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A TOP-DOWN MULTIREGIONAL ECONOMETRIC MODEL OF THE PHILIPPINES

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This paper presents the results of the estimation and historical simulation of a system of top-down regional econometric models for the regions of the Philippines. The structure of the model ensures that the regional forecasts will be consistent with national forecasts. The dynamic historical simulations show that the predicted values of the national variables track their actual values quite well.

1. Introduction

This paper presents the results of the estimation and simulation of a system of regional econometric models for the regions of the Philippines. The specification of each regional model follows essentially the prototype model for a single region described in an earlier paper (Danao, 1990). The new features of the model include the introduction of a wage equation and the upgrading of data to 1987.

The model is of the top-down variety (Klein, 1979; Milne et al., 1980) i.e., each regional model is linked to a national model in which the direction of causality is from the national model (top) to the regional model (down). The main feature of the model is that its structure ensures that regional forecasts will be consistent with national forecasts. Each regional model is linked to a national model via output, employment, price, government consumption, private investment, and public investment. These links are shown in Figure 1 which also shows the relationships among the regional variables. The national model generates values of economic variables which are fed as exogenous inputs to the regional models. Each regional model determines gross regional product, regional personal consumption, regional private construction, regional employment, regional price and wage rate, regional taxes, and local government revenues and expenditures.

The simulation shows that the predicted values of national variables, taken as sums or averages of the values of corresponding

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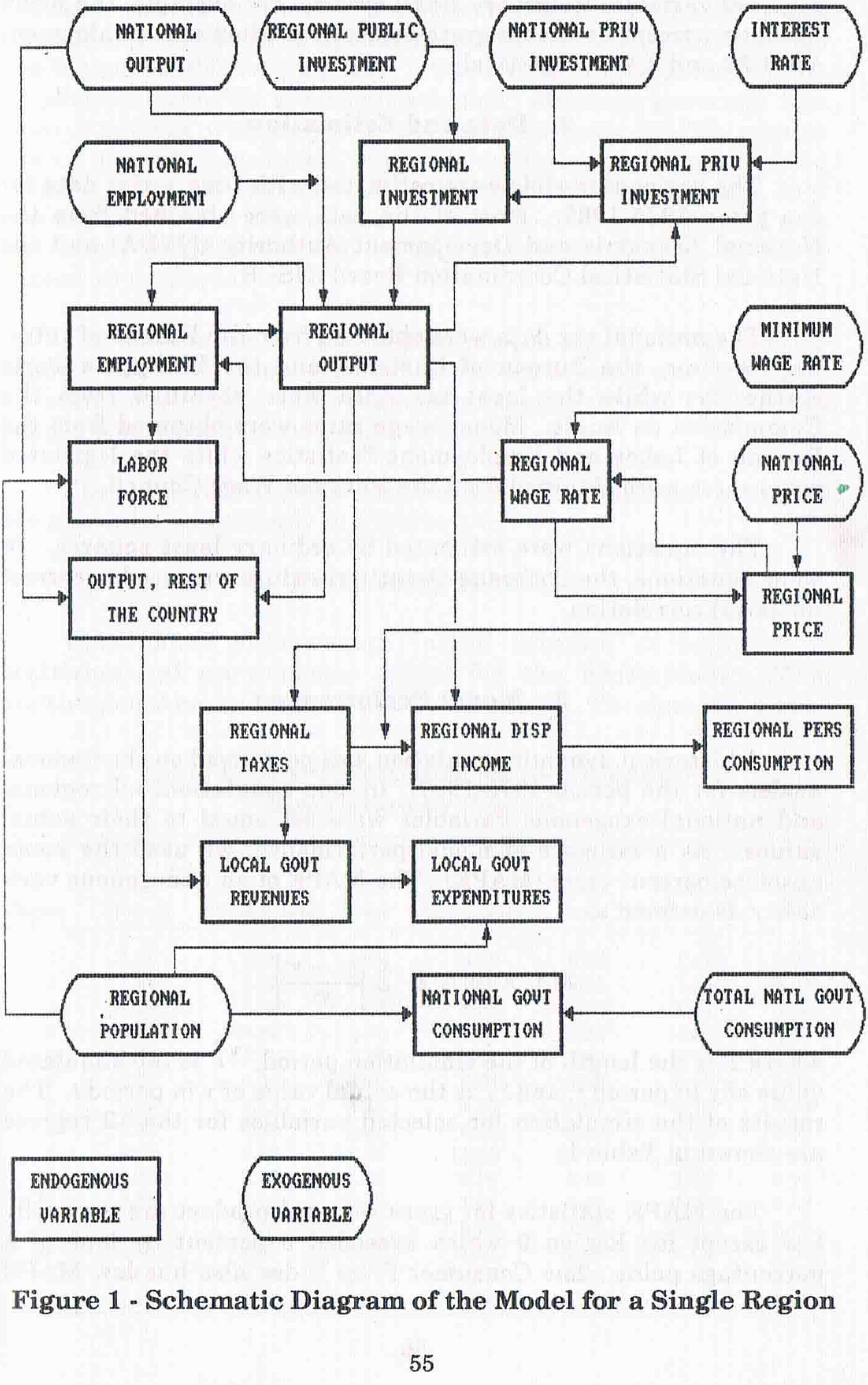


