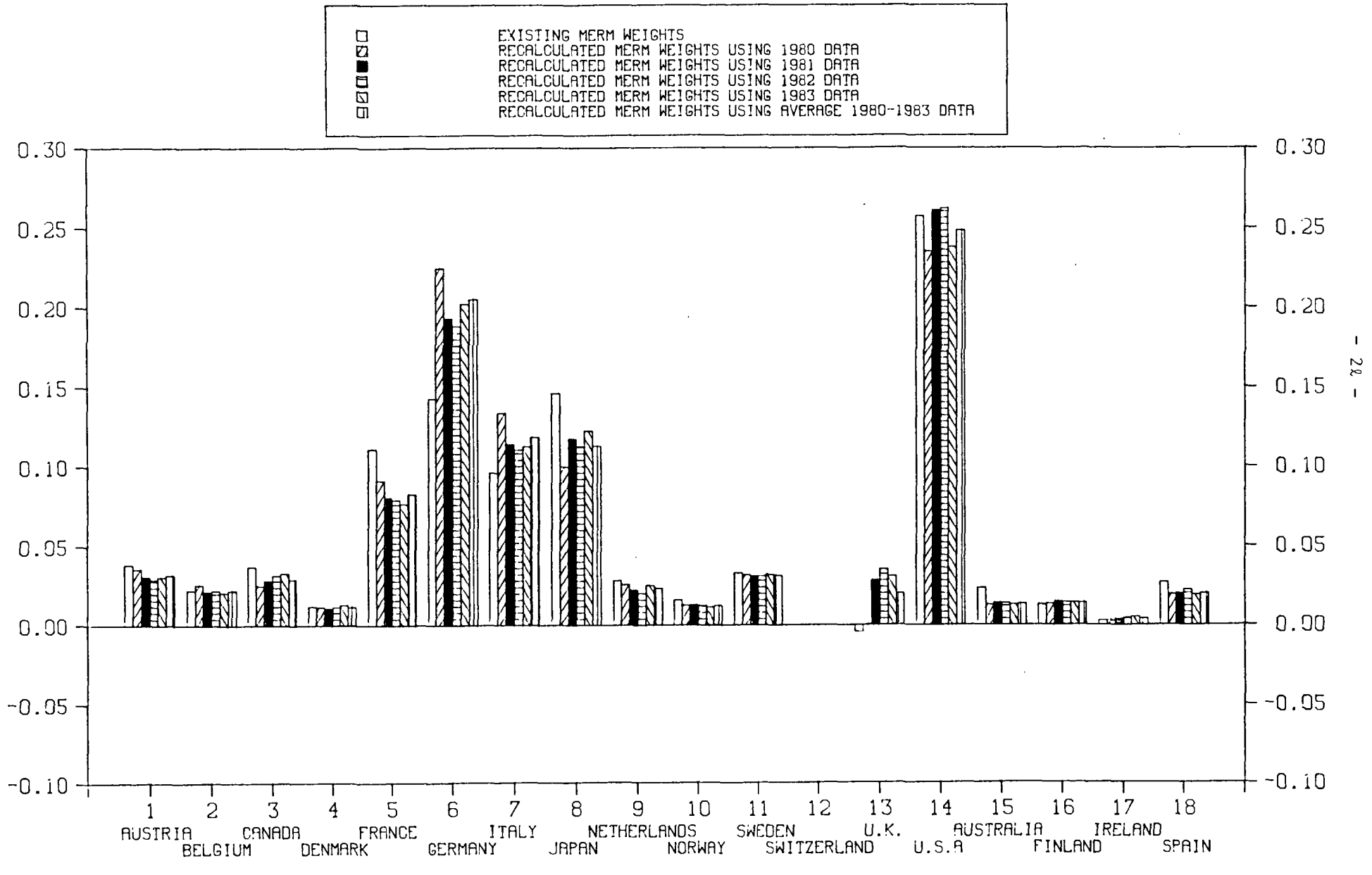

FIGURE 13 : UNITED KINGDOM
EFFECTS OF DIFFERENT TRADE DATA ON MERM EXCHANGE RATES

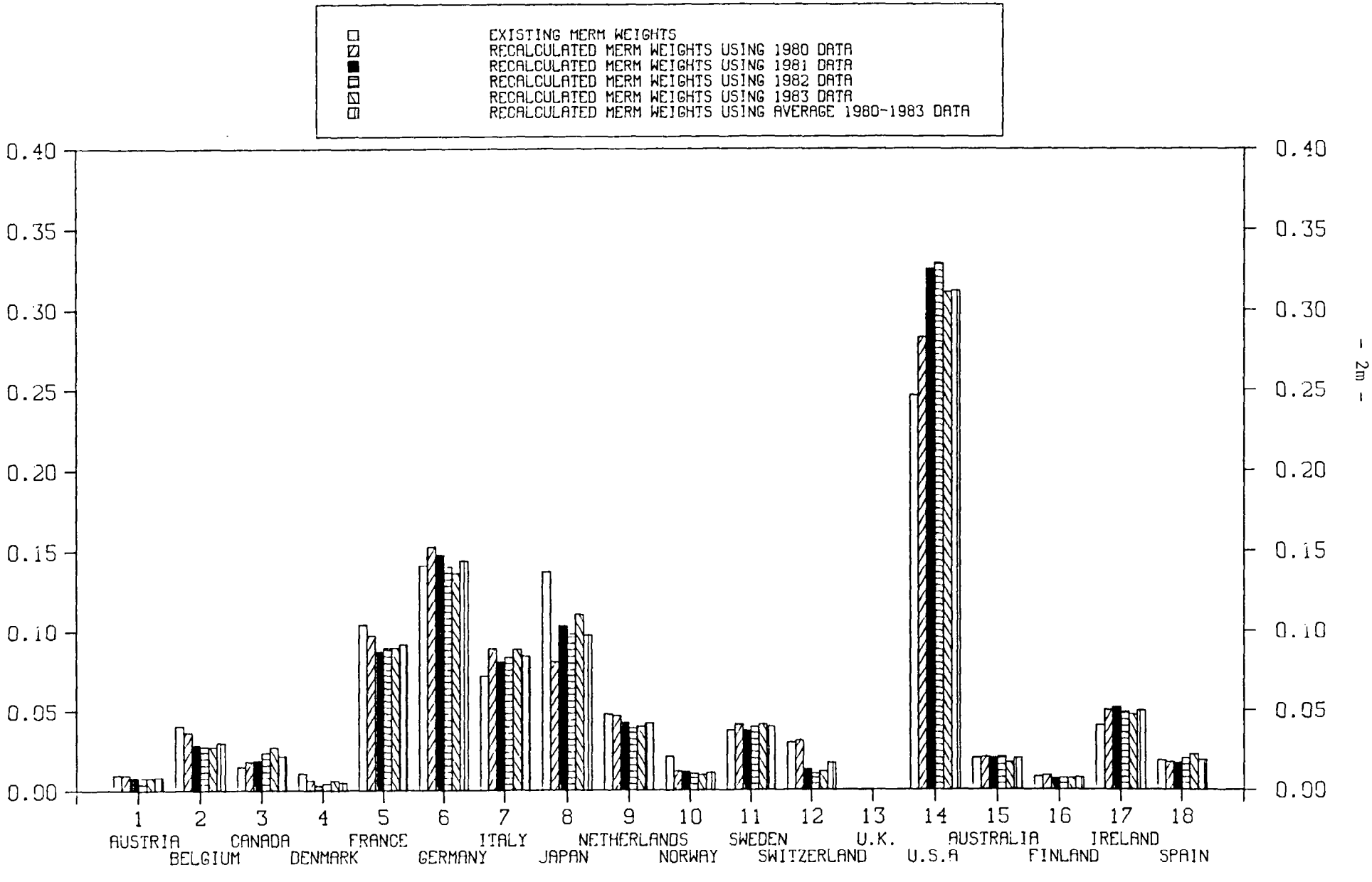

FIGURE 14 : UNITED STATES
EFFECTS OF DIFFERENT TRADE DATA ON MERM EXCHANGE RATES

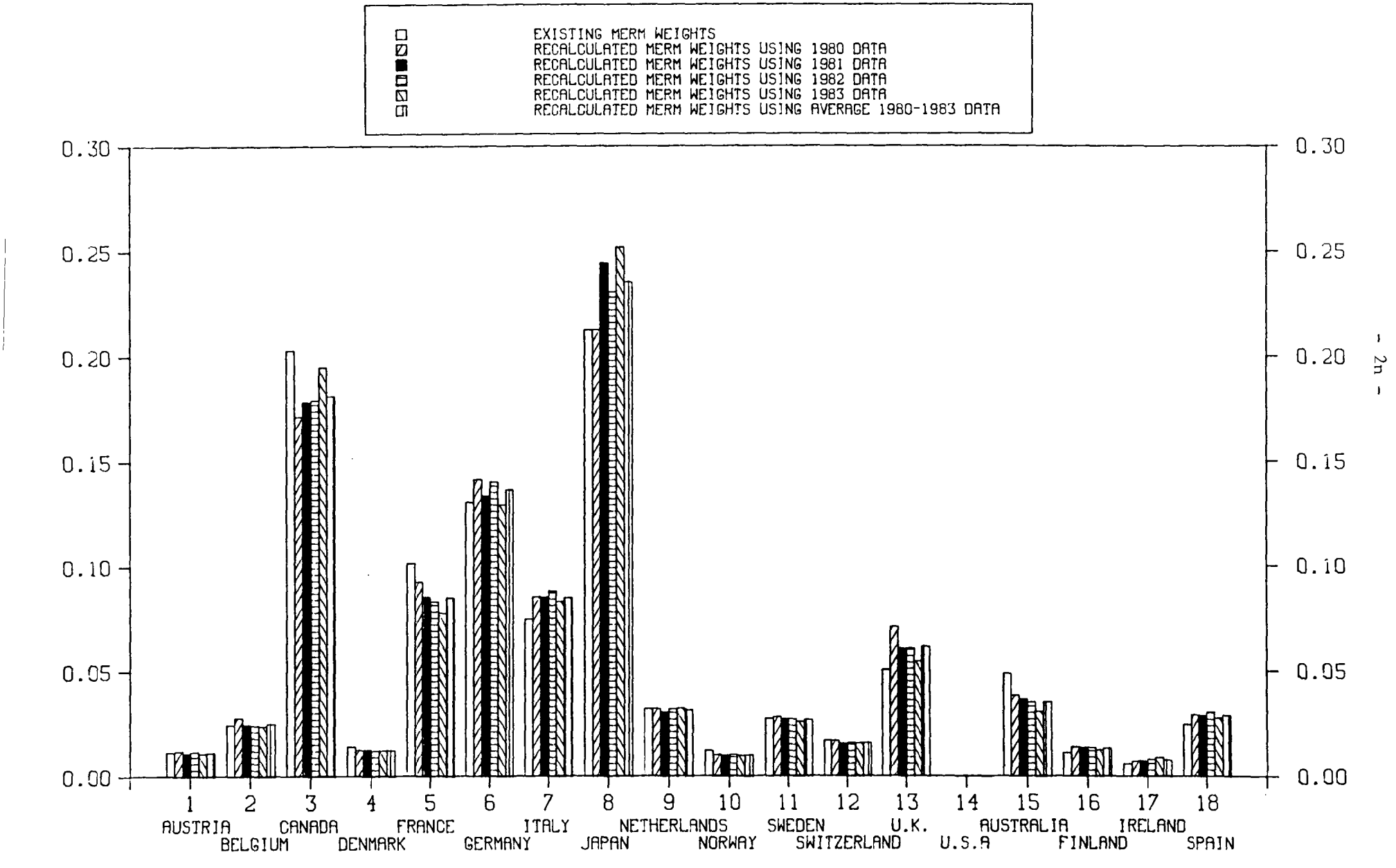

FIGURE 15 : AUSTRALIA
