

## CYCLICAL BEHAVIOUR OF THE PORTUGUESE ECONOMY: 1953-1995\*

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## 1. INTRODUCTION

This paper describes some empirical regularities in Portuguese macroeconomic time-series over the period 1953-1995, using the very detailed dataset of Pinheiro *et al* (1999). This task is carried out by examining the relationship between the aggregate cycle and the cyclical behaviour of various economic series, such as production, expenditure, external accounts, labour market, productivity, savings, income distribution and monetary variables. This study follows previous research conducted at Banco de Portugal on the Portuguese business cycle, i.e. Correia *et al* (1992), Dias (1997) and Neves and Belo (2002), but with a considerable larger degree of detail in the number and variety of economic series considered.

This paper is organised as follows. Section 2 describes the data. Section 3 highlights the main stylised facts of Portuguese business cycles. Finally, section 4 concludes.

## 2. THE DATA

This paper uses the annual data for the Portuguese economy over the period 1953-1995, published in Pinheiro *et al* (1999). Most variables were expressed in *per capita* terms. In addition, quantity measures (Gross Domestic Product (GDP), expenditure components, employment, real wages, real disposable income, real monetary aggregates, etc.) were studied after taking their logarithms. Nomi-

nal variables were expressed in constant prices, using the specific deflator when available, the GDP deflator (in the case of monetary variables) or the private consumption deflator (for compensation of employees, disposable income variables and savings). Variables expressed as ratios (the unemployment rate, external balances, the savings ratio, amongst others) were used without further transformation. The annex presented at the end of the paper provides a statistical description of the variables analysed.

To analyse the cyclical behaviour of the selected economic series, it is necessary to breakdown the observed series into their main components: trend and cycle. For that purpose, we use the Hodrick-Prescott filter, widely used in business cycle analysis. A smoothing parameter of 100 was selected, as this is a fairly standard choice for annual data.

Chart 1 presents *per capita* values (logarithms) of both observed output and trend output. This chart highlights that real GDP growth was markedly different in the first half and in the second half of the sample. Empirical evidence on that is provided in Botas, Marques and Neves (1998). Dias (1997) presents a very interesting discussion on the cyclical regularities in the two sub-samples, issue that will not be addressed in this paper.

Chart 2 presents the cyclical component of GDP throughout the sample period. It is worth mentioning the following main results. First, up to beginning of the 70's, economic cycles show a less regular pattern; only from then onwards reasonably long and regular economic cycles are observed. The most negative components of the cy-

\* The views expressed in this article are those of the authors and not necessarily those of the Banco de Portugal.

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Chart 1

## GROSS DOMESTIC PRODUCT AND TREND

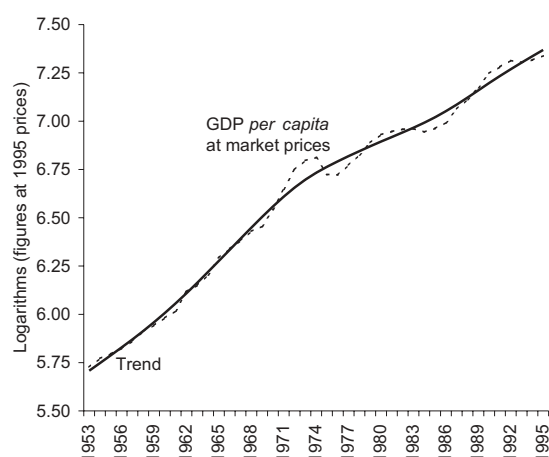
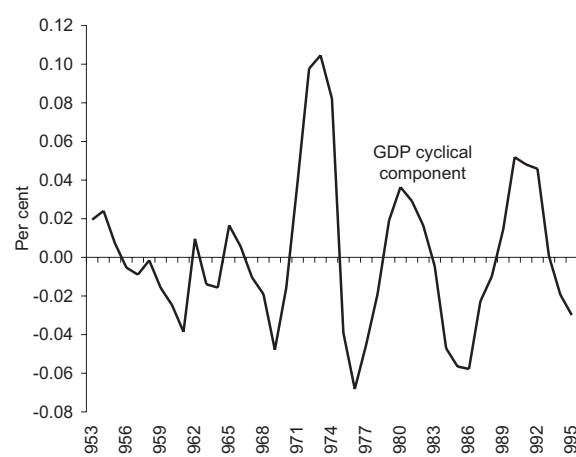


Chart 2

## CYCLICAL BEHAVIOUR



clical component of GDP — the troughs — were observed in 1961, 1969, 1976, 1986 and 1995 (-3.9, -4.8, -6.8, -5.8 and -3.0 per cent, respectively). The most positive components of the cyclical component of GDP — the peaks — were observed in 1954, 1962, 1965, 1973, 1980 and 1990 (2.4, 1.0, 1.7, 10.5, 3.6 and 5.2 per cent, respectively). As it is well-known, estimates of the cyclical component at the very beginning (end) of the sample period are subject to potentially sizeable measurement errors when the Hodrick-Prescott filter is used.

### 3. STYLISTED FACTS OF PORTUGUESE BUSINESS CYCLES

This section describes the most salient features of the Portuguese economic cycles, for selected groups of economic variables. The following descriptive statistics will be analysed:

- standard deviation of the cyclical component of each of the series (absolute and as a proportion of the standard deviation of the cyclical component of GDP when the series are expressed in the same unit);<sup>(1)</sup>
- autocorrelation coefficients for the cyclical component of each variable;
- cross-correlation coefficients (contemporaneous, leading and lagging) of the cyclical component of each series with the cyclical component of real GDP; a (large) positive correlation indicates pro-cyclical behaviour, whereas a (large) negative correlation indicates counter-cyclical behaviour.

These descriptive statistics are reported in Table 1, in the same order as the one followed in this section. Chart 3 presents the cyclical component of real GDP (dashed line) and the cyclical component of each series analysed (thick line).

#### a) Activity in the different productive sectors

Activity in the different productive sectors moves in line with the aggregate cycle. There is a very strong positive correlation between activity in industry, construction and services with the cyclical component of real GDP. The maximal correlations are the contemporaneous ones (figures of 0.86, 0.75 and 0.88, respectively). Chart 3 illustrates clearly the very high degree of cyclical synchronization between real GDP and value added of the industrial and services sectors, particularly in the second half of the sample.

Activity in the primary sector (agriculture, forestry and fishing) is relatively volatile and exhibits

(1) In the case of series that are expressed in logarithms, the units correspond to deviations (expressed in per cent) from trend paths; in the case of variables that are expressed as ratios, the units also correspond to deviations from trend paths (but expressed in percentage points).