Figure 1 - Schematic Diagram of the Model for a Single Region

regional variables have very small errors. For example, the mean absolute percent errors for gross domestic product and employment are 1.32 and 2.49, respectively.

2. Data and Estimation

The regional models were estimated with time series data for the years 1975-1987. Most of the data were obtained from the National Economic and Development Authority (NEDA) and the National Statistical Coordination Board (NSCB).

The national tax data were obtained from the Bureau of Internal Revenue, the Bureau of Customs, and the Philippine Ports Authority, while the local tax data were obtained from the Commission on Audit. Money wage rates were obtained from the Bureau of Labor and Employment Statistics while the legislated wage rates were obtained from the National Wage Council.

The equations were estimated by ordinary least squares. In some equations, the Cochrane-Orcutt procedure was used to correct for serial correlation.

3. Model Performance

A historical dynamic simulation was performed on the regional models for the period 1978-1987. In this simulation, all regional and national exogenous variables were set equal to their actual values. As a measure of model performance, we used the mean absolute percent error (MAPE). The MAPE of an endogenous variable y is defined as

$$MAPE\,(y) = \frac{1}{T}\sum_{t=1}^{T}\left|\frac{y_t^s - y_t^a}{y_t^a}\right|$$

where T is the length of the simulation period, y_t^s is the simulated value of y in period t, and y_t^a is the actual value of y in period t. The results of the simulation for selected variables for the 13 regions are shown in Table 1.

The MAPE statistics for gross regional product are generally low except for Region 9 which exceeded 5 percent by 0.69 of a percentage point. The Consumer Price Index also has low MAPE

statistics except for Region 6 where MAPE is 6.89 percent. As expected, personal consumption, because of its low variability, has the lowest MAPE, ranging from 0.70 percent to 2.68 percent. The employment MAPEs are slightly higher, although generally less than 5 percent with only four regions that have MAPEs greater than 5 percent. Investment in private construction, being the more volatile economic variable, showed larger MAPEs although only one region (Region 9) exceeded 10 percent. Money wage rate also has larger MAPEs although in only one region (Region 9) did it exceed 10 percent.

The bottom row in Table 1 presents the MAPEs for the entire country (RP). The simulated values for the country were obtained as totals (or averages) of the regional simulated values. The MAPEs ranged from 0.99 percent to 5.08 percent.

The simulated and the actual values of the national variables are presented graphically in Figures 1-6.