EFFECTS OF DIFFERENT TRADE DATA ON MERM EXCHANGE RATES

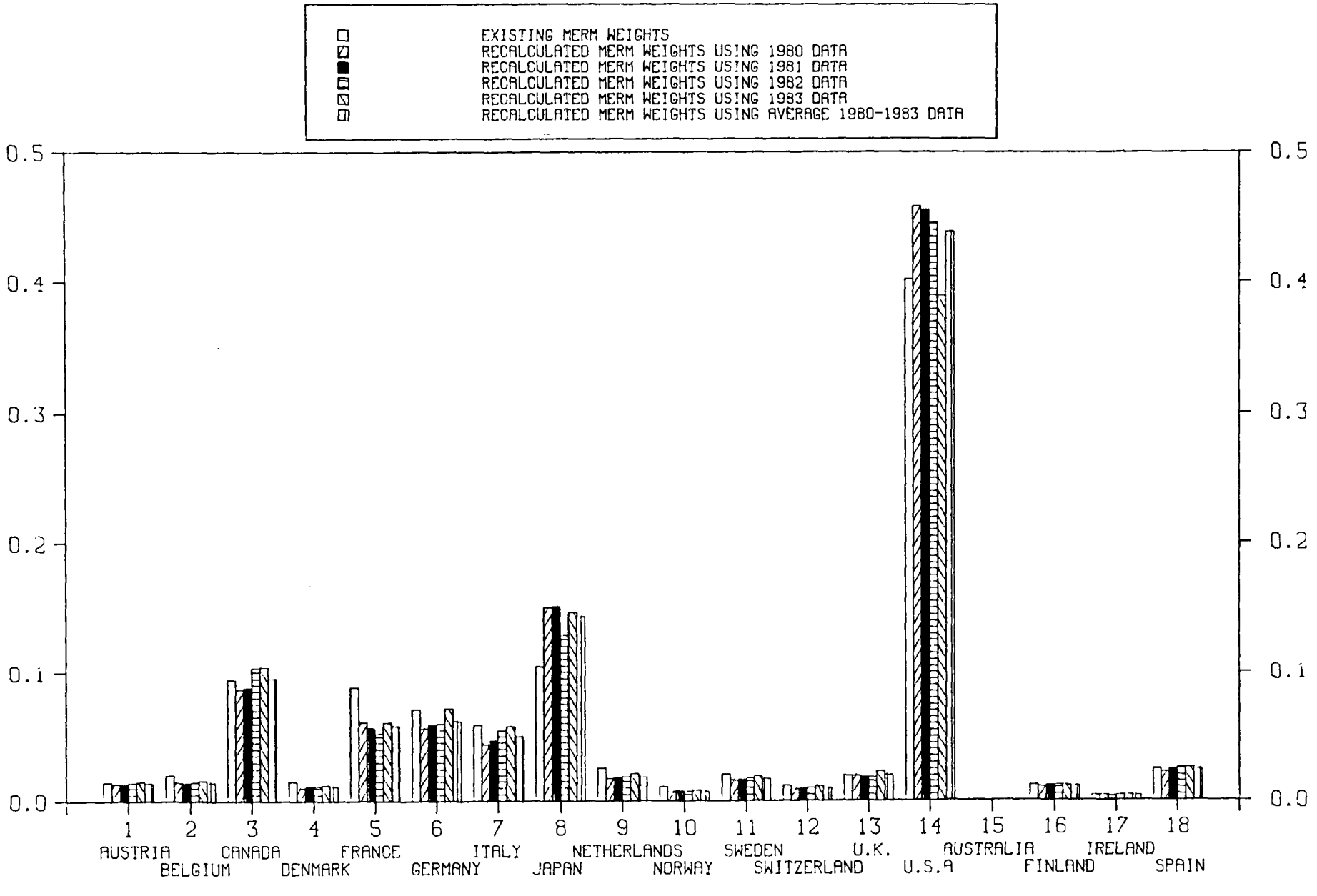

FIGURE 16 : FINLAND
EFFECTS OF DIFFERENT TRADE DATA ON MERM EXCHANGE RATES

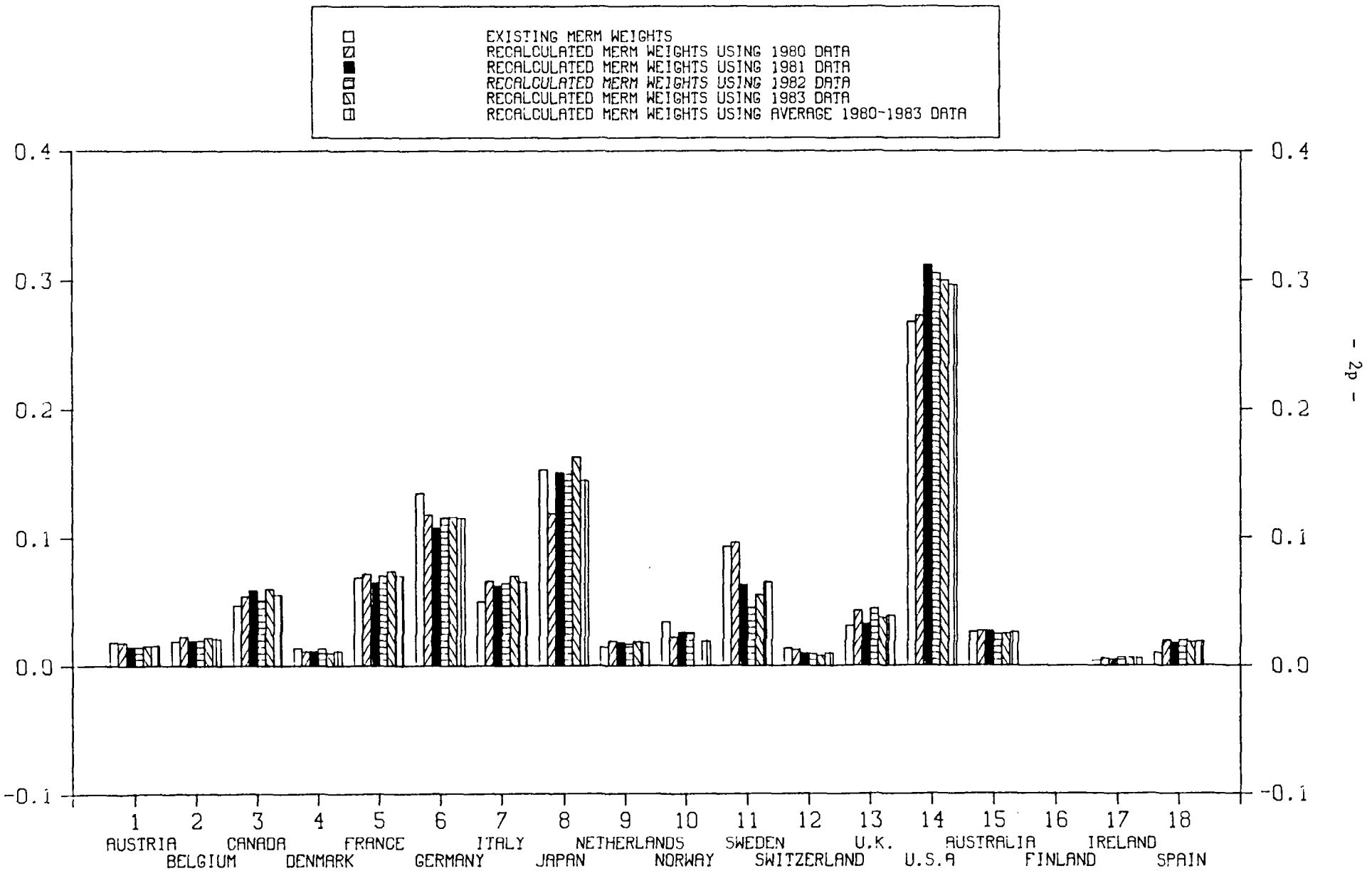

FIGURE 17 : IRELAND
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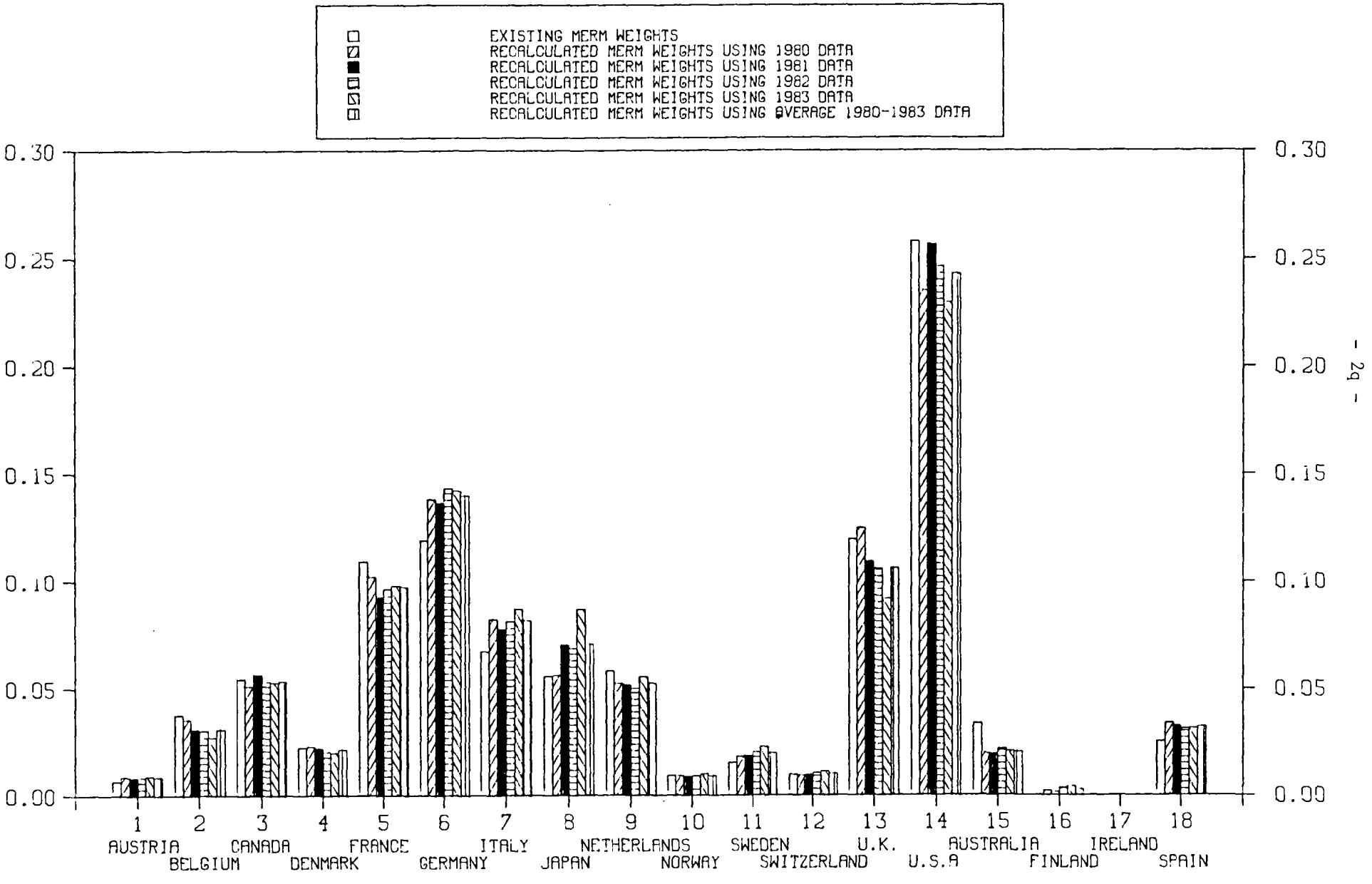