Table 1 – (to be continued)

## DESCRIPTIVE STATISTICS OF THE MACROECONOMIC VARIABLES CONSIDERED

Per capita values at 1995 prices (logarithms)

	Measurement unit	Standard deviation	sd(x) / /sd(GDP)	Autocorrelation coefficient		Correlation coefficient between x (t) and GDP(t + i)				
				-1	-2	i=-2	i=-1	i=0	i=1	i=2
GDP at market prices	constant prices	0.039	1.00	0.68	0.13	0.13	0.68	1.00	0.68	0.13
<b>a) Activity in the different productive sectors</b>										
Sectoral desegregation of Gross Value Added										
Agriculture, forestry and fishing	constant prices	0.065	1.65	0.35	0.01	0.06	0.26	0.49	0.29	0.00
Industry	constant prices	0.057	1.45	0.53	0.05	0.07	0.56	0.86	0.56	0.14
Construction	constant prices	0.093	2.36	0.62	0.05	0.07	0.52	0.75	0.58	0.10
Services	constant prices	0.027	0.69	0.69	0.11	0.15	0.66	0.88	0.61	0.07
<b>b) Expenditure components</b>										
Private consumption	constant prices	0.040	1.01	0.61	0.10	0.28	0.76	0.91	0.51	0.00
Private consumption of non-durables	constant prices	0.047	1.20	0.57	0.07	0.20	0.68	0.84	0.48	0.09
Private consumption of services	constant prices	0.034	0.85	0.43	-0.07	0.28	0.59	0.66	0.33	-0.25
Private consumption of non-durables and services	constant prices	0.036	0.92	0.59	0.06	0.25	0.74	0.90	0.50	-0.02
Private consumption of durables	constant prices	0.094	2.37	0.62	0.16	0.30	0.66	0.74	0.43	0.09
Public consumption	constant prices	0.040	1.02	0.46	-0.07	0.20	0.43	0.51	0.29	-0.04
Investment	constant prices	0.104	2.63	0.58	0.03	-0.03	0.42	0.81	0.71	0.28
Gross Fixed Capital Formation (GFCF)	constant prices	0.102	2.58	0.57	0.07	0.15	0.58	0.79	0.50	0.03
GFCF (machinery)	constant prices	0.103	2.62	0.58	0.00	0.21	0.63	0.77	0.42	-0.04
GFCF (transport equipment)	constant prices	0.144	3.64	0.39	0.10	0.12	0.30	0.39	0.35	0.22
GFCF (construction)	constant prices	0.120	3.04	0.47	0.02	0.11	0.49	0.69	0.40	-0.06
Change in inventories (as a % of GDP)	% GDP	0.014	-	0.12	-0.13	-0.37	-0.30	0.07	0.44	0.51
Domestic demand	constant prices	0.052	1.31	0.66	0.13	0.14	0.64	0.93	0.66	0.15
Exports of goods and services	constant prices	0.080	2.03	0.61	0.14	-0.02	0.38	0.65	0.51	0.18
Exports of goods	constant prices	0.084	2.12	0.62	0.12	-0.03	0.32	0.55	0.44	0.18
Exports of services	constant prices	0.102	2.59	0.43	0.04	0.01	0.42	0.70	0.52	0.13
Exports of consumption goods	constant prices	0.088	2.24	0.67	0.22	-0.07	0.32	0.55	0.46	0.16
Exports of non-durable consumption goods	constant prices	0.088	2.23	0.66	0.22	-0.10	0.28	0.55	0.47	0.19
Exports of durable consumption goods	constant prices	0.173	4.39	0.65	0.34	0.14	0.38	0.40	0.28	0.09
Exports of investment goods	constant prices	0.140	3.55	0.36	-0.21	0.11	0.39	0.49	0.29	-0.05
Exports of intermediate goods	constant prices	0.084	2.14	0.56	0.15	0.02	0.22	0.38	0.28	0.12
Exports of energetic goods	constant prices	0.436	11.05	0.22	0.03	0.05	0.27	0.37	0.26	0.15
Overall demand	constant prices	0.050	1.26	0.68	0.15	0.11	0.64	0.96	0.70	0.18
Imports of goods and services	constant prices	0.092	2.32	0.52	0.06	0.08	0.50	0.77	0.62	0.22
Imports of goods	constant prices	0.090	2.28	0.52	0.11	0.04	0.43	0.75	0.64	0.29
Imports of services	constant prices	0.165	4.17	0.50	-0.05	0.27	0.61	0.59	0.32	-0.10
Imports of consumption goods	constant prices	0.159	4.04	0.61	0.39	0.40	0.51	0.51	0.28	0.06
Imports of non-durable consumption goods	constant prices	0.166	4.21	0.47	0.25	0.35	0.35	0.37	0.22	0.07
Imports of durable consumption goods	constant prices	0.196	4.97	0.64	0.33	0.39	0.62	0.60	0.30	0.03
Imports of investment goods	constant prices	0.140	3.54	0.47	-0.01	-0.06	0.36	0.69	0.60	0.27
Imports of intermediate goods	constant prices	0.082	2.08	0.36	-0.09	-0.14	0.26	0.65	0.63	0.32
Imports of energetic goods	constant prices	0.069	1.74	0.46	0.20	-0.01	0.32	0.64	0.70	0.46
Net imports of goods	constant prices	0.357	9.05	0.46	-0.10	-0.04	0.19	0.37	0.37	0.17

Table 1 (continued)

## DESCRIPTIVE STATISTICS OF THE MACROECONOMIC VARIABLES CONSIDERED

Per capita values at 1995 prices (logarithms)