4. Concluding Remarks

This paper presents an initial attempt at building a multiregional econometric model for the Philippines. The multiregional model is of the top-down variety. The dynamic simu-

Table 1 - MAPE Statistics for the Dynamic Simulation by Region

Region	Gross Product	Employment	Price Level	Private Construction	Money Wage Rate	Personal Consumption	Labor Force
1	1.60	3.90	1.45	4.10	6.34	1.42	3.77
2	1.04	4.25	5.50	7.53	6.62	1.76	3.96
3	1.96	3.00	1.55	5.34	7.05	1.33	2.90
4	2.90	8.32	1.58	2.82	7.33	2.68	1.13
5	1.74	4.75	1.16	6.41	7.49	0.95	1.13
6	2.65	5.24	6.99	5.21	7.60	0.70	3.39
7	2.84	3.12	1.13	4.39	5.91	0.27	4.04
8	2.20	3.86	5.01	6.12	9.20	1.13	6.53
9	5.69	4.86	1.36	11.02	12.74	1.35	4.60
10	2.98	7.17	1.60	9.76	5.72	1.32	5.29
11	2.67	5.75	2.09	7.67	4.46	1.87	3.19
12	3.91	3.52	1.86	8.38	1.63	1.53	2.71
13	2.26	2.80	4.10	2.91	7.54	0.92	5.26
Mean	2.65	4.86	2.72	6.28	6.89	1.33	3.68
RP	1.32	2.49	1.53	1.74	5.08	.99	1.64

lation showed errors that are within current modelling standards except the money wage variable. Two things that can be done here include (a) rechecking the wage rate data and (b) respecifying the wage equation to include the "stickiness" of wage behavior.

The main feature of the model is that its structure ensures that regional forecasts will be consistent with national forecasts.

The obvious limitations of the current model include the fact that there are no bottom-up features and there are no interregional