FIGURE 18 : SPAIN
EFFECTS OF DIFFERENT TRADE DATA ON MERM EXCHANGE RATES

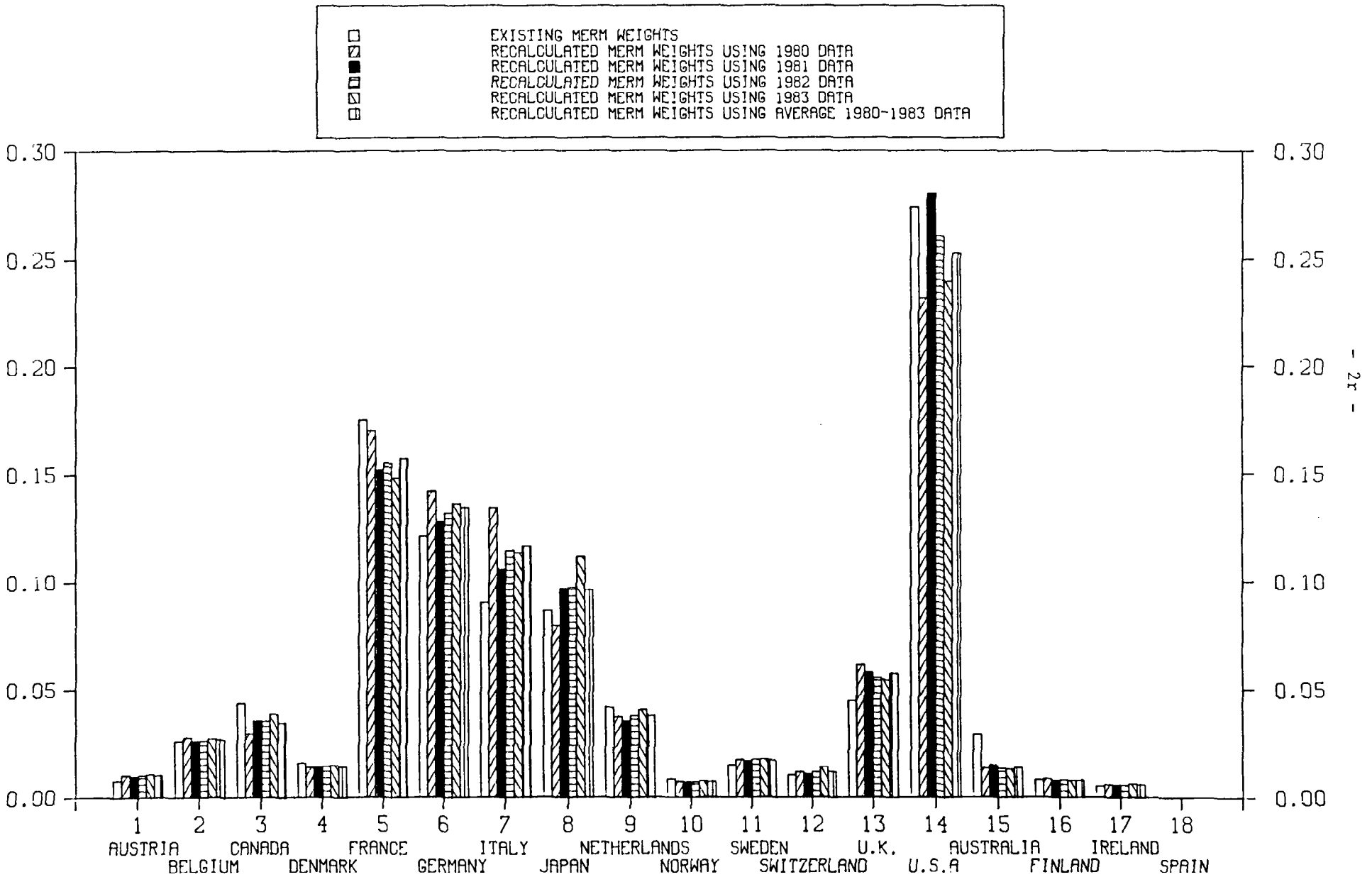

FIGURE 19 : AUSTRIA
EFFECTIVE EXCHANGE RATE INDICES CALCULATED USING EXISTING AND NEW MERM WEIGHTS

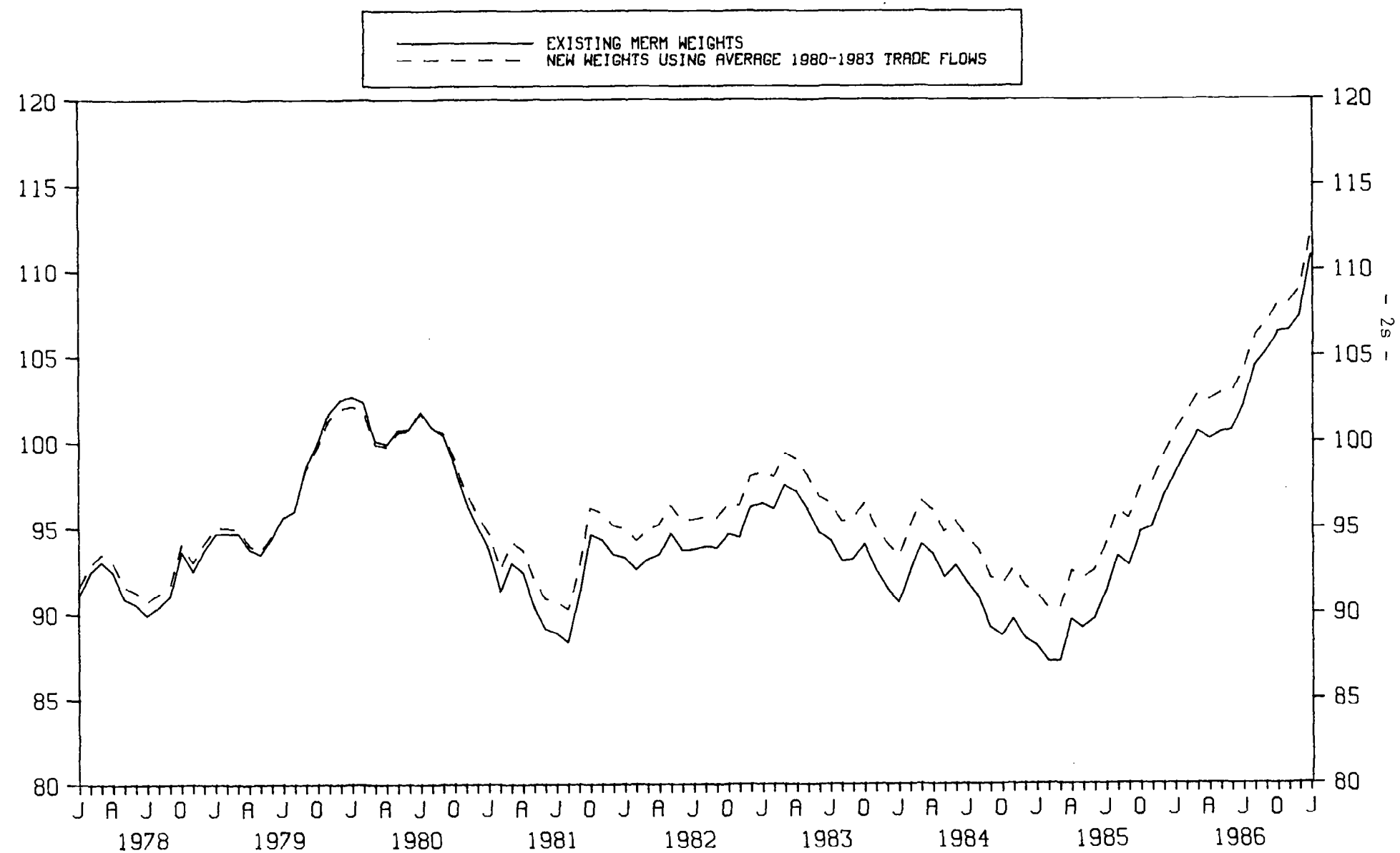

FIGURE 20 : BELGIUM
EFFECTIVE EXCHANGE RATE INDICES CALCULATED USING EXISTING AND NEW MERM WEIGHTS

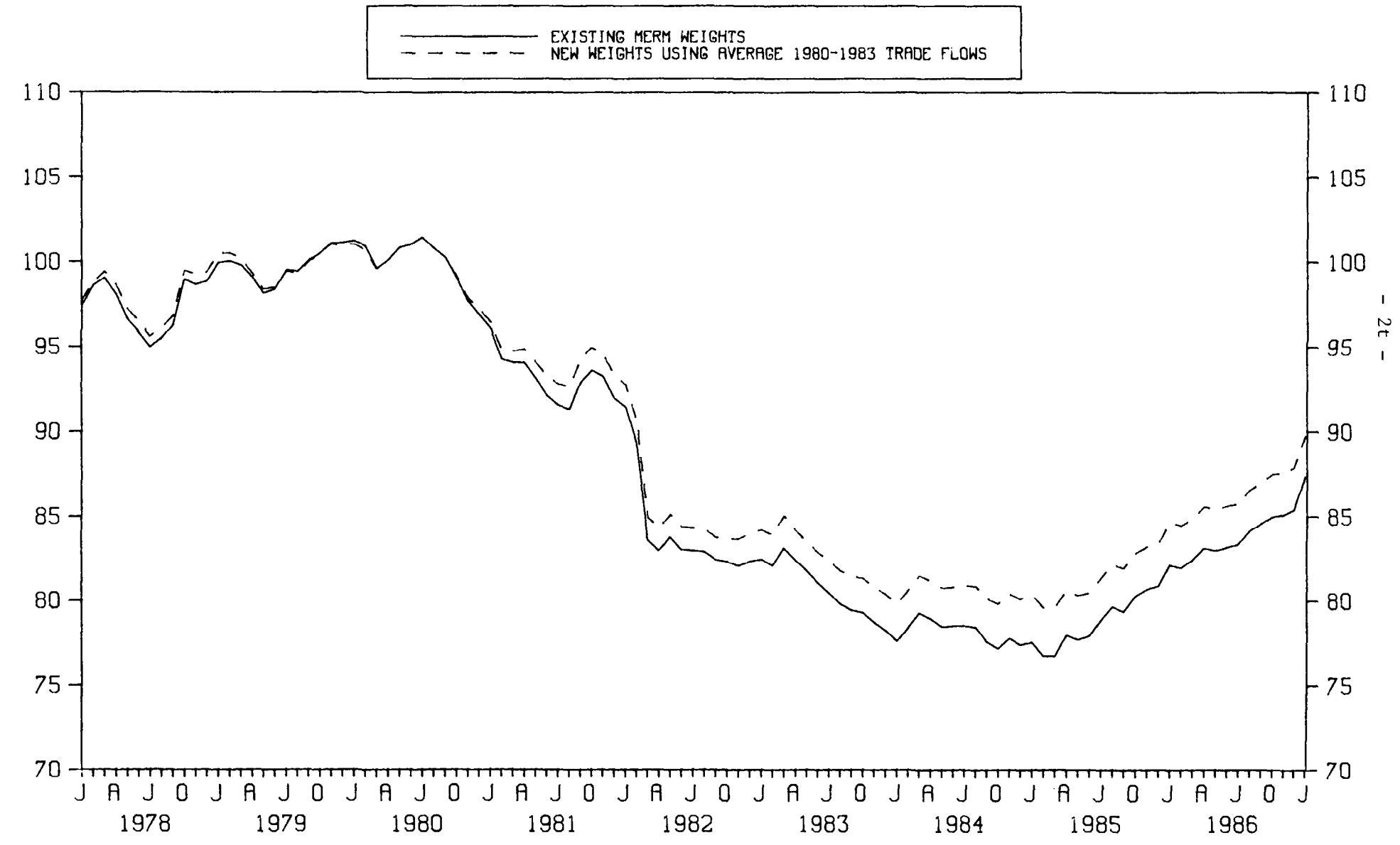

FIGURE 21 : CANADA
EFFECTIVE EXCHANGE RATE INDICES CALCULATED USING EXISTING AND NEW MERM WEIGHTS

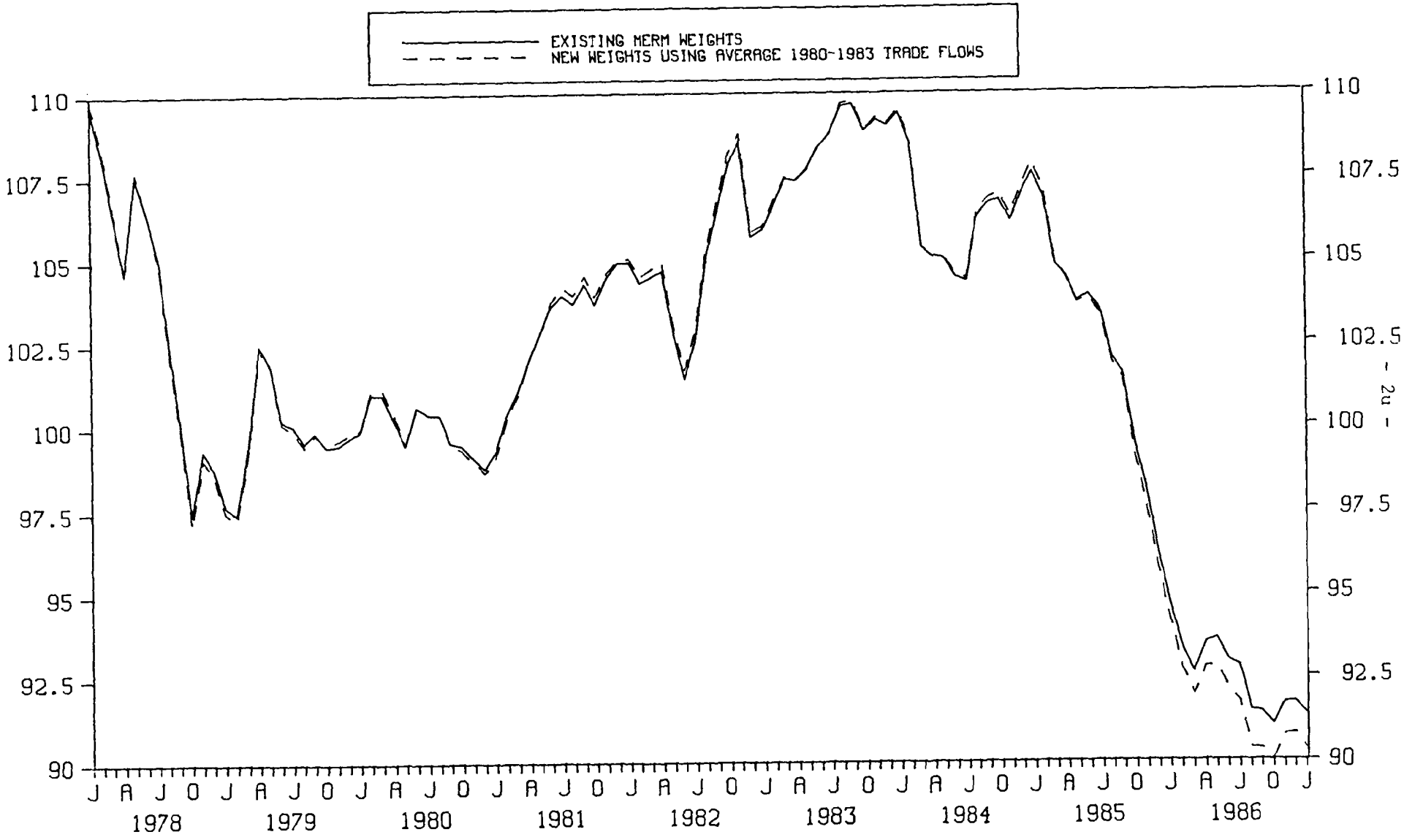

FIGURE 22 : DENMARK

EFFECTIVE EXCHANGE RATE INDICES CALCULATED USING EXISTING AND NEW MERM WEIGHTS

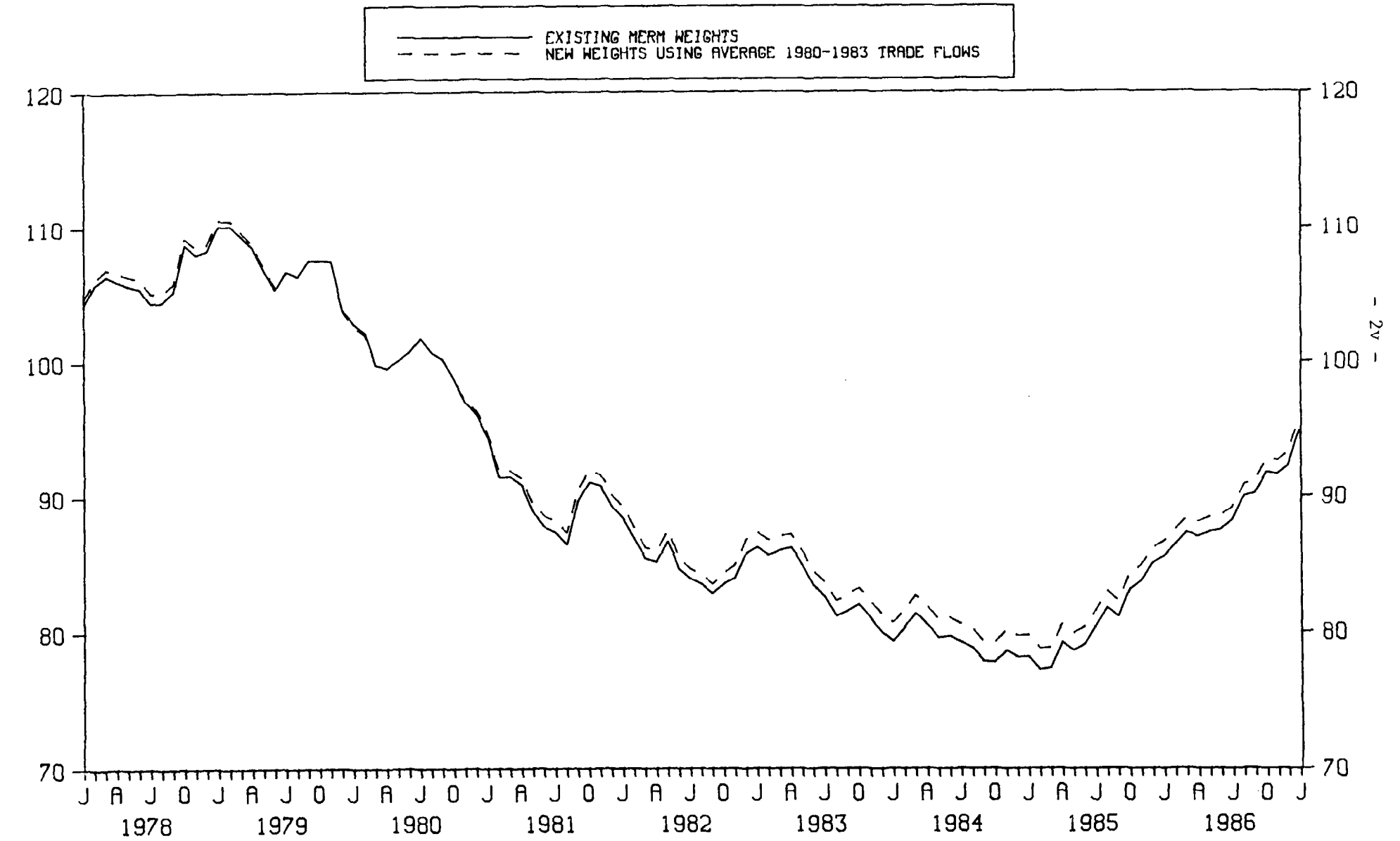

FIGURE 23 : FRANCE
EFFECTIVE EXCHANGE RATE INDICES CALCULATED USING EXISTING AND NEW MERM WEIGHTS

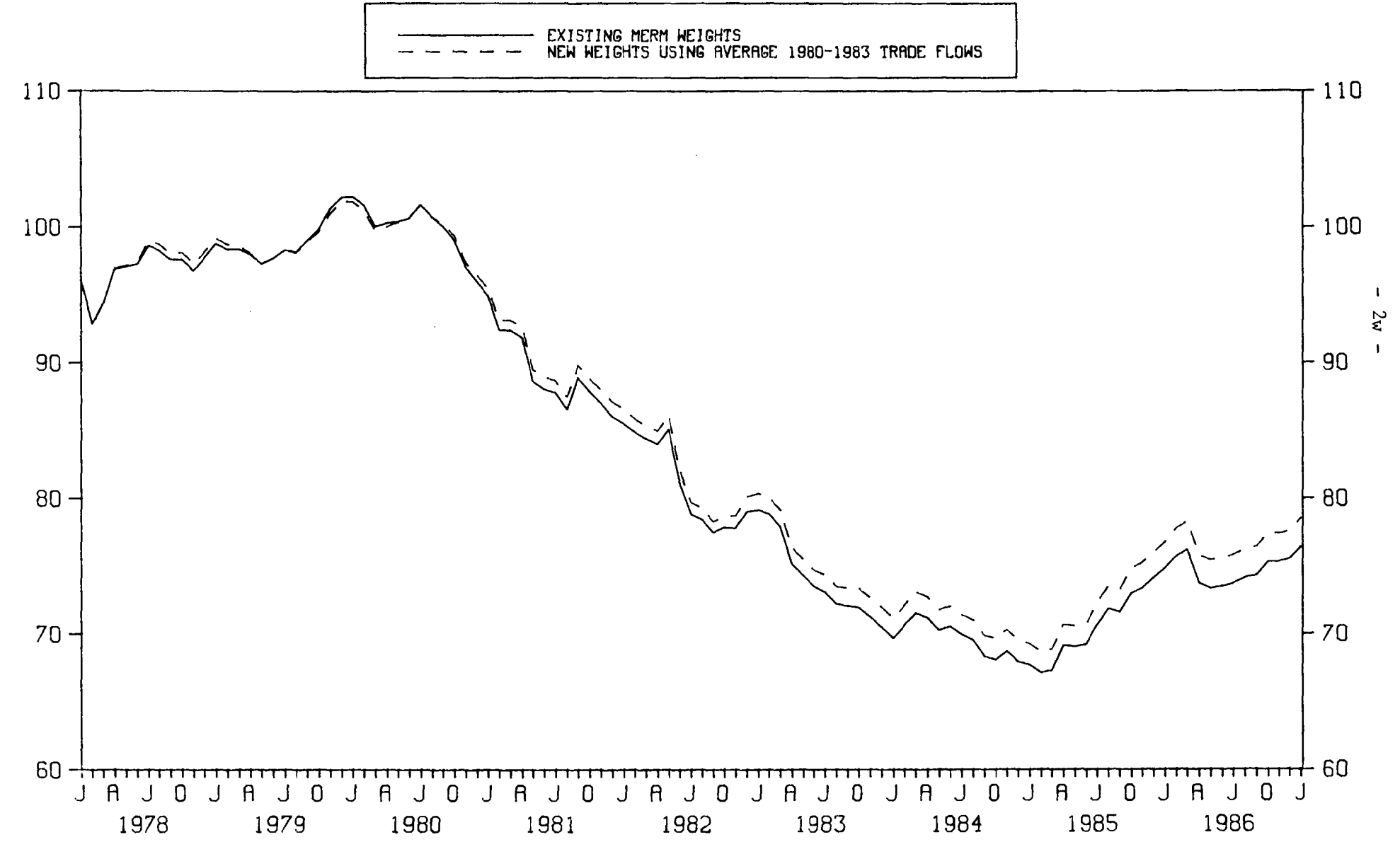

FIGURE 24 : GERMANY
EFFECTIVE EXCHANGE RATE INDICES CALCULATED USING EXISTING AND NEW MERM WEIGHTS

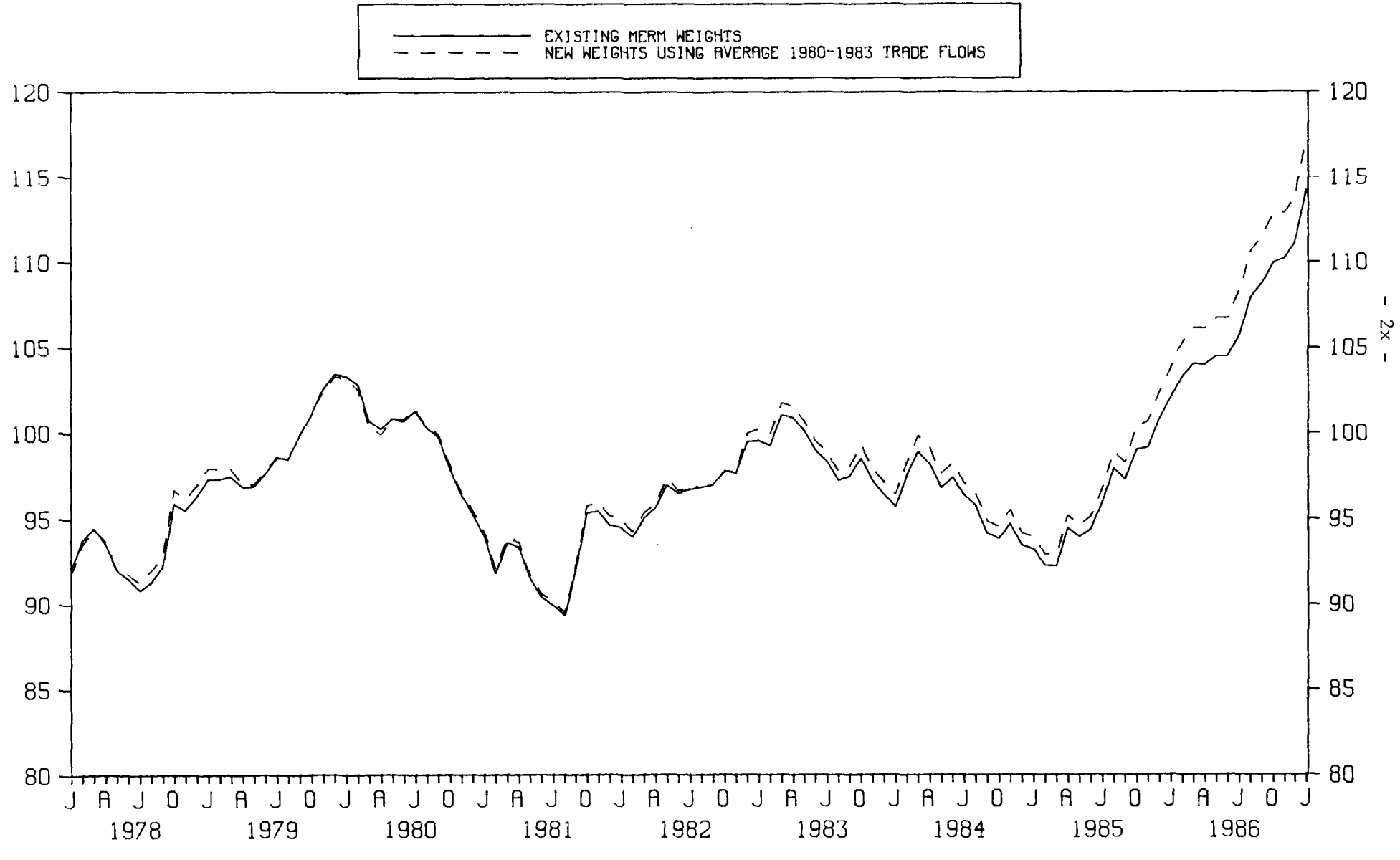

FIGURE 25 : ITALY
EFFECTIVE EXCHANGE RATE INDICES CALCULATED USING EXISTING AND NEW MERM WEIGHTS

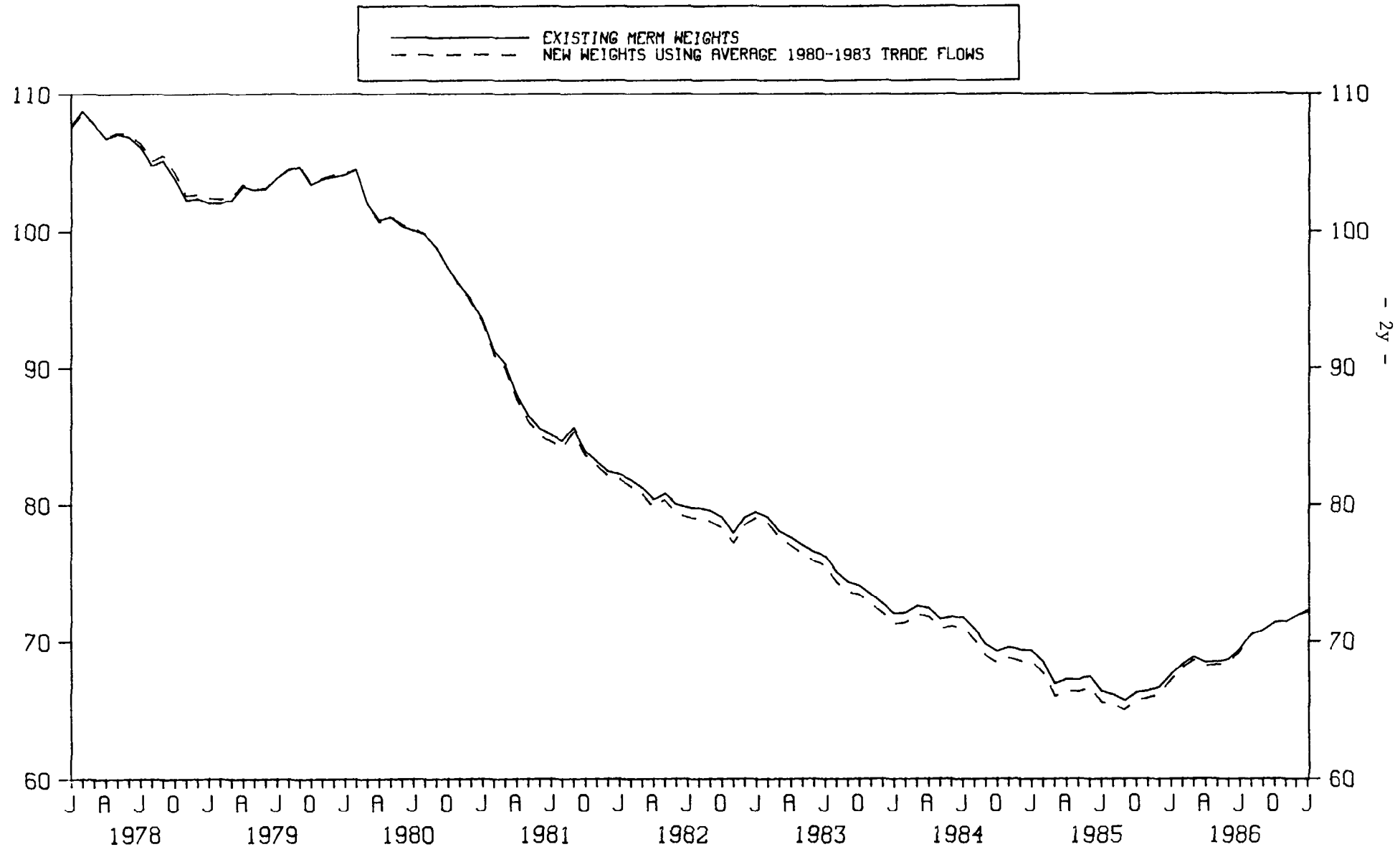

FIGURE 26 : JAPAN
EFFECTIVE EXCHANGE RATE INDICES CALCULATED USING EXISTING AND NEW MERM WEIGHTS

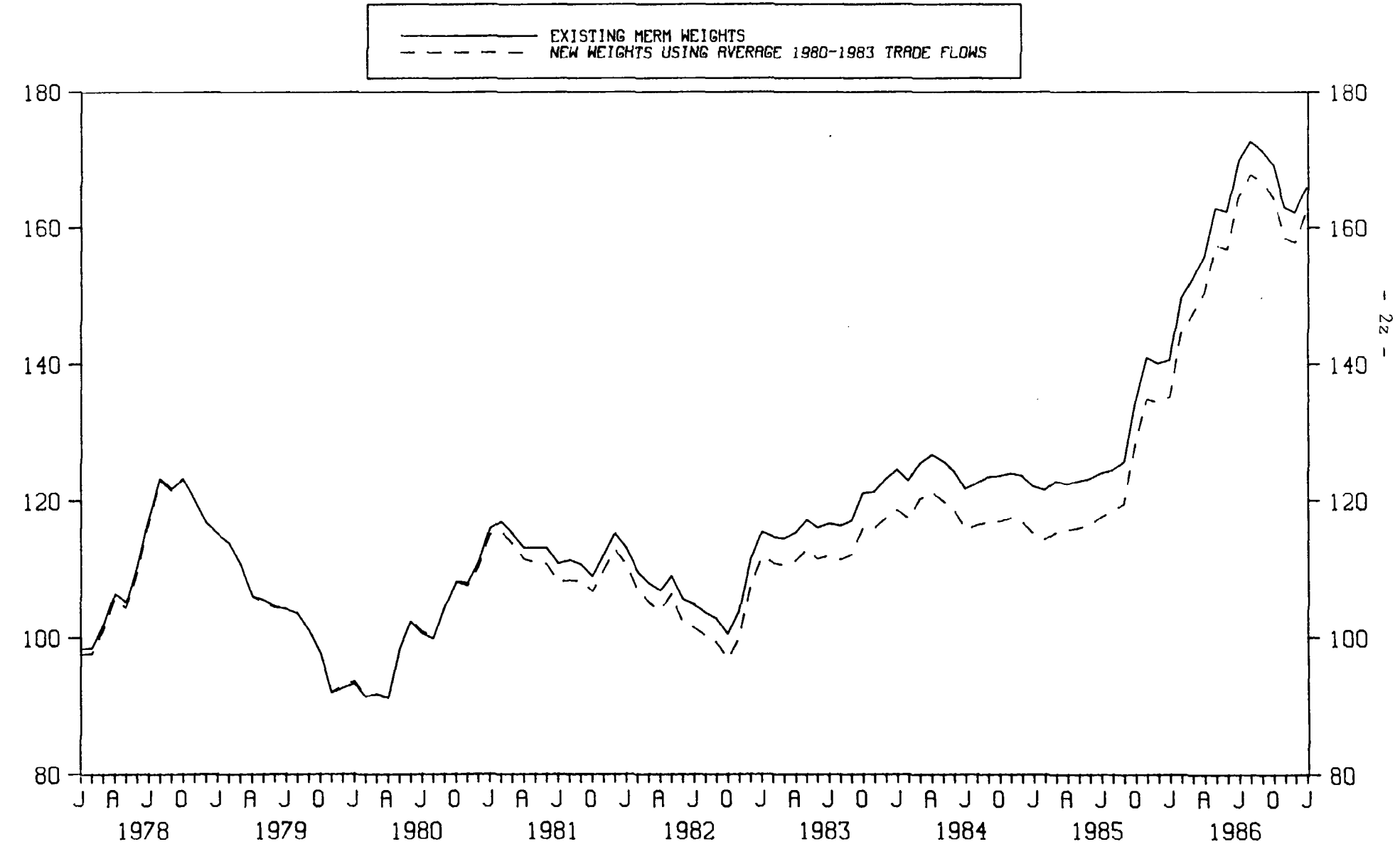

FIGURE 27 : NETHERLANDS
EFFECTIVE EXCHANGE RATE INDICES CALCULATED USING EXISTING AND NEW MERM WEIGHTS

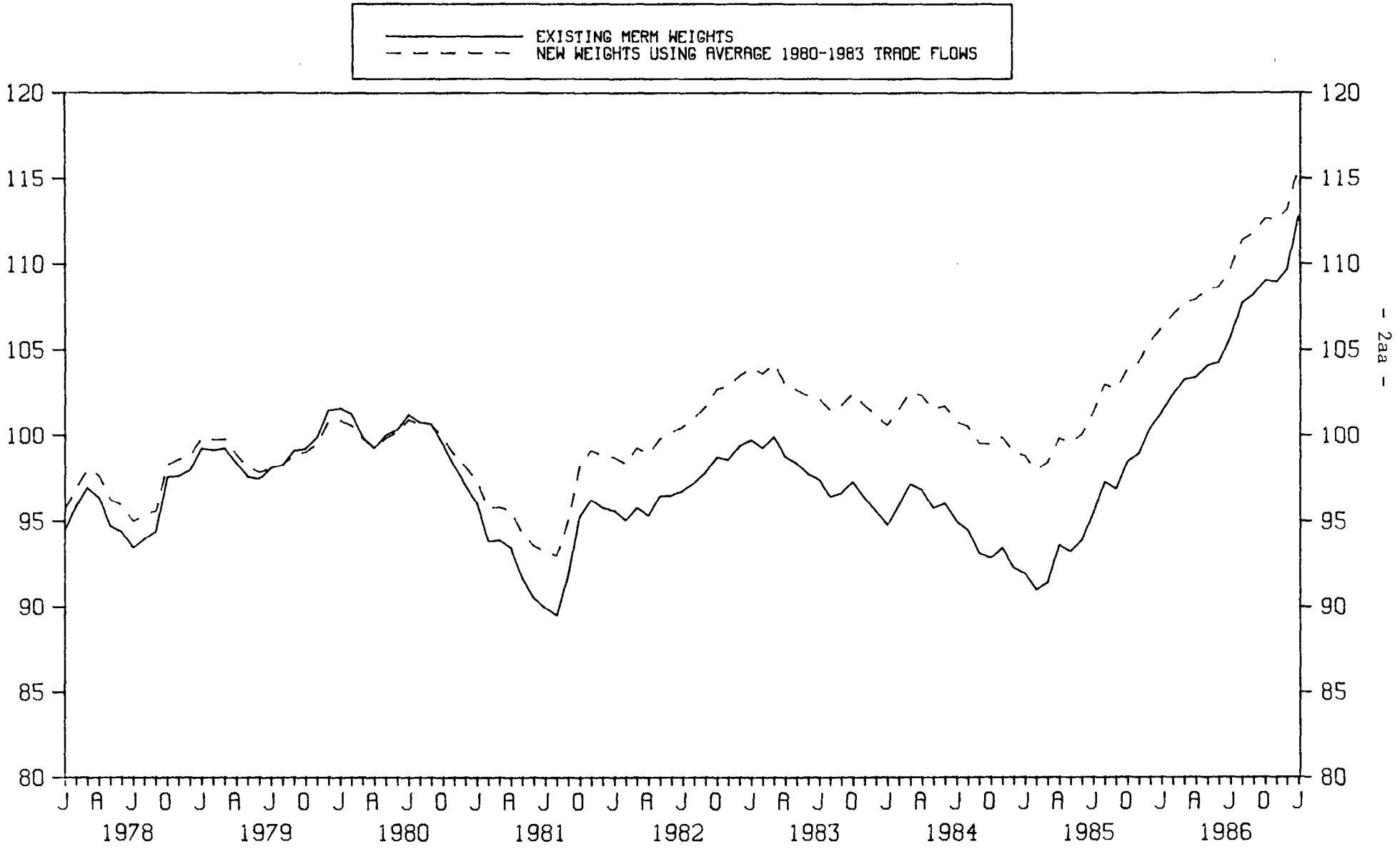

FIGURE 28 : NORWAY
EFFECTIVE EXCHANGE RATE INDICES CALCULATED USING EXISTING AND NEW MERM WEIGHTS

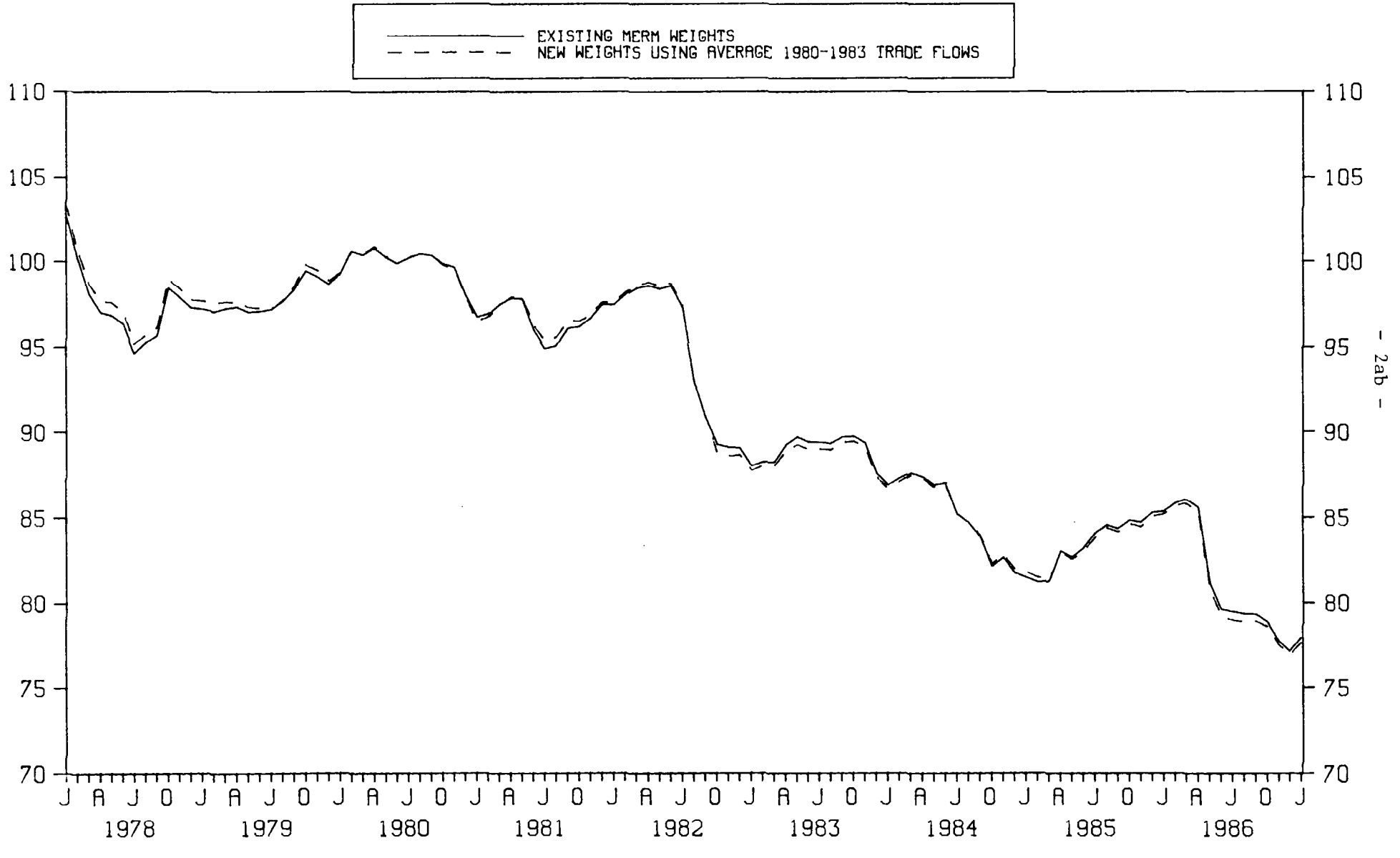

FIGURE 29 : SWEDEN
EFFECTIVE EXCHANGE RATE INDICES CALCULATED USING EXISTING AND NEW MERM WEIGHTS

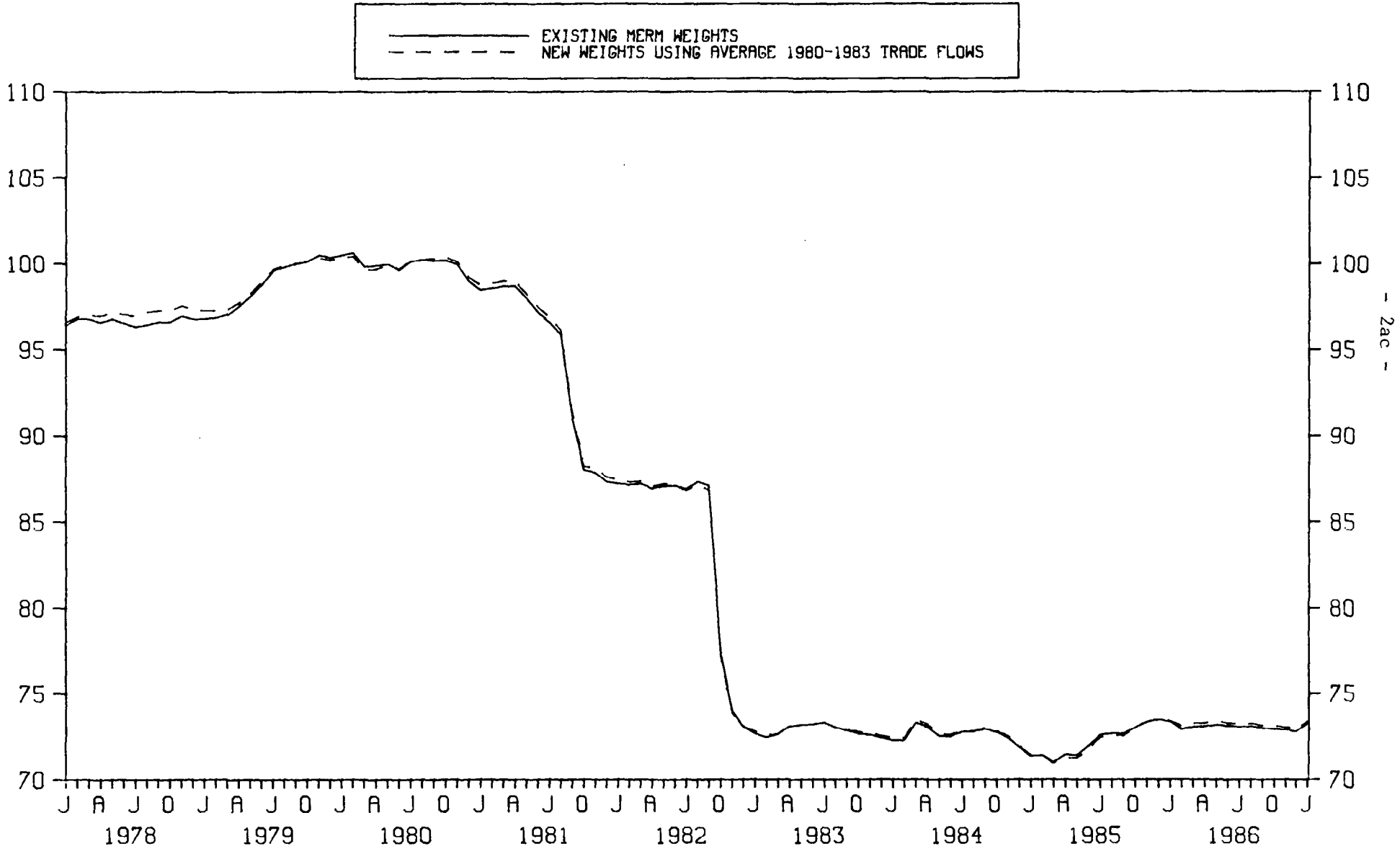

FIGURE 30 : SWITZERLAND
EFFECTIVE EXCHANGE RATE INDICES CALCULATED USING EXISTING AND NEW MERM WEIGHTS

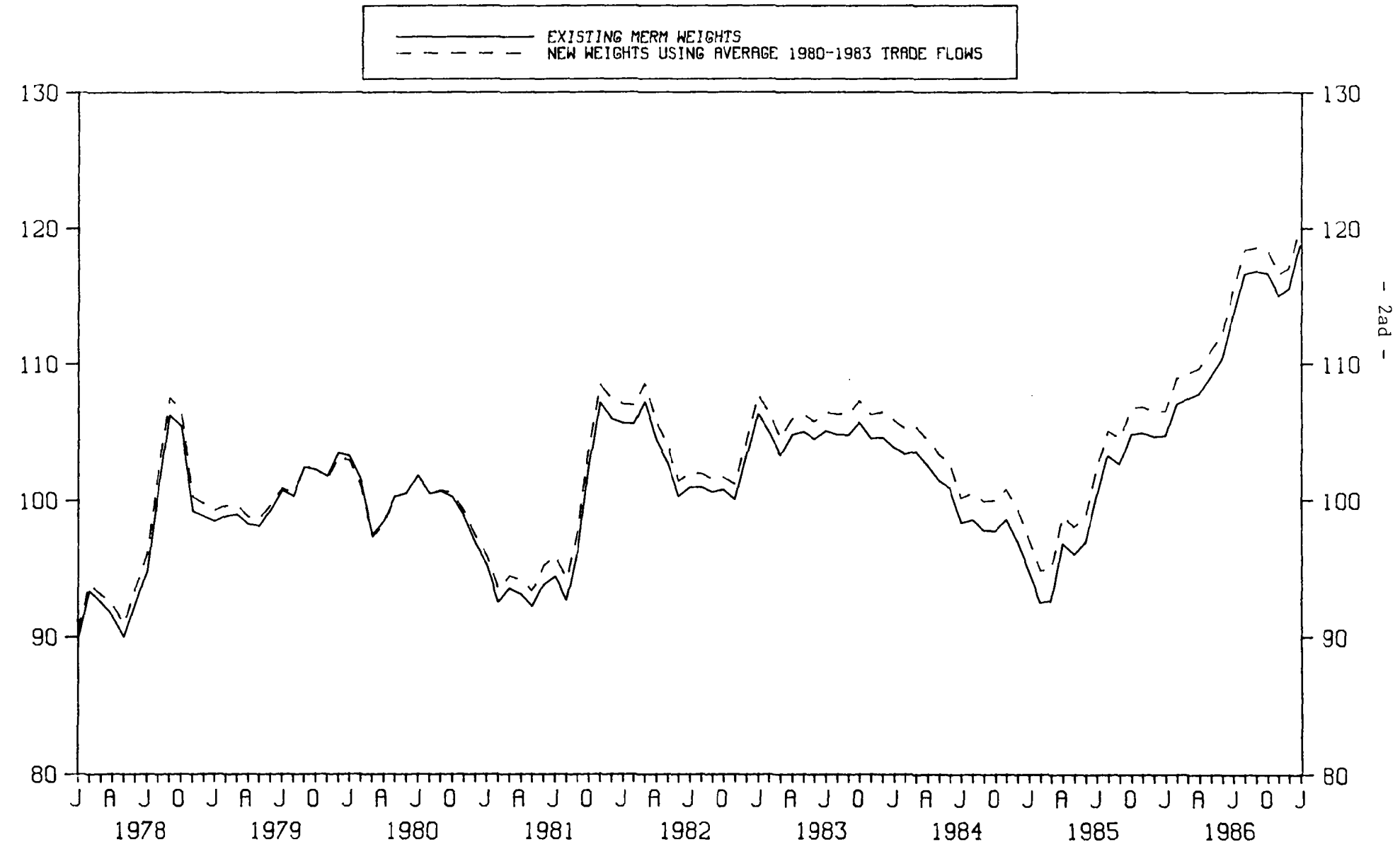

FIGURE 31 : UNITED KINGDOM