	Measurement unit	Standard deviation	sd(x) / / sd(GDP)	Autocorrelation coefficient		Correlation coefficient between x (t) and GDP (t + i)				
				-1	-2	i=-2	i=-1	i=0	i=1	i=2
c) External accounts										
Current account as a % of GDP										
Current account	%GDP	0.028	-	0.43	-0.09	-0.42	-0.17	0.11	0.29	0.32
Goods and services	%GDP	0.025	-	0.43	-0.05	-0.35	-0.30	-0.14	0.05	0.17
Goods	%GDP	0.020	-	0.41	-0.04	-0.21	-0.26	-0.25	-0.09	0.07
Services	%GDP	0.009	-	0.45	0.00	-0.47	-0.23	0.19	0.32	0.28
Income balances	%GDP	0.007	-	0.76	0.38	-0.12	0.13	0.33	0.37	0.36
Transfer balances	%GDP	0.008	-	0.61	0.10	-0.27	0.21	0.50	0.51	0.29
d) Employment, unemployment and productivity										
Labour force	thousands	0.010	0.24	0.63	0.08	-0.23	0.23	0.52	0.51	0.24
Total employment	thousands	0.015	0.38	0.66	0.12	0.09	0.59	0.78	0.57	0.13
Sectoral employment										
Agriculture, forestry and fishing	thousands	0.020	0.51	0.37	0.05	-0.26	-0.56	-0.53	-0.32	0.04
Industry	thousands	0.028	0.71	0.69	0.14	-0.07	0.41	0.63	0.50	0.15
Construction	thousands	0.061	1.54	0.67	0.09	0.14	0.46	0.53	0.32	-0.14
Services	thousands	0.021	0.52	0.76	0.33	0.18	0.60	0.73	0.56	0.26
Unemployment	thousands	0.188	4.76	0.61	0.06	-0.29	-0.68	-0.72	-0.37	0.09
Unemployment rate	percentage	0.008	-	0.67	0.14	-0.39	-0.76	-0.77	-0.41	0.04
Apparent labour productivity	constant prices	0.023	0.59	0.55	0.06	0.08	0.54	0.89	0.58	0.08
Agriculture, forestry and fishing	constant prices	0.071	1.79	0.38	-0.04	0.10	0.32	0.51	0.29	-0.03
Industry	constant prices	0.039	0.98	0.28	-0.03	0.10	0.38	0.64	0.35	0.09
Construction	constant prices	0.052	1.33	0.42	0.10	-0.08	0.27	0.55	0.53	0.31
Services	constant prices	0.020	0.50	0.66	0.24	-0.07	0.03	0.12	0.02	-0.22
e) Wages, disposable income and savings										
Total compensation of employees	constant prices	0.054	1.36	0.72	0.30	0.53	0.72	0.63	0.34	0.00
Total compensation per employee	constant prices	0.047	1.19	0.66	0.20	0.53	0.45	0.25	0.06	-0.07
Disposable income	constant prices	0.048	1.22	0.71	0.21	0.43	0.79	0.82	0.50	0.01
Savings of the private sector (households and corporations)	constant prices	0.122	3.08	0.49	-0.10	-0.39	0.18	0.68	0.71	0.39
Savings of households and private administrations	constant prices	0.186	4.70	0.10	0.17	0.21	0.39	0.37	0.30	0.09
Households' savings rate (as a % of disposable income)	percentage	0.021	-	0.12	-0.03	0.16	0.27	0.27	0.31	0.11
f) Income distribution										
Total compensation of employees	constant prices	0.054	1.36	0.72	0.30	0.53	0.72	0.63	0.34	0.00
Gross operating surplus	constant prices	0.098	2.47	0.57	-0.13	-0.41	0.18	0.68	0.62	0.26
Labour share	%GDP factor costs	0.028	-	0.57	-0.04	0.59	0.20	-0.25	-0.33	-0.20
Profit share	%GDP factor costs	0.028	-	0.57	-0.04	-0.59	-0.20	0.25	0.33	0.20
g) Monetary variables										
Monetary base (real)	constant prices	0.191	4.84	0.52	0.05	0.41	0.54	0.41	0.17	-0.13
M1 (real)	constant prices	0.065	1.64	0.61	0.16	0.25	0.51	0.47	0.31	0.03
M2 (real)	constant prices	0.057	1.45	0.67	0.21	0.40	0.72	0.74	0.44	-0.04
Credit to non-financial corporations and households	constant prices	0.067	1.70	0.65	0.22	0.43	0.56	0.46	0.11	-0.34