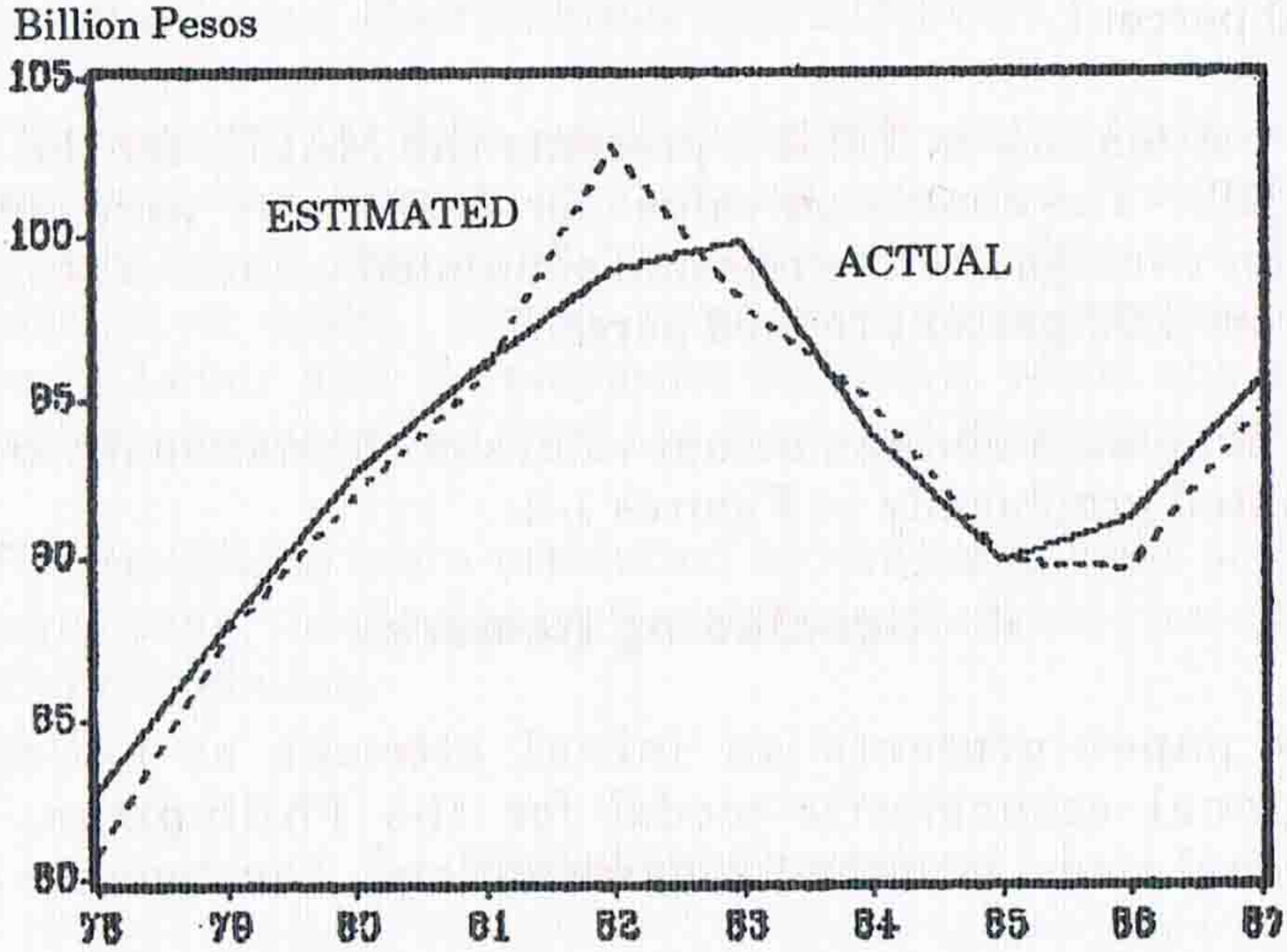


Figure 1 - Gross Domestic Product

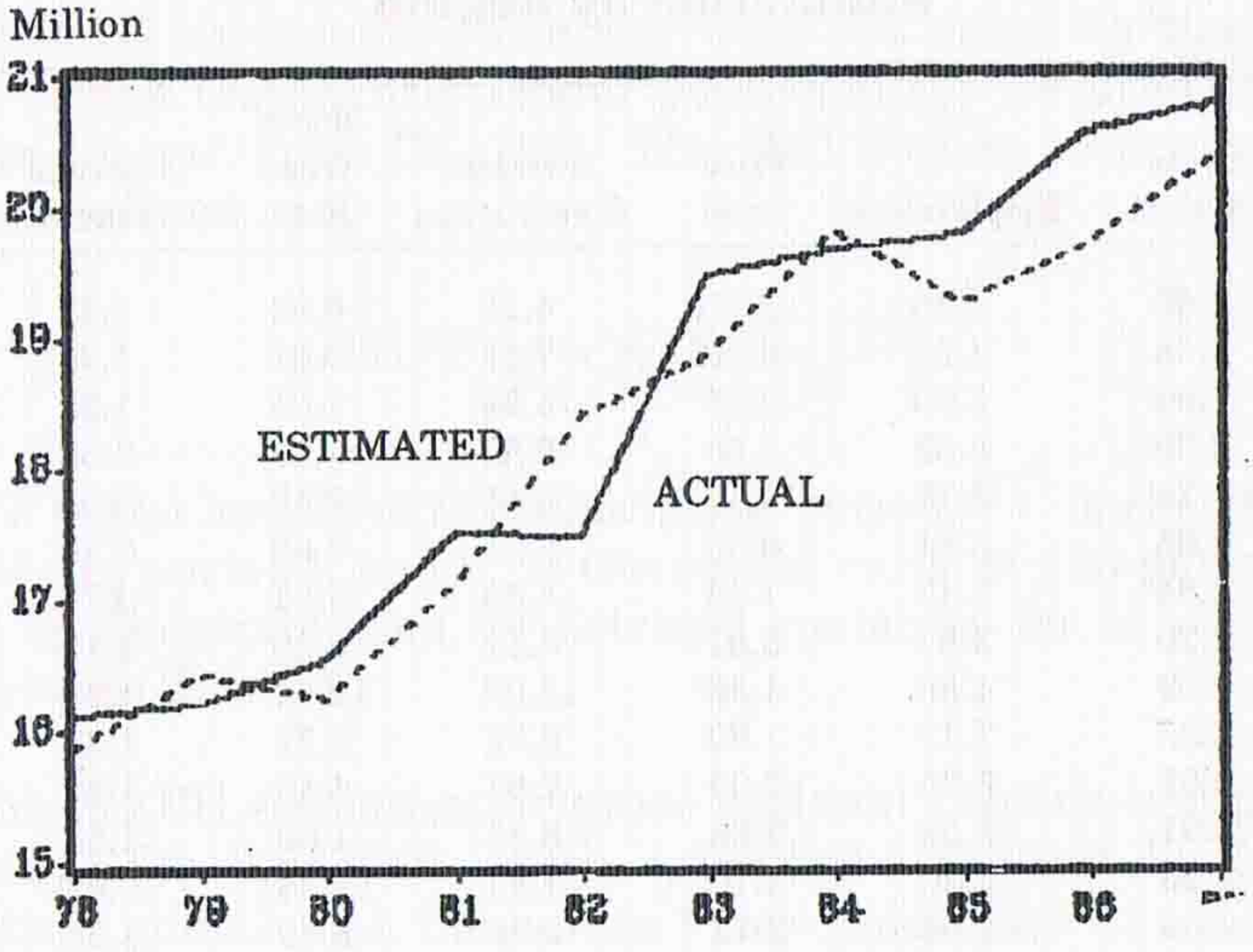