EFFECTIVE EXCHANGE RATE INDICES CALCULATED USING EXISTING AND NEW MERM WEIGHTS

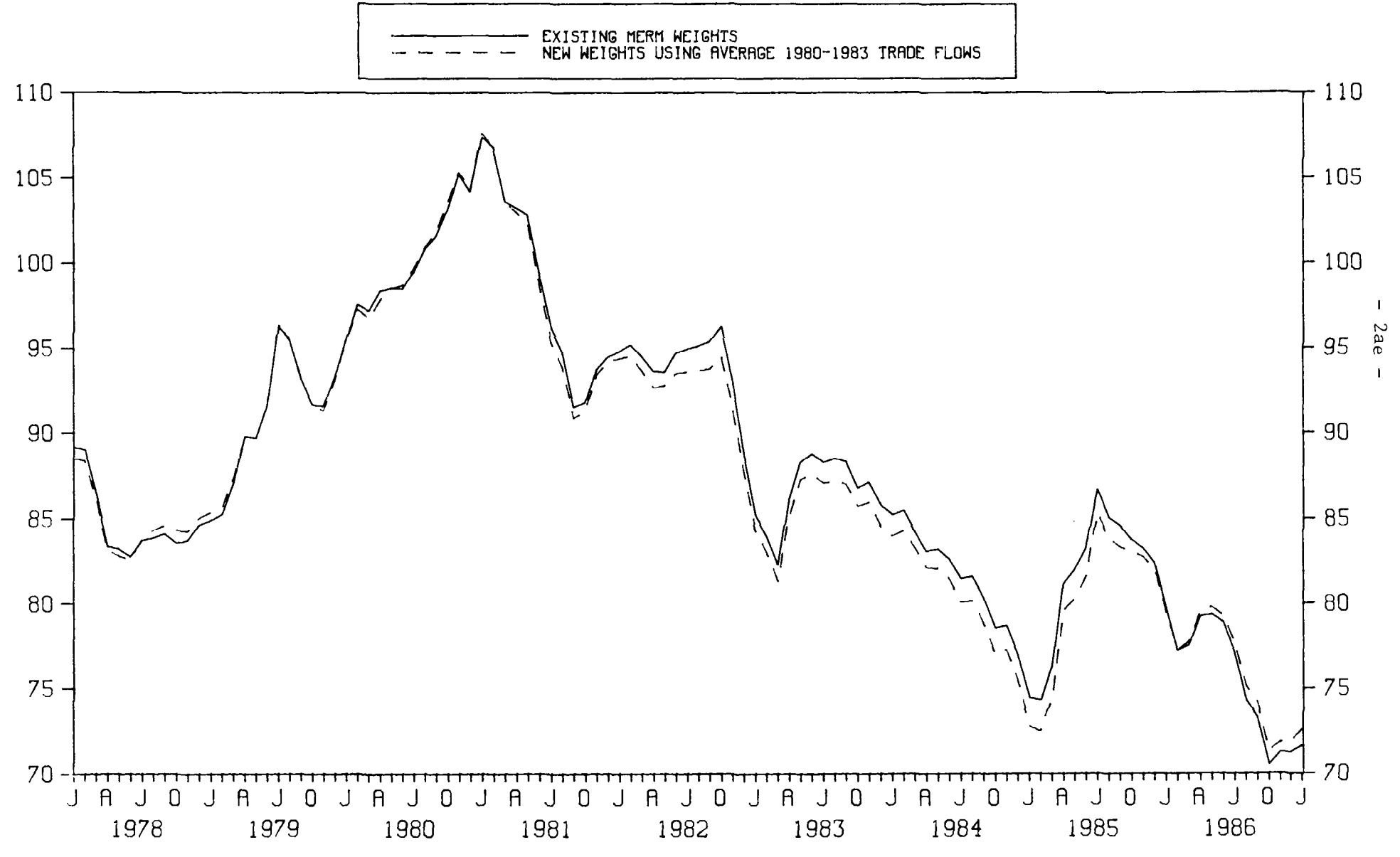

FIGURE 32 : UNITED STATES
EFFECTIVE EXCHANGE RATE INDICES CALCULATED USING EXISTING AND NEW MERM WEIGHTS

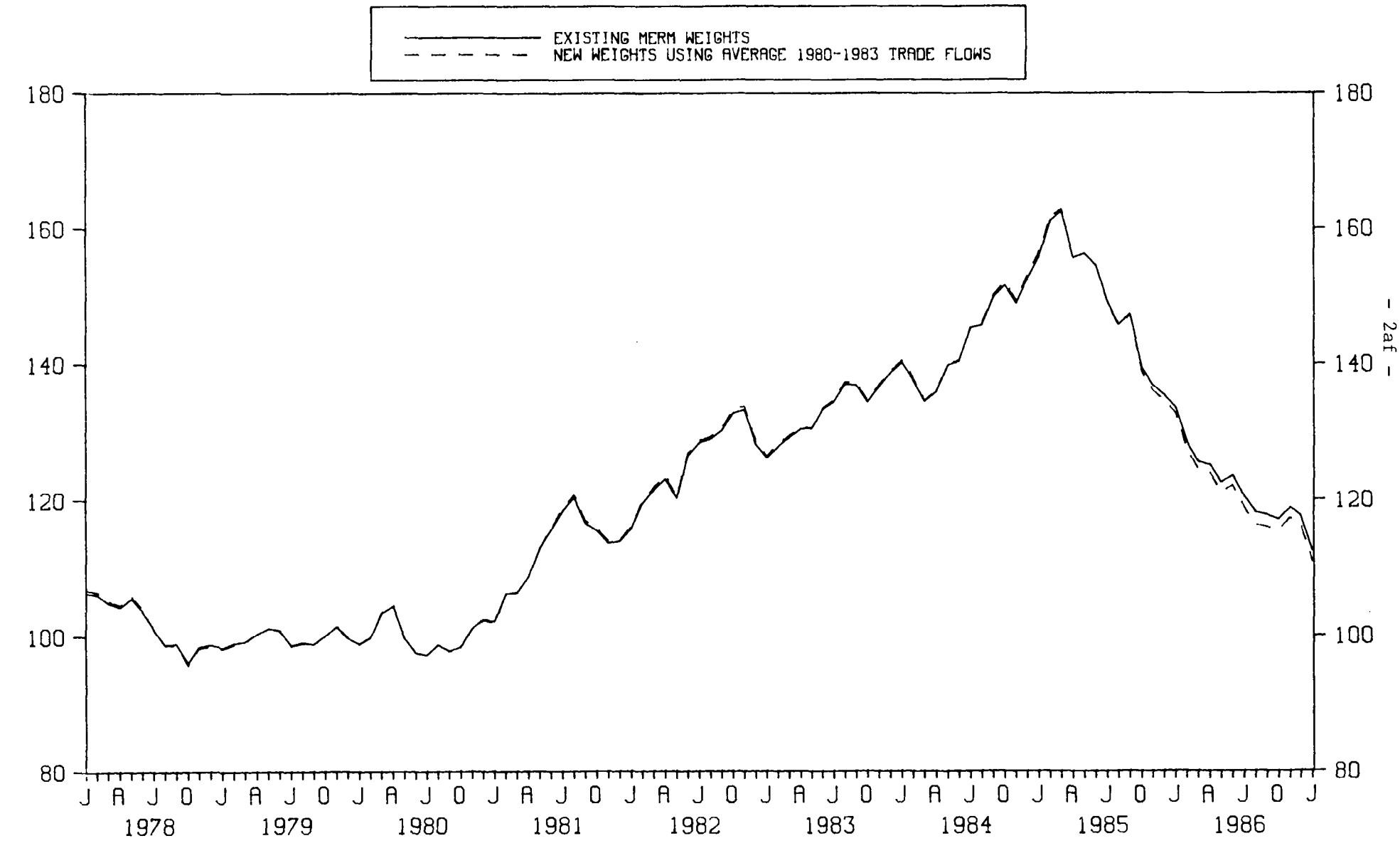

FIGURE 33 : AUSTRALIA
EFFECTIVE EXCHANGE RATE INDICES CALCULATED USING EXISTING AND NEW MERM WEIGHTS

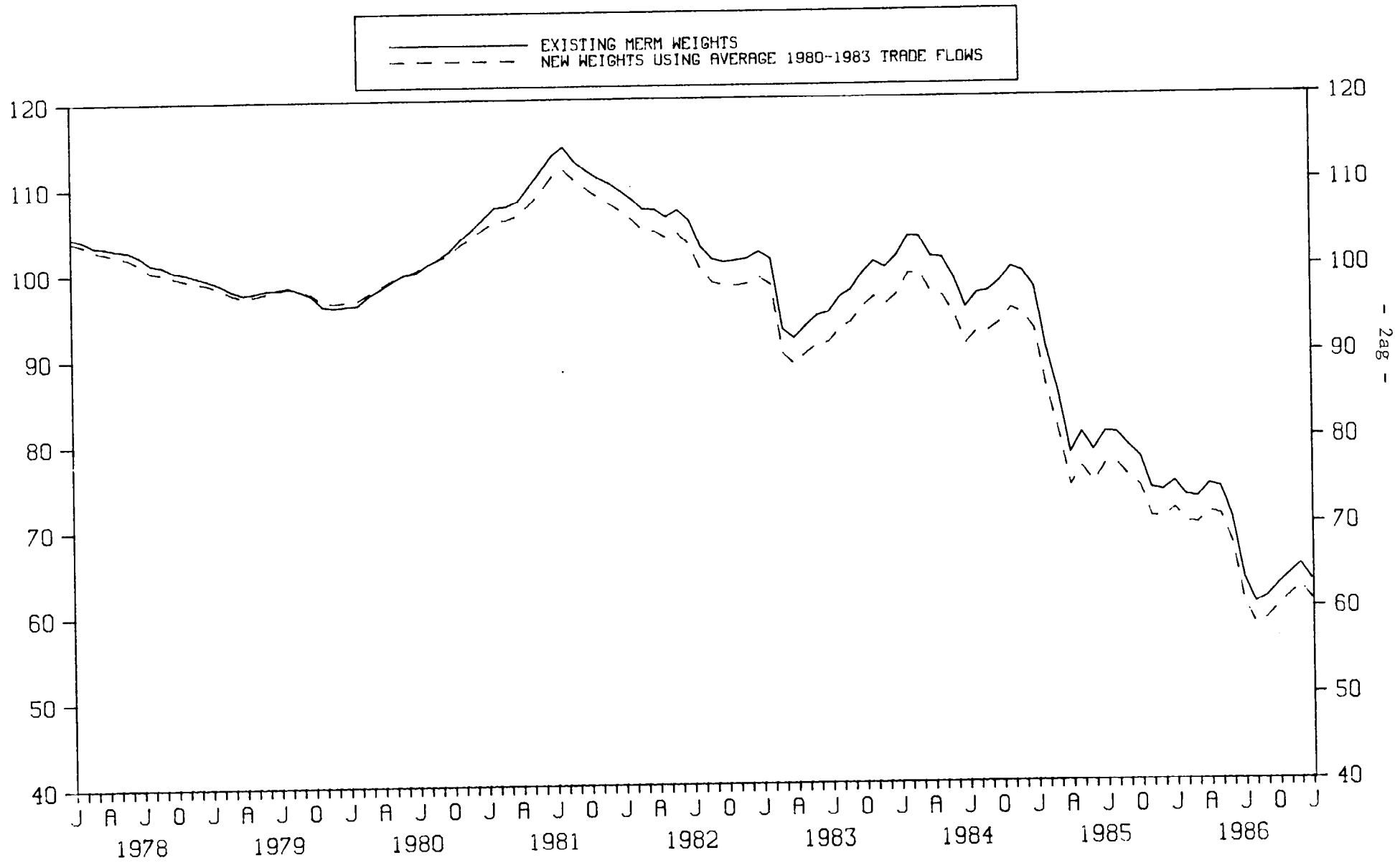

FIGURE 34 : FINLAND
EFFECTIVE EXCHANGE RATE INDICES CALCULATED USING EXISTING AND NEW MERM WEIGHTS

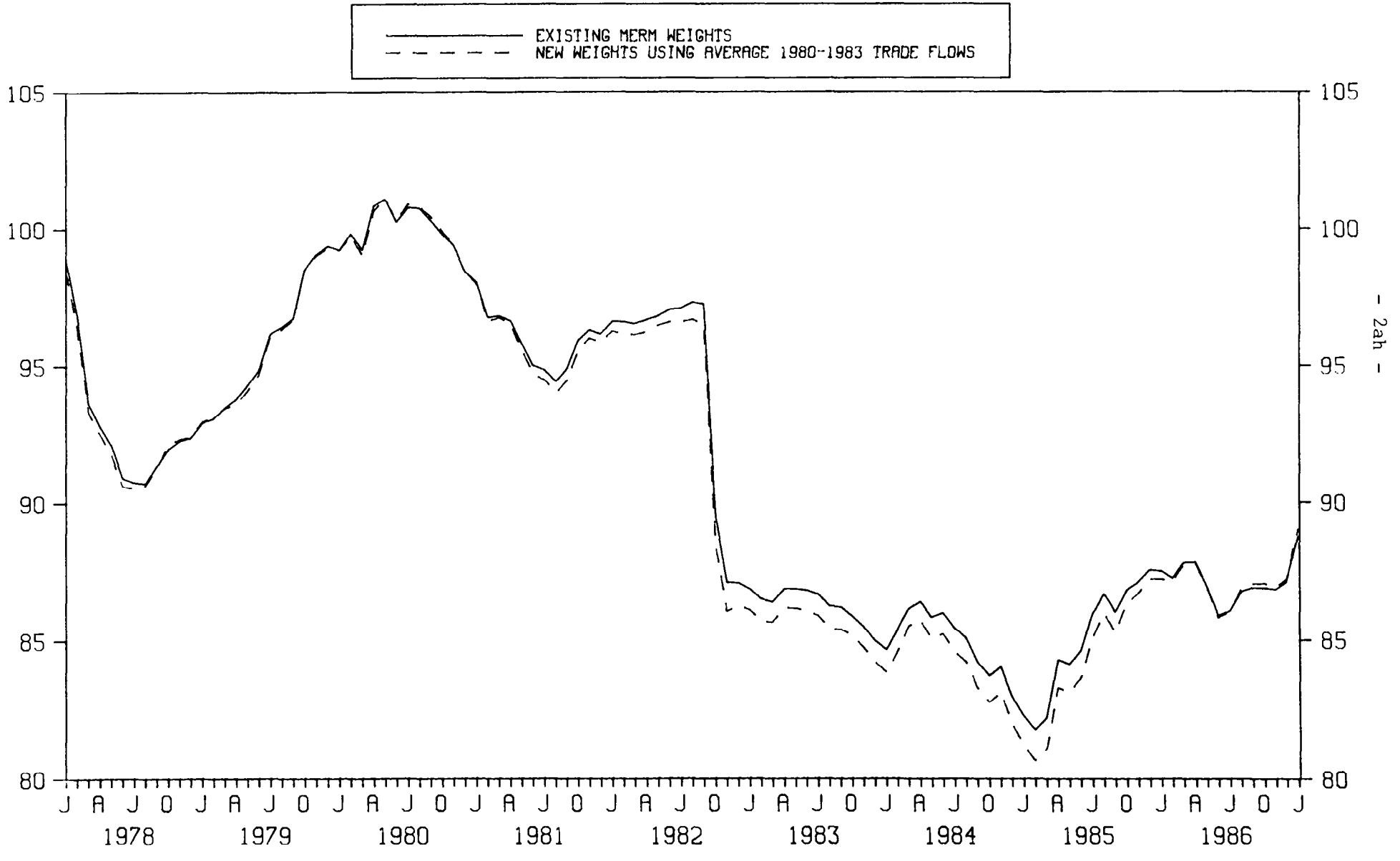

FIGURE 35 : IRELAND
EFFECTIVE EXCHANGE RATE INDICES CALCULATED USING EXISTING AND NEW MERM WEIGHTS

FIGURE 36 : SPAIN
EFFECTIVE EXCHANGE RATE INDICES CALCULATED USING EXISTING AND NEW MERM WEIGHTS

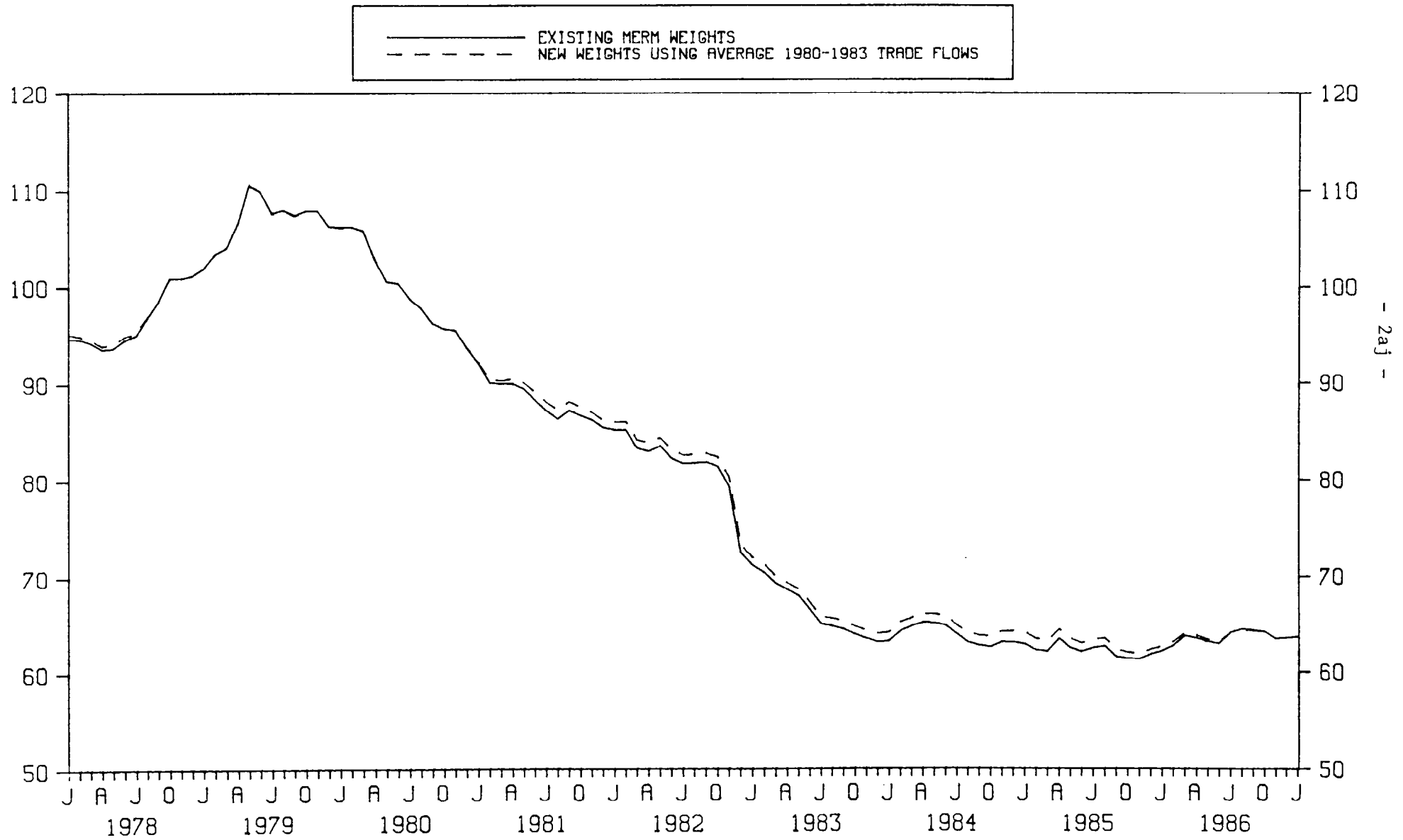

Table 1. Existing MERM Weights, Based on 1977 Trade Flows 1/

	AUSTRI	BELGIU	CANADA	DENMAR	FRANCE	GERMAN	ITALY	JAPAN	NETHER	NORWAY	SWEDEN	SWITZE	U.K.	U.S.A.	AUSTRA	FINLAN	IRELAN	SPAIN
AUSTRIA	0	.0220	.0443	.0177	.0871	.1643	.0807	.1264	.0300	.0162	.0392	.0251	.0400	.2399	.0278	.0167	.0036	.0189
BELGIUM	.0153	0	.0123	.0141	.1881	.2323	.0928	.0724	.0921	.0126	.0245	.0194	.0211	.1626	.0131	.0094	.0018	.0160
CANADA	.0085	.0104	0	.0077	.0465	.0504	.0384	.0711	.0143	.0056	.0164	.0081	.0195	.6421	.0367	.0093	.0030	.0122
DENMARK	.0104	.0181	.0450	0	.0834	.1122	.1047	.0871	.0344	.0428	.0745	.0114	.0713	.2399	.0286	.0095	.0065	.0203
FRANCE	.0143	.0494	.0303	.0117	0	.2007	.1569	.1090	.0411	.0139	.0232	.0234	.0414	.2269	.0156	.0090	.0045	.0287
GERMANY	.0397	.0486	.0171	.0164	.1666	0	.1247	.1256	.0600	.0161	.0399	.0353	.0477	.2165	.0092	.0123	.0037	.0205
ITALY	.0162	.0303	.0214	.0097	.1797	.2285	0	.1138	.0367	.0084	.0212	.0275	.0506	.2072	.0109	.0075	.0039	.0264
JAPAN	.0077	.0194	.0348	.0110	.0811	.1319	.0449	0	.0260	.0170	.0219	.0142	.0415	.4976	.0235	.0087	.0032	.0158