Chart 3 (to be continued)  
CYCLICAL COMPONENTS

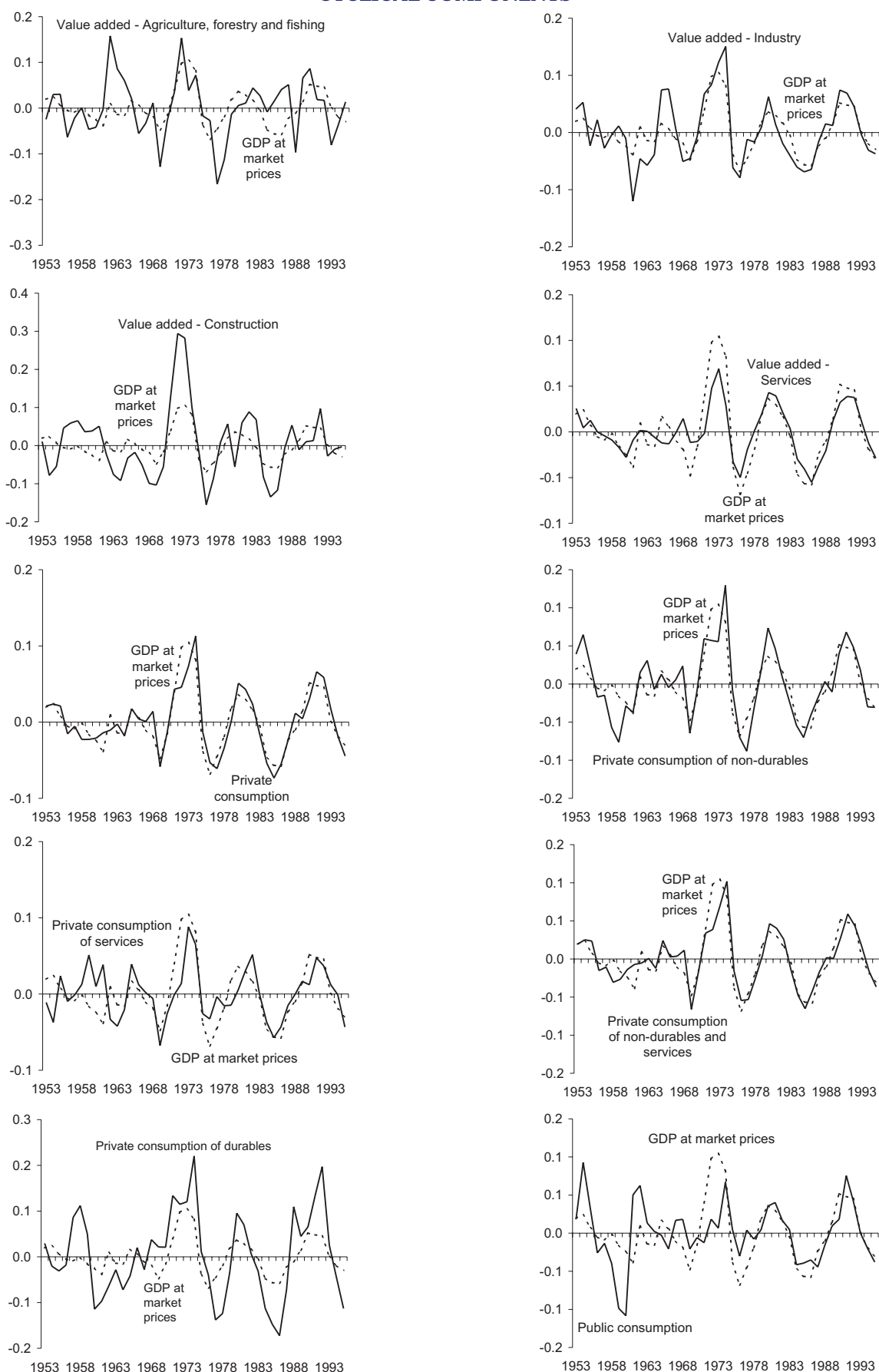


Chart 3 (continued)  
CYCLICAL COMPONENTS

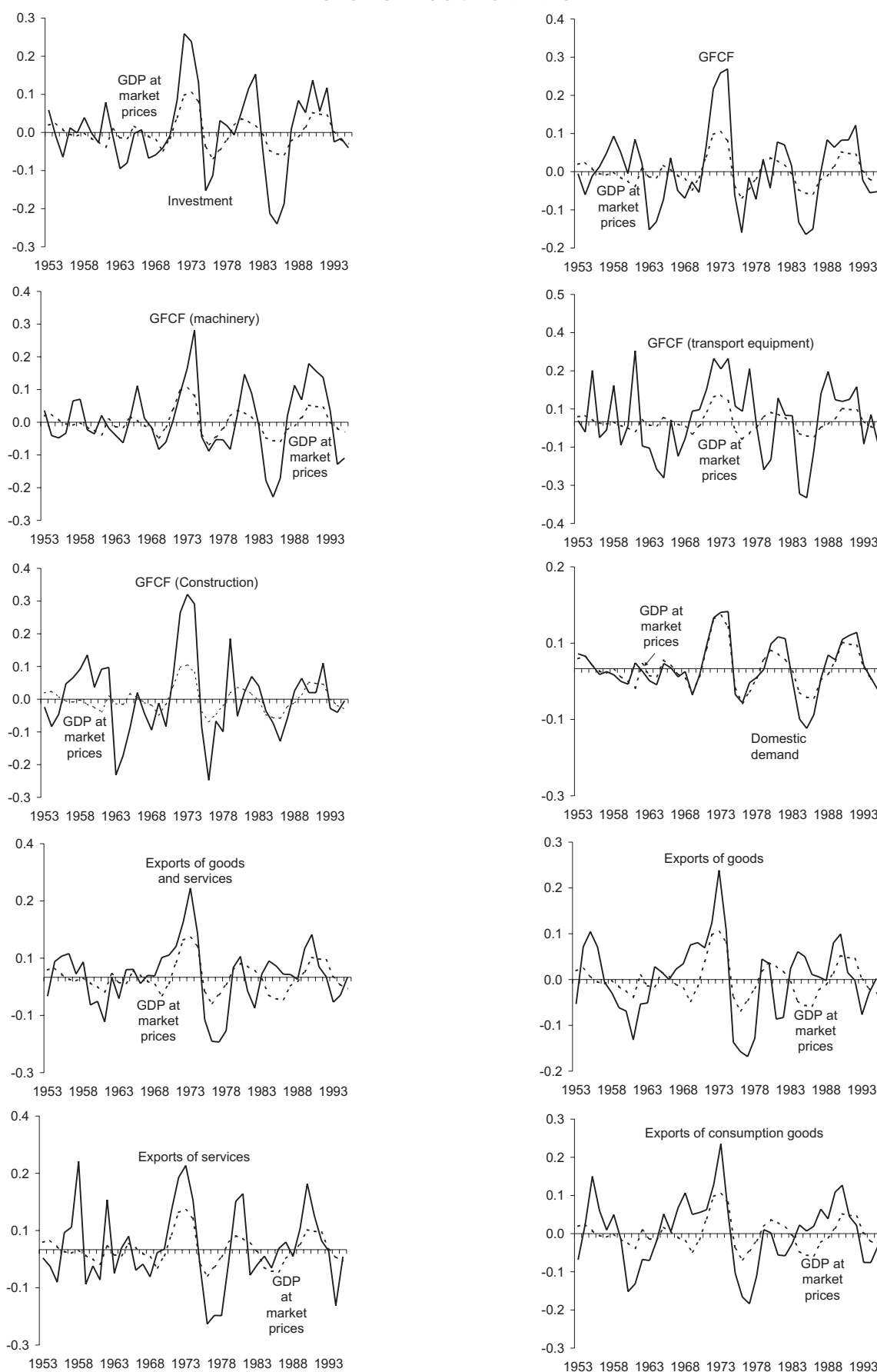


Chart 3 (continued)  
CYCLICAL COMPONENTS

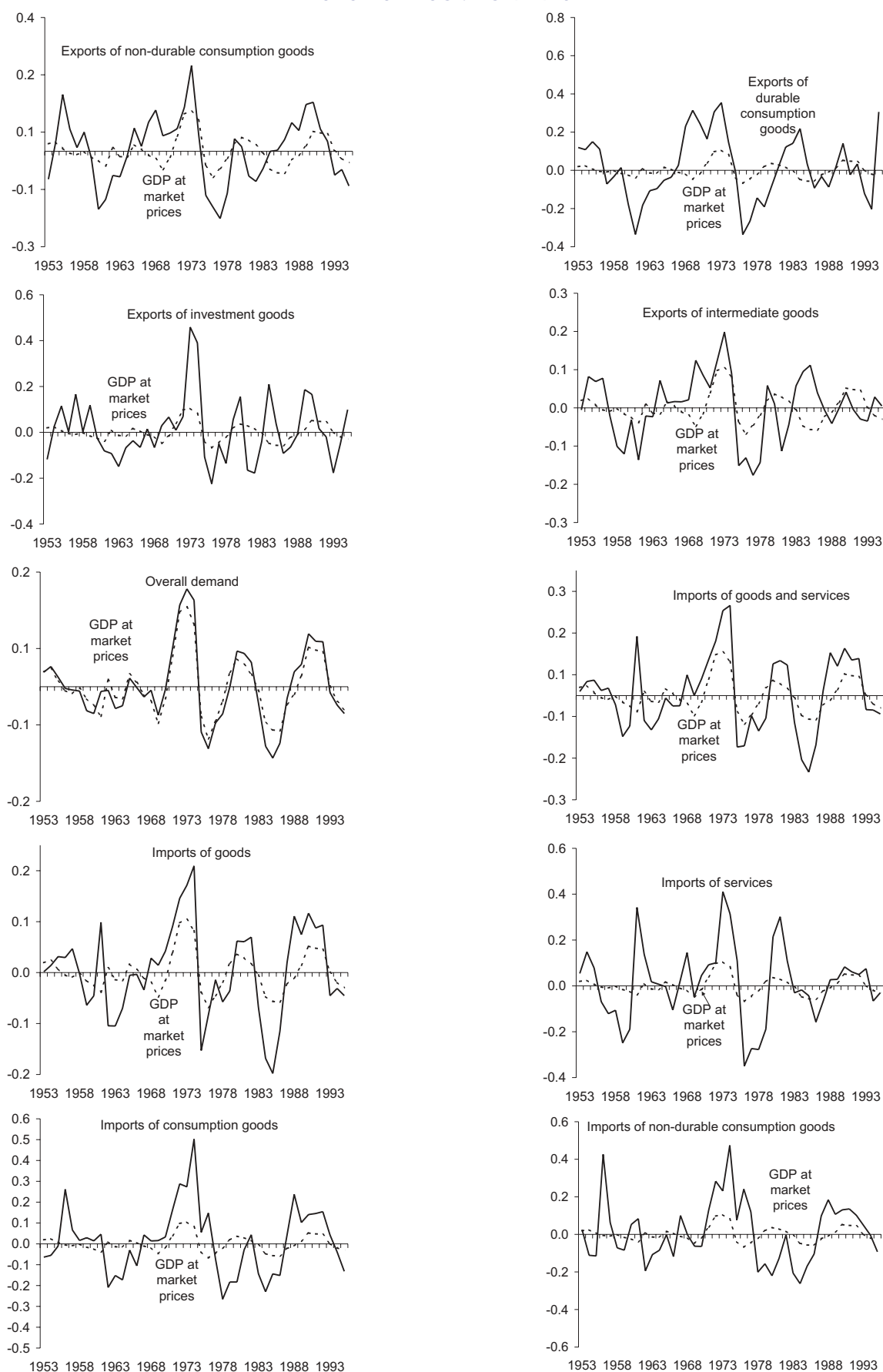




Chart 3 (continued)  
CYCLICAL COMPONENTS

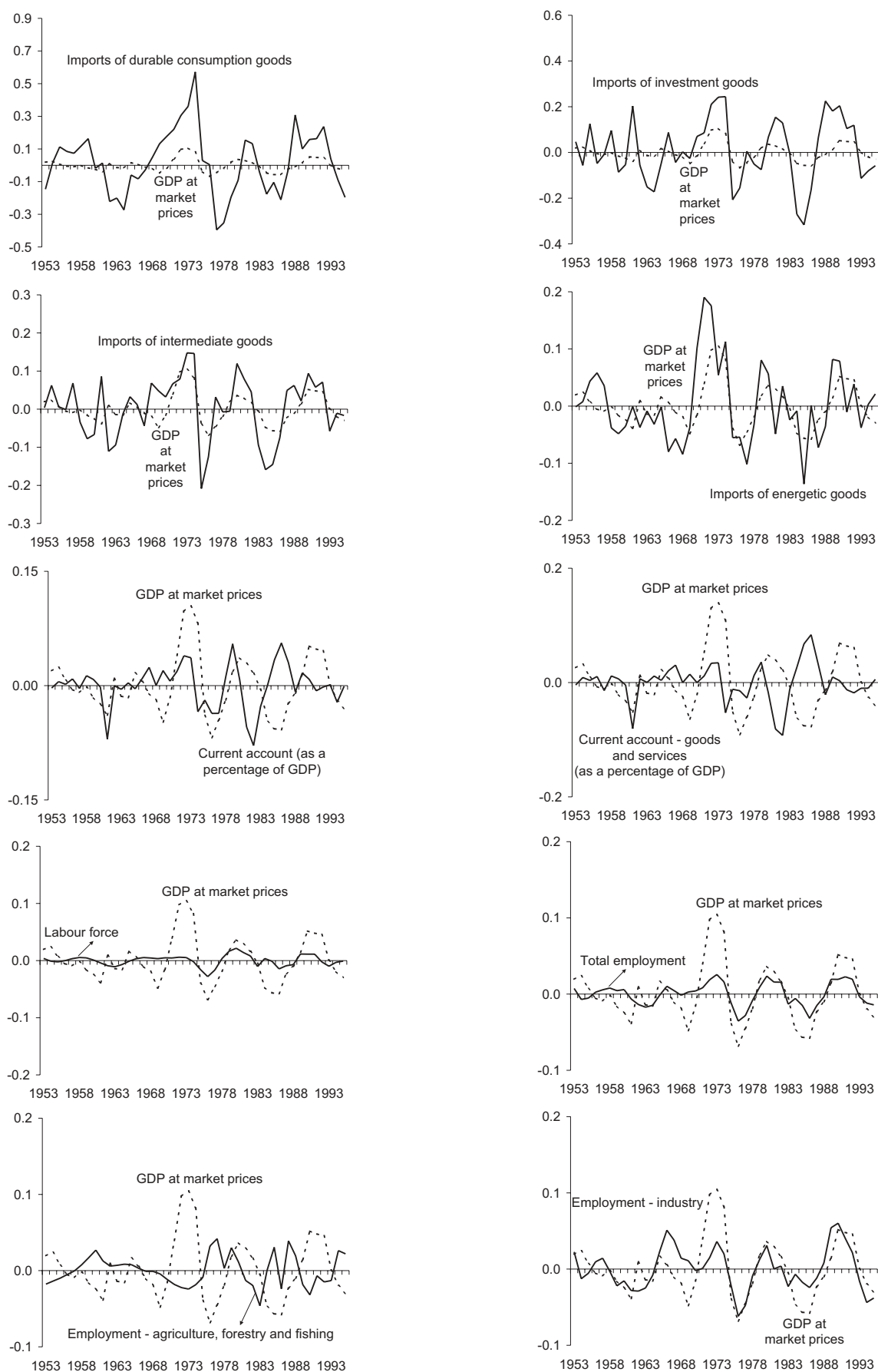




Chart 3 (continued)  
CYCLICAL COMPONENTS

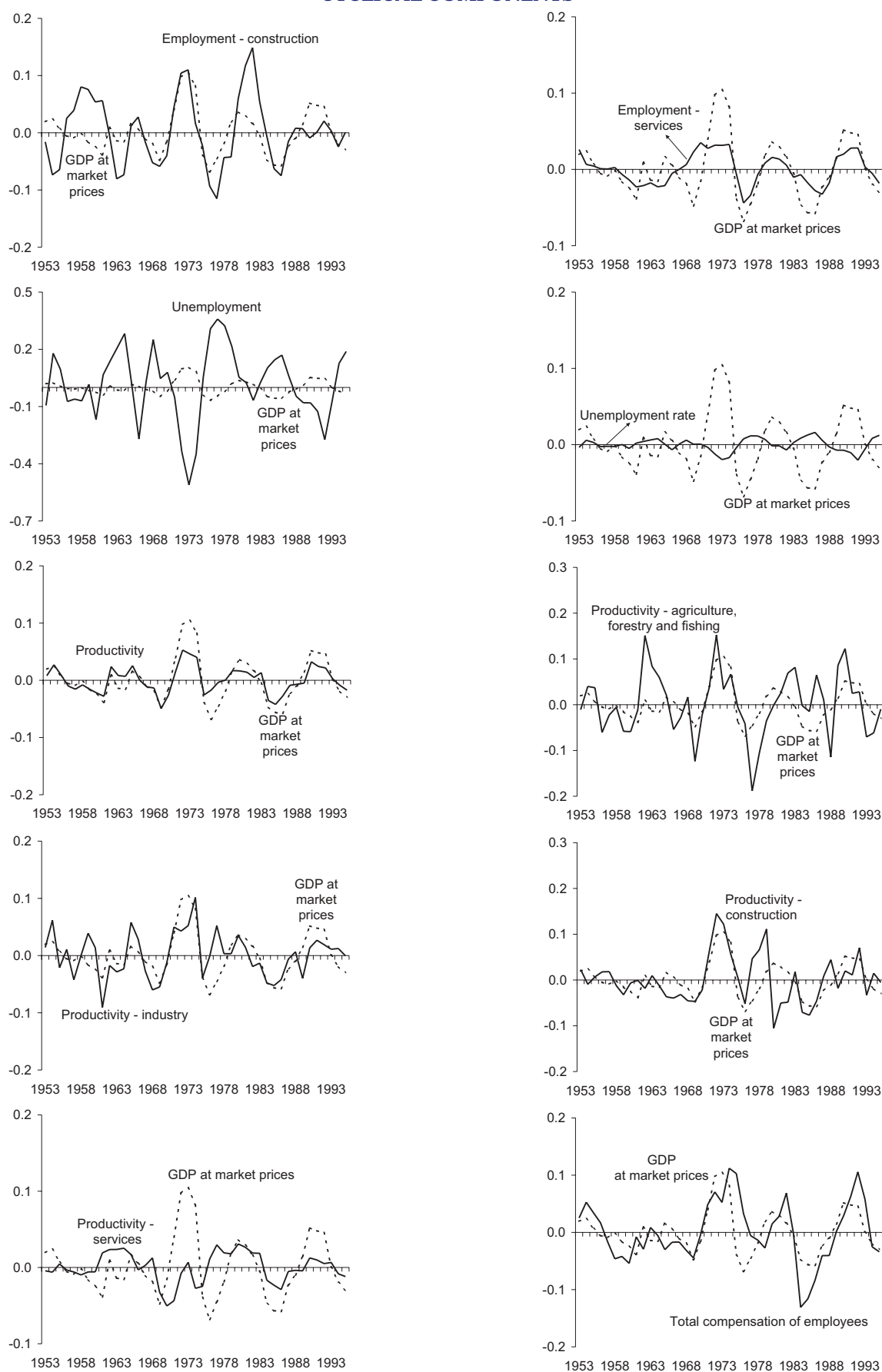
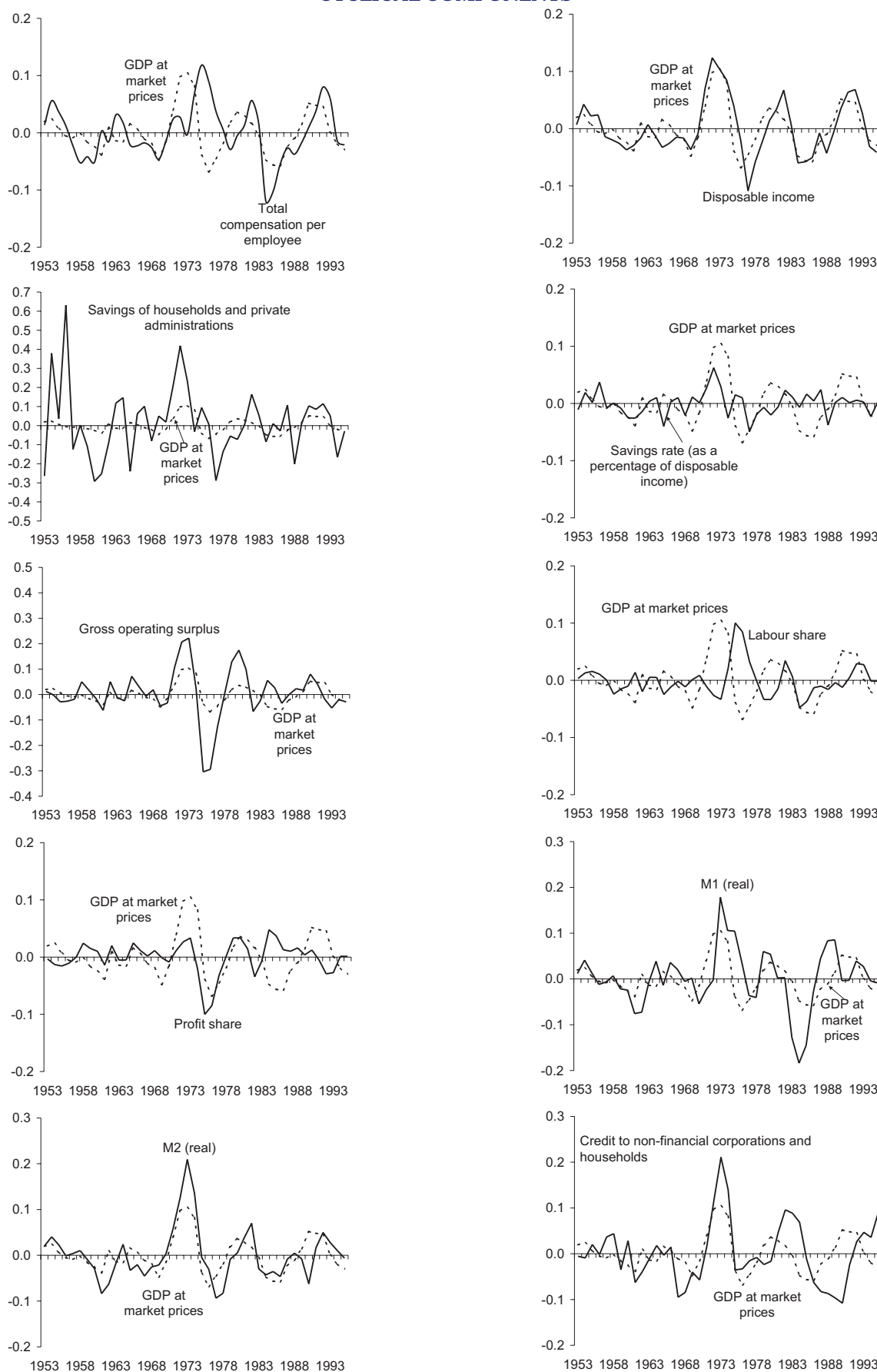


Chart 3 (continued)  
CYCLICAL COMPONENTS



a very low persistence, as one could expect given the nature of the factors that affect agricultural output. It is also pro-cyclical, even if with a lower degree of statistical association than the ones obtained for the remaining sectors. Manufacturing activity is strongly pro-cyclical and with a variability approximately 1.5 times the one of the cyclical component of GDP. Activity in construction is remarkably volatile and strongly pro-cyclical. Finally, the cyclical component of activity in services is less volatile than the one of GDP, is the more persistent and is strongly correlated with the aggregate cycle.

It is worth pointing out that very important changes in the productive structure took place over this period. The weight of the primary sector on Gross Value Added declined dramatically from 28.9 per cent in 1953 to 6.5 per cent in 1995. In the cases of industry (decline from 27.4 to 27.3 per cent) and building and construction (increase from 5.8 to 6.7 per cent) the changes were relatively small. In the case of services, the weight in Gross Value Added increased from 37.9 per cent in 1953 to 59.5 per cent in 1995.

## b) Expenditure components

Private consumption and gross fixed capital formation are strongly pro-cyclical. The contemporaneous correlation between the respective cyclical components and the one of GDP is 0.91 and 0.79, respectively. In the case of public consumption the correlation is 0.51.