Figure 2 - Employment

Figure 3 - Private Construction

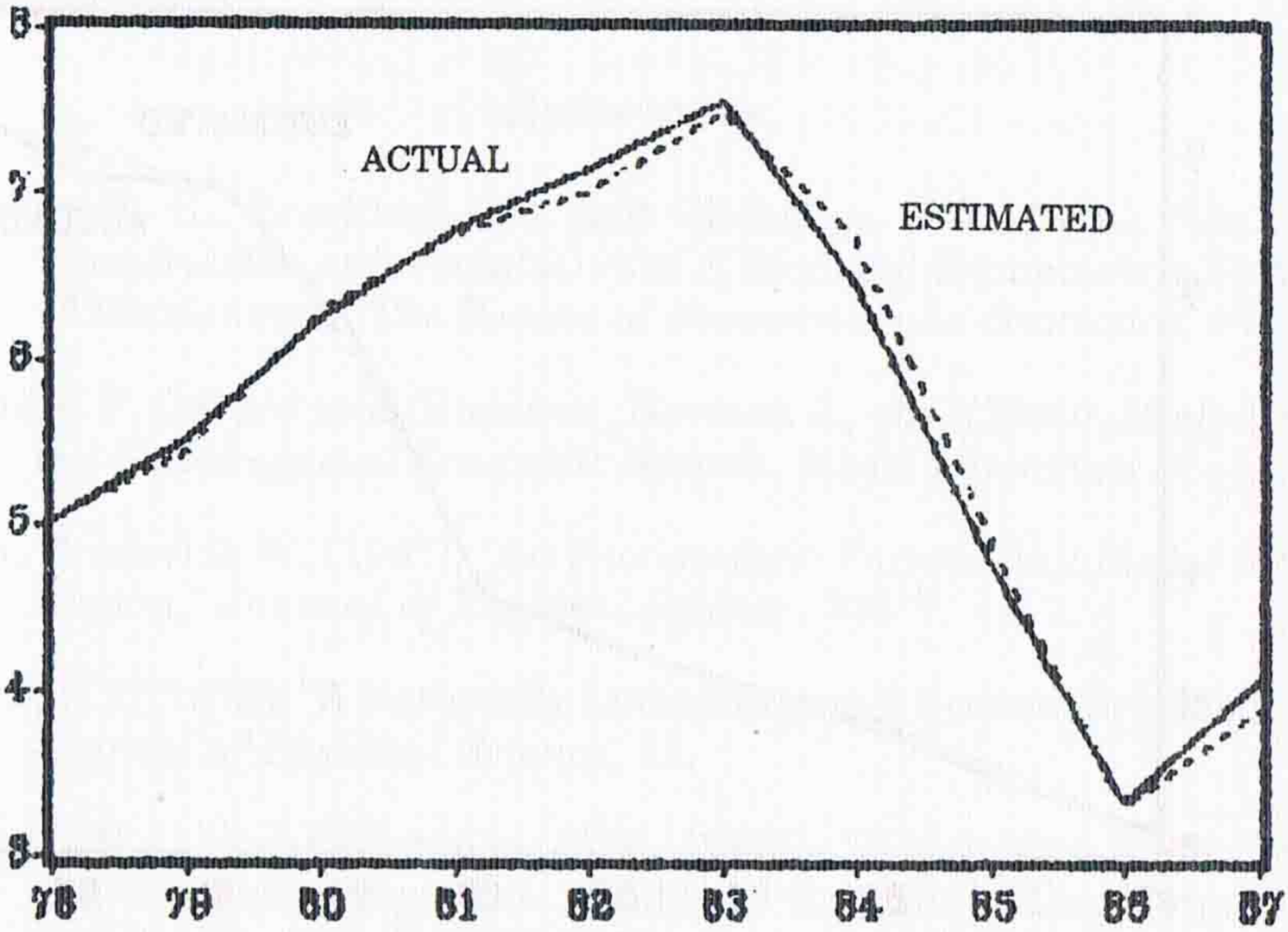