NETHERLANDS	.0138	.0643	.0314	.0196	.1391	.2021	.1207	.0684	0	.0115	.0218	.0143	.0321	.1934	.0307	.0052	.0052	.0264
NORWAY	.0115	.0197	.0368	.0233	.0815	.1225	.0703	.1247	.0299	0	.0563	.0120	.0791	.2612	.0265	.0238	.0045	.0164
SWEDEN	.0171	.0223	.0455	.0420	.0879	.1147	.0698	.1055	.0266	.0792	0	.0155	.0408	.2342	.0294	.0483	.0050	.0161
SWITZERLAND	.0381	.0222	.0368	.0120	.1108	.1427	.0959	.1460	.0283	.0158	.0327	0	-.0042	.2570	.0235	.0128	.0026	.0268
U.K.	.0100	.0404	.0151	.0109	.1040	.1409	.0718	.1368	.0474	.0211	.0373	.0300	0	.2464	.0200	.0085	.0406	.0187
U.S.A.	.0113	.0244	.2028	.0140	.1011	.1303	.0747	.2125	.0320	.0121	.0273	.0169	.0506	0	.0487	.0111	.0058	.0244
AUSTRALIA	.0145	.0202	.0943	.0152	.0884	.0710	.0591	.1051	.0261	.0112	.0209	.0117	.0200	.4020	0	.0117	.0039	.0248
FINLAND	.0185	.0191	.0468	.0139	.0690	.1346	.0498	.1529	.0149	.0346	.0931	.0138	.0309	.2677	.0264	0	.0041	.0101
IRELAND	.0066	.0375	.0543	.0223	.1090	.1188	.0672	.0555	.0581	.0093	.0153	.0097	.1193	.2579	.0335	.0004	0	.0252
SPAIN	.0079	.0259	.0435	.0158	.1747	.1209	.0899	.0864	.0415	.0084	.0149	.0102	.0445	.2737	.0287	.0081	.0051	0

Source: Artus and McGuirk (1981).

1/ The effective exchange rate index of any country in the stub is calculated by applying the weights shown in the row for this country to the exchange rate relatives of the corresponding countries in the heading.

Table 2. New MERM Weights, Based on 1980-83 Trade Flows 1/

	AUSTRI	BELGIU	CANADA	DENMAR	FRANCE	GERMAN	ITALY	JAPAN	NETHER	NORWAY	SWEDEN	SWITZE	U.K.	U.S.A.	AUSTRA	FINLAN	IRELAN	SPAIN
AUSTRIA	0	.0214	.0357	.0157	.0757	.2141	.1109	.1031	.0262	.0138	.0330	.0260	.0419	.2174	.0163	.0202	.0042	.0245
BELGIUM	.0141	0	.0122	.0167	.1682	.2416	.1286	.0569	.0780	.0122	.0245	.0207	.0482	.1321	.0075	.0131	.0042	.0210