Private consumption moves approximately coincidentally with the aggregate business cycle. However, the cyclical behaviour of its components — services, durables and non-durables — is not uniform, displaying some interesting features. Consumption of services is less volatile than output over the cycle, whereas the consumption of non-durables is slightly more volatile than output. The aggregate of these two components of private consumption is less volatile than output — and even less so than the cyclical component of disposable income — which is consistent with the smoothing implied by the permanent income hypothesis. Consumption of durables, as measured by purchases and not the service flow of those goods, is considerably more volatile than output (around 2.4 times). This is consistent with the fact

that purchases of this type of goods are usually concentrated on good economic times. Chart 3 illustrates the very high volatility of the consumption of durables, as well as the high degree of cyclical synchronization between real GDP and all the categories of consumption. It is also worth mentioning that the synchronization between the cyclical components of GDP and consumption increased in the second half of the sample, a result already pointed out in Dias (1997).

It is also worth mentioning that, for aggregate consumption as well as for each one of the three components considered, the correlation with the cyclical component of  $t-1$  GDP is clearly above the one with the cyclical component of  $t+1$  GDP. This suggests that for a quarterly frequency of the data, one could find that private consumption peaks somewhat later than real GDP, probably reflecting the lagging behaviour of labour market variables and their influence on real disposable income.

Public consumption also presents a reasonably strong correlation with real GDP. The volatility of the respective cyclical components is nearly the same as the one of real GDP.<sup>(2)</sup> The synchronization of the series increased substantially in the second half of the sample period.<sup>(3)</sup>

Gross Fixed Capital Formation is strongly pro-cyclical and very volatile, as its cyclical component is some 2.6 times more volatile than the cyclical component of GDP. These results hold for the main components of Gross Fixed Capital Formation, i.e. machinery, transport equipment and building and construction. It is worth mentioning that investment in transport equipment is the least strongly correlated with contemporaneous real GDP as well as the most volatile. This is likely to reflect the fact that an important part of this type of investment relates to the acquisition of transport equipment for public services (aeroplanes, boats, railways equipment), not necessarily correlated with the business cycle.

In order to assess the cyclical behaviour of stocks, we estimated the cyclical component of the change in inventories, expressed as a percentage of

(2) It is worth noting that, in the case of the USA, Cooley and Prescott (1995) and Stock and Watson (1999) conclude that government non defence purchases are largely unrelated to the business cycle.

(3) See also Dias (1997).

GDP. The maximum correlation is achieved for  $t+2$  indicating that the evolution of that variable can provide leading indications about the future evolution of real GDP. This result should be interpreted with caution, however, as the change in inventories, as registered in national accounts, also reflects statistical discrepancies.

Exports of goods and services are strongly correlated with real GDP, being the correlation slightly stronger in the case of services than in the case of goods. The strongest correlation is the contemporaneous one. The cyclical component of exports is twice as much volatile as the GDP one. Table 1 also presents the cyclical properties of the main components of exports of goods, i.e. consumption (durables and non-durables), investment, intermediate and energetic exports. All the components are pro-cyclical, being worth mentioning the large volatility in the case of exports of durable consumption, investment and energetic goods (in the last case, one should stress the very minor weight of this component in total exports).

It is also worth mentioning that, for total exports as well as for both exports of goods and services, the correlation with the cyclical component of  $t+1$  GDP is clearly above the one with the cyclical component of  $t-1$  GDP. This suggests that if we were using quarterly data, one could find that exports tend to peak somewhat earlier than total GDP, a not surprising result for a small and open economy.

Imports of goods and services are strongly correlated with output, being the correlation higher in the case of goods than in the case of services. The cyclical component of total imports is 2.3 times more volatile than the cyclical component of GDP. Table 1 also presents the descriptive statistics for the main components of imports of goods, i.e. consumption (durables and non-durables), investment, intermediate and energetic goods. The cyclical components of imports of consumption (both durables and non-durables) and investment goods display the largest volatilities. It is also worth mentioning that imports of energetic and intermediate goods have some leading properties vis-à-vis the cyclical component of GDP, whereas imports of consumption durables seem to have some lagging properties.

As we have just seen, total imports of goods and services are strongly pro-cyclical (correlation

coefficient of 0.77). Exports are also pro-cyclical, but with a smaller correlation with the cyclical component of aggregate activity (correlation coefficient of 0.65). Net imports of goods — measured at constant prices — are pro-cyclical. This means that periods of higher use of productive resources (i.e. associated with higher cyclical components of GDP) tend to coincide with periods of larger trade imbalances.

### c) External accounts

It is also interesting to analyse the cyclical behaviour of the current account and its main components, when expressed in percentage of GDP. The current account and the trade account are counter-cyclical, with a lag of one or two years, whereas both the income and transfer balances are pro-cyclical, leading GDP by one year.

These results are broadly in line with the evidence on international business cycles. Backus *et al* (1995), for instance, conclude that for 10 industrialised countries the contemporaneous correlation of the cyclical component of the ratio of net exports to output, both at current prices, with the cyclical component of activity is always negative. They also point out that the correlation with output varies substantially across the countries considered, from -0.01 to -0.68. The figure presented for Portugal is very close to the average figure obtained for those 10 countries. Stock and Watson (1999) also conclude that the trade balance is counter-cyclical in the USA.

### d) Employment, unemployment and productivity

The labour force is pro-cyclical, being the contemporaneous correlation and the one with the cyclical component of  $t+1$  GDP approximately equal, suggesting that this variable may provide some leading indications on the evolution of economic activity. The positive correlation between the cyclical components of labour force and real GDP means that stronger increases in labour participation take place in good times, probably reflecting the effect of better pay conditions.

Total employment is strongly pro-cyclical, being the largest correlation the contemporaneous one. This series does not seem to be neither leading nor lagging vis-à-vis real GDP. Sectoral em-

ployment is, with the notable exception of employment in the primary sector, pro-cyclical, being the largest correlation the contemporaneous one. Employment in agriculture, forestry and fishing is counter-cyclical, indicating that the (structural process of) transition of employment from agriculture to other activities is intensified when general conditions are more favourable. The cyclical component of employment in the construction sector is clearly more volatile than in the remaining sectors. This seems to be related with the considerable larger variability of value added in that sector, as mentioned in a).

Unemployment is strongly counter-cyclical, being the largest correlations the contemporaneous and the one with GDP lagged one period. The volatility of unemployment exceeds by large the one of employment, which is also slightly larger than the one of working population. This ranking is the expected one, given the magnitude of those variables. The cyclical properties of the unemployment rate are very similar to the ones already mentioned for the level of unemployment.

Apparent labour productivity is strongly pro-cyclical and varies less than output (0.6 times less volatile than output). This result is in line with well-known established regularities of international business cycles. See for instance Cooley and Prescott (1995), Kydland (1995), Backus, Kehoe and Kydland (1995) and Stock and Watson (1999). However, in the Portuguese case the strongest correlation is the contemporaneous one, whereas available evidence usually indicates some leading indications of productivity. For instance, Stock and Watson (1999) conclude, for the United States, that productivity has a lead of two quarters on aggregate activity. The result obtained in Portugal probably reflects the frequency of the data (i.e. annual rather than quarterly data).