Figure 4 - Personal Consumption

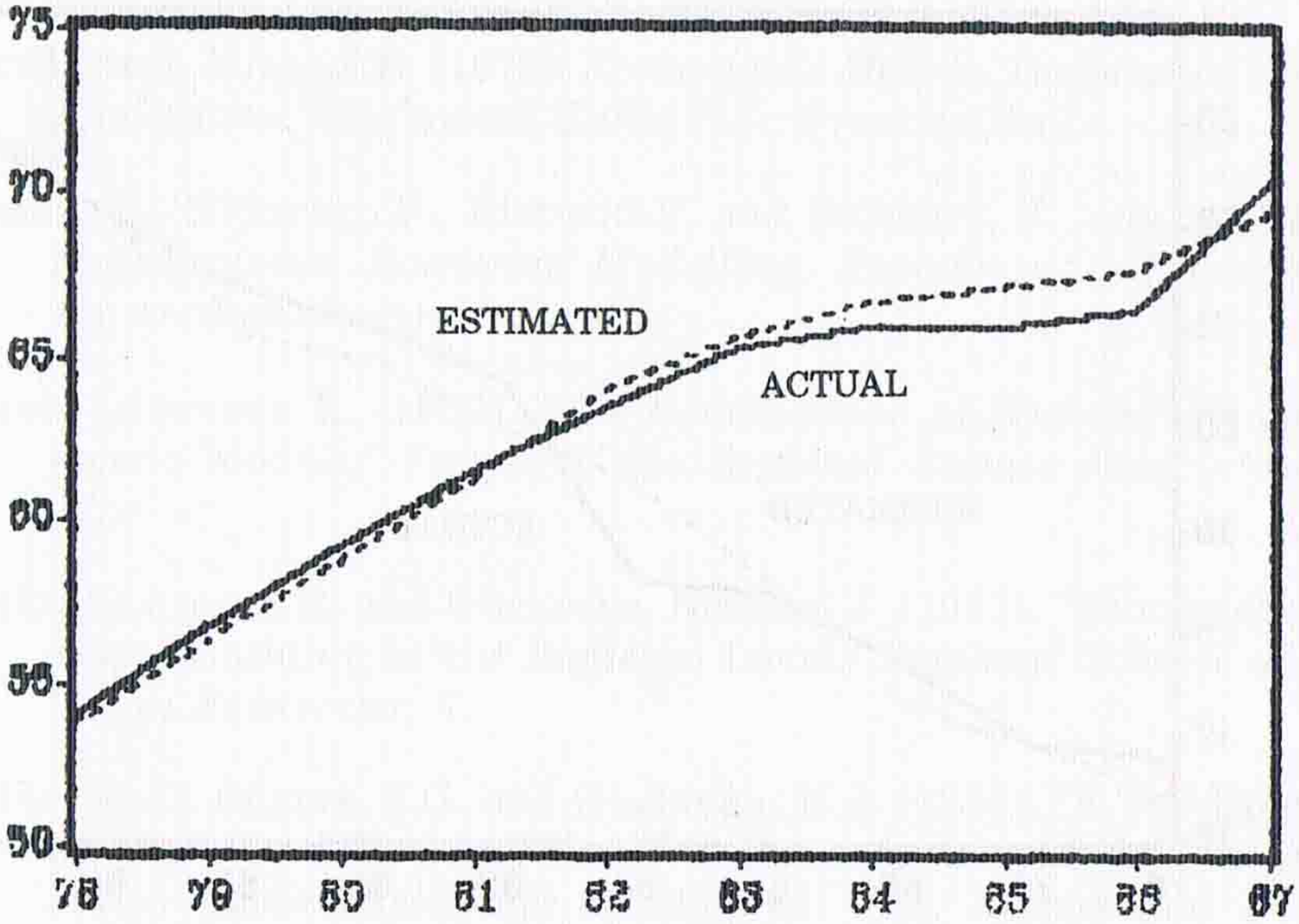


Figure 5 - Gross Domestic Product Deflator