CANADA	.0076	.0104	0	.0076	.0383	.0523	.0437	.0914	.0151	.0052	.0145	.0075	.0265	.6281	.0244	.0092	.0038	.0144
DENMARK	.0102	.0165	.0357	0	.0670	.1265	.1198	.0775	.0300	.0457	.0776	.0108	.0890	.2328	.0142	.0119	.0089	.0261
FRANCE	.0140	.0458	.0282	.0117	0	.1950	.1946	.0791	.0349	.0090	.0220	.0227	.0487	.2350	.0098	.0102	.0059	.0334
GERMANY	.0394	.0471	.0196	.0158	.1514	0	.1493	.0921	.0464	.0150	.0392	.0298	.0630	.2383	.0082	.0161	.0058	.0236
ITALY	.0154	.0286	.0218	.0096	.1562	.2317	0	.1041	.0287	.0079	.0229	.0251	.0649	.2310	.0080	.0107	.0047	.0286
JAPAN	.0079	.0156	.0417	.0081	.0493	.1216	.0333	0	.0171	.0100	.0187	.0092	.0426	.5729	.0210	.0126	.0034	.0147
NETHERLANDS	.0148	.0786	.0170	.0241	.1218	.2546	.1580	.0411	0	.0114	.0237	.0182	.0533	.1285	.0113	.0081	.0078	.0275
NORWAY	.0094	.0181	.0383	.0050	.0703	.1444	.0910	.1334	.0292	0	.0224	.0105	.1249	.2542	.0155	.0062	.0045	.0228
SWEDEN	.0148	.0274	.0425	.0419	.0696	.1268	.0727	.0846	.0303	.0669	0	.0140	.0518	.2556	.0177	.0575	.0068	.0190
SWITZERLAND	.0320	.0222	.0291	.0117	.0826	.2050	.1185	.1128	.0234	.0123	.0311	0	.0198	.2482	.0133	.0140	.0039	.0199
U.K.	.0085	.0297	.0216	.0049	.0912	.1439	.0845	.0977	.0420	.0112	.0397	.0172	0	.3115	.0197	.0080	.0499	.0189
U.S.A.	.0112	.0249	.1809	.0122	.0846	.1362	.0846	.2351	.0314	.0100	.0269	.0158	.0615	0	.0351	.0132	.0077	.0288
AUSTRALIA	.0136	.0145	.0953	.0112	.0581	.0620	.0502	.1434	.0187	.0076	.0170	.0097	.0201	.4386	0	.0115	.0039	.0246
FINLAND	.0159	.0210	.0554	.0118	.0704	.1150	.0654	.1449	.0184	.0194	.0654	.0101	.0392	.2963	.0262	0	.0062	.0190
IRELAND	.0086	.0310	.0533	.0215	.0974	.1400	.0818	.0707	.0524	.0093	.0200	.0101	.1058	.2428	.0205	.0028	0	.0321
SPAIN	.0102	.0266	.0345	.0142	.1568	.1341	.1162	.0959	.0377	.0072	.0172	.0120	.0572	.2525	.0137	.0080	.0059	0

1/ The effective exchange rate index of any country in the stub is calculated by applying the weights shown in the row for this country to the exchange rate relatives of the corresponding countries in the heading.

Table 3. Differences Between Existing and New MERM Weights

	AUSTRI	BELGIU	CANADA	DENMAR	FRANCE	GERMAN	ITALY	JAPAN	NETHER	NORWAY	SWEDEN	SWITZE	U.K.	U.S.A.	AUSTRA	FINLAN	IRELAN	SPAIN
AUSTRIA	0	.0006	.0086	.0020	.0114	-.0498	-.0302	.0234	.0038	.0023	.0062	-.0009	-.0019	.0225	.0115	-.0035	-.0006	-.0056
BELGIUM	.0012	0	.0001	-.0026	.0199	-.0094	-.0359	.0155	.0141	.0004	0	-.0012	-.0270	.0305	.0055	-.0037	-.0023	-.0050
CANADA	.0009	0	0	.0001	.0082	-.0020	-.0053	-.0203	-.0008	.0003	.0019	.0006	-.0070	.0140	.0123	.0001	-.0009	-.0022
DENMARK	.0002	.0016	.0093	0	.0164	-.0143	-.0151	.0096	.0045	-.0029	-.0031	.0005	-.0178	.0071	.0144	-.0024	-.0024	-.0058
FRANCE	.0004	.0036	.0021	-.0001	0	.0057	-.0377	.0299	.0062	.0049	.0012	.0007	-.0073	-.0082	.0058	-.0012	-.0014	-.0047
GERMANY	.0003	.0015	-.0025	.0006	.0152	0	-.0246	.0335	.0136	.0011	.0007	.0055	-.0152	-.0218	.0009	-.0038	-.0021	-.0031
ITALY	.0008	.0017	-.0004	.0002	.0236	-.0033	0	.0098	.0080	.0005	-.0017	.0024	-.0143	-.0238	.0029	-.0031	-.0009	-.0023
JAPAN	-.0002	.0038	-.0069	.0030	.0318	.0103	.0115	0	.0088	.0069	.0032	.0049	-.0011	-.0753	.0024	-.0040	-.0002	.0011
NETHERLANDS	-.0010	-.0144	.0144	-.0046	.0173	-.0525	-.0374	.0272	0	.0001	-.0019	-.0039	-.0212	.0649	.0194	-.0029	-.0025	-.0011
NORWAY	.0021	.0015	-.0015	.0183	.0112	-.0219	-.0207	-.0086	.0007	0	.0339	.0015	-.0458	.0070	.0110	.0176	0	-.0063
SWEDEN	.0023	-.0051	.0030	.0001	.0184	-.0121	-.0030	.0209	-.0037	.0122	0	.0015	-.0110	-.0214	.0117	-.0092	-.0018	-.0029
SWITZERLAND	.0061	0	.0077	.0002	.0282	-.0623	-.0226	.0333	.0049	.0036	.0016	0	-.0240	.0088	.0102	-.0012	-.0013	.0069
U.K.	.0016	.0107	-.0064	.0061	.0128	-.0030	-.0127	.0391	.0054	.0100	-.0024	.0128	0	-.0651	.0003	.0005	-.0093	-.0003