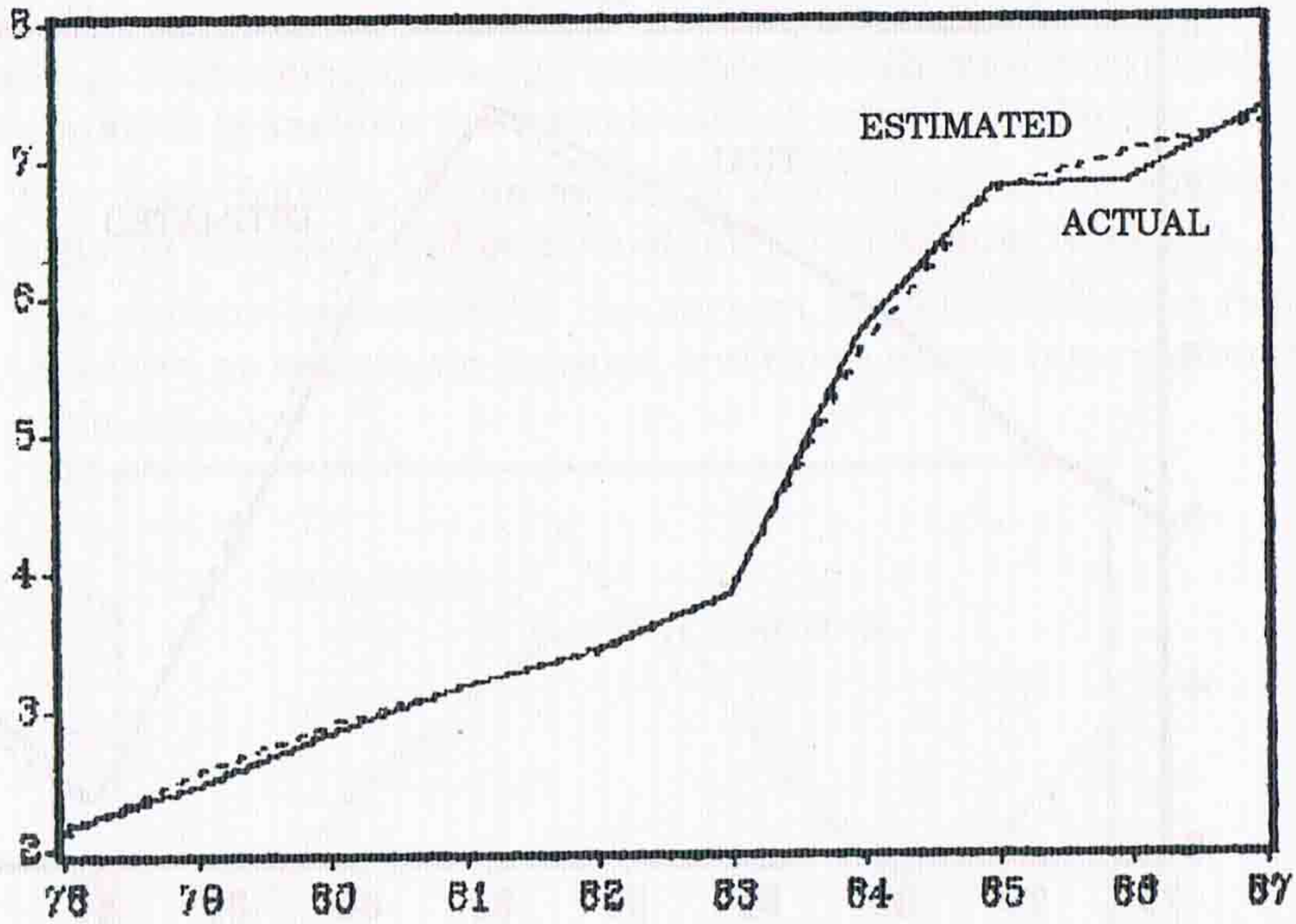
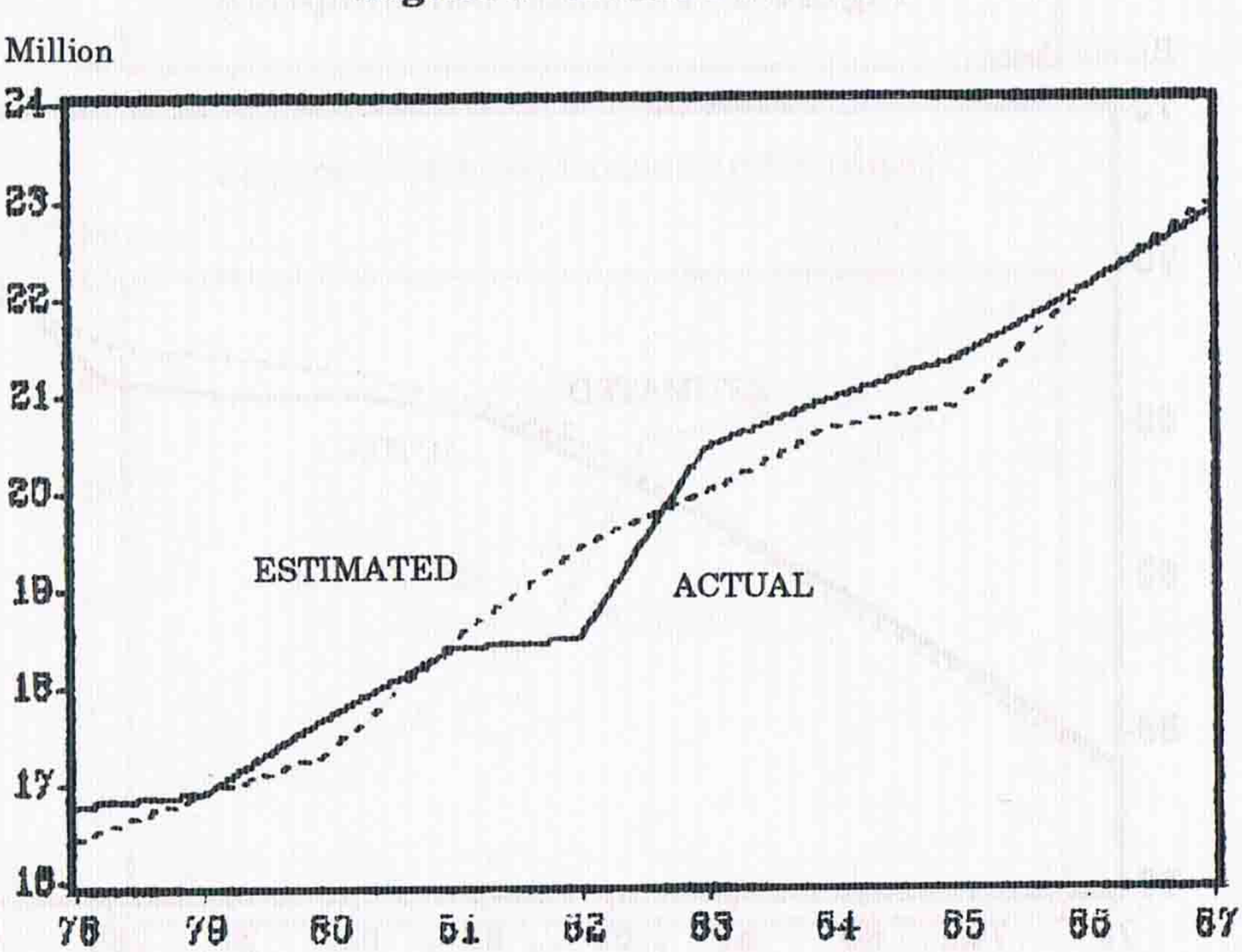


Figure 6 - Labor Force



interactions. Efforts toward removing these limitations are currently being pursued.

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