U.S.A.	.0001	-.0005	.0219	.0018	.0165	-.0060	-.0099	-.0226	.0006	.0021	.0004	.0012	-.0109	0	.0136	-.0021	-.0019	-.0044
AUSTRALIA	.0009	.0057	-.0010	.0040	.0303	.0090	.0089	-.0383	.0074	.0036	.0039	.0021	-.0001	-.0366	0	.0002	0	.0002
FINLAND	.0026	-.0020	-.0086	.0022	-.0014	.0196	-.0156	.0080	-.0035	.0152	.0276	.0037	-.0083	-.0286	.0001	0	-.0021	-.0089
IRELAND	-.0020	.0065	.0010	.0008	.0116	-.0212	-.0146	-.0152	.0057	0	-.0047	-.0004	.0135	.0151	.0130	-.0024	0	-.0069
SPAIN	-.0023	-.0007	.0090	.0016	.0178	-.0133	-.0264	-.0095	.0039	.0012	-.0023	-.0018	-.0127	.0212	.0150	.0001	-.0008	0

Source: Tables 1 and 2.

involved the appreciation of the dollar against all other major currencies, followed by its depreciation since early 1985. Consequently, the new effective exchange rate index no longer shows as sharp a depreciation in the effective rate for the Netherlands in the 1982-85 period.

IV. Conclusions

Recalculation of the MERM weights with new trade data is important because it allows one to assess whether there is a severe bias in the existing MERM exchange rate. On the basis of the evidence presented here, this does not seem to be the case. The possibility remains of a large change in weights as a result of updating the input/ouput tables, but since the inter-industry structure of production is unlikely to change substantially, especially at the highly aggregated level considered here, it would not seem worthwhile to proceed with updating input/output tables. Given the small differences in indices, especially at the end of 1986, it is also probably not necessary to replace the existing official weights by the new ones, nor to publish revised historical effective exchange rates calculated with the new weights.

References

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