Apparent labour productivity is also pro-cyclical and contemporaneously correlated with real GDP in the main sectors, even if the correlations are clearly lower than in the case of aggregate productivity. The variability of the cyclical component of productivity in the primary sector and construction clearly exceeds the one in industry. Productivity in the services sector is the least volatile. Persistence is remarkably high (low) in the services sector (primary sector and, maybe surprisingly, in industry).

#### e) Wages, disposable income and savings

When assessing the cyclical properties of wages — or more exactly total compensation of employees, as it includes social security contributions — it is useful to distinguish between total and per employee figures. Table 1 presents the cyclical properties for both cases. These variables are pro-cyclical and lagged in relation to the overall economic cycle, by one and two years, respectively. This constitutes a very important feature of the Portuguese labour market, which is probably related to the fact that unemployment also shows some lagging indications vis-à-vis the GDP cycle — as the larger correlations were either the contemporaneous one or the one lagged one period — which has non-negligible effects on the wage bargaining process.

The volatility of per employee wages is two times the volatility of apparent productivity. This is a clear illustration that real wages increase by more (less) than productivity in good (bad) times, as it will be also discussed in f) below.

The evolution of household disposable income is strongly pro-cyclical. The larger correlation is the contemporaneous one (correlation coefficient of 0.82) but the one lagged one period is very similar (0.79). This result is, of course, a natural implication of the already mentioned cyclical behaviour of wages and employment.

Real savings of the private sector (households and private corporations) — deflated using the private consumption deflator — are strongly pro-cyclical and peak nearly one year before GDP. Households' savings are also pro-cyclical, but their correlation with GDP is not so strong. The strongest correlation of this variable is either the contemporaneous one or the one lagged one period in relation to GDP. Households' savings ratio, expressed as a percentage of disposable income, is also pro-cyclical. The same magnitude for the empirical correlation (i.e. from 0.27 to 0.31) is obtained in the cases of the cyclical components of  $t-1$ ,  $t$  or  $t+1$  GDP.

#### f) Income distribution

The Gross Domestic Product at factor prices is equal to the sum of total compensation of employees (including social security contributions) and



the gross operating surplus. The definition of the labour and profit shares is, therefore, straightforwardly derived, even if they can be seen only as empirical proxies to the measurement of labour and profit shares. In the computation of the shares all the variables were considered at current prices.

When the variables are expressed in levels, both total compensation of employees and the gross operating surplus are pro-cyclical. In the first case, and as already noticed, the strongest correlation is with the cyclical component of  $t-1$  GDP, whereas in the second case the strongest correlation is obtained with the cyclical components of  $t$  and  $t+1$  GDP. As one could expect, the gross operating surplus is more volatile (two times more) than the total compensation of employees.

Being both variables pro-cyclical in levels, it is interesting to see how they behave when expressed as shares, and therefore being forced to respect a linear restriction. The largest correlation between the cyclical component of the shares and the cyclical component of GDP is obtained with a lag of two years. There is a positive correlation between the deviations of the labour share vis-à-vis its trend and the cyclical component of aggregate activity. The lag probably reflects the lag in some labour market variables, like real wages. The cyclical behaviour of the labour share means that, in good times, real wages increase by more than productivity and that, in bad times, they increase by less. This constitutes a stylised fact of the Portuguese labour market, usually referred as the high real wage flexibility. Throughout the sample period this process has been consistent with share variations around a fairly constant labour share of 55 per cent, using the proxy above mentioned.

Given the linear constraint on the sum of the shares, one obtains a (exactly symmetric) negative correlation between the profit share and the cyclical component of GDP and the corresponding lag. Empirical evidence available for the USA shows that the labour share is counter-cyclical, with a lag of two quarters. See for instance Kydland (1995). Therefore, the cyclical behaviour of the labour share in Portugal seems to be different than the one obtained for the USA.

## g) Monetary variables

In what concerns monetary variables, we decided to analyse three different aggregates: the monetary base, M1 and M2. These three variables were filtered in real terms, using as price indicator the GDP deflator. The cyclical components of the three series are pro-cyclical, usually with one year lag vis-à-vis the cyclical component of real GDP. The same result was obtained for credit to non-financial firms and households. The result of pro-cyclical monetary aggregates is a reasonably robust stylised fact. See, for instance, Cooley and Hansen (1995) or Stock and Watson (1999). However in both studies monetary aggregates are leading indicators to the evolution of real GDP whereas in Portugal, for the period analysed, they seemed to have behaved with a lag of one year.

## 4. CONCLUSIONS

The main stylised features of the cyclical behaviour of the Portuguese economy in the period 1953-1995 were the following:

- a) cyclical fluctuations across the main sectors of the economy — i.e. industry, building and construction, and services — are relatively synchronized;
- b) the demand components — private consumption, gross fixed capital formation, exports, imports and, to a minor extent, public consumption, — are strongly pro-cyclical;
- c) consumption of non-durables and services is smooth, fluctuating slightly less than output;
- d) gross fixed capital formation and the consumption of durables fluctuate considerably more than output (2.5 times more volatile);
- e) exports and imports fluctuate considerably more than output (2.0 and 2.3 times more volatile, respectively);
- f) the external balance is counter-cyclical, with a lag of one or two years;
- g) the labour force and employment are strongly pro-cyclical;
- h) unemployment is strongly counter-cyclical, either contemporaneously or with a slight lag;

- i) apparent labour productivity is strongly pro-cyclical;
- j) the variability of GDP real can be approximately decomposed in the variability of productivity and employment (with contributions of 60 and 40 per cent, respectively);
- k) real wages are pro-cyclical, with a lag of one or two years vis-à-vis the cyclical component of GDP;
- l) real wages are two times more volatile than apparent productivity;
- m) savings — both in levels and as a percentage of disposable income — are pro-cyclical;
- n) the labour share is pro-cyclical, peaking around two years after real GDP;
- o) monetary aggregates are pro-cyclical.

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## ANNEX

## STATISTICAL DESCRIPTION OF THE SERIES USED IN THE STUDY

This annex provides detailed statistical information on the series used in this study. Annex 1 reports the arithmetical average of the observed growth rates for a long list of macroeconomic variables. Variables presented in a), b) and d) are ex-

pressed in real terms. The respective standard error and the maximum and minimum values are also included in the table. Annex 2 includes the same basic descriptive statistics for variables expressed as ratios.

## Annex 1

## DESCRIPTIVE STATISTICS

## Growth rates

	Average	Standard deviation	Maximum	Minimum
<b>a) Economic activity</b>				
GDP at market prices .....	4.4	3.1	10.5	-5.1
GDP at market prices <i>per capita</i> .....	4.0	3.6	11.1	-8.4
Gross Value Added — Agriculture, forestry and fishing ..	1.6	7.8	20.7	-15.1
Gross Value Added — Industry .....	6.0	6.2	22.7	-11.9
Gross Value Added — Construction .....	2.9	9.0	25.4	-16.0
Gross Value Added — Services .....	4.5	2.2	9.9	0.3
<b>b) Expenditure components</b>				
Private consumption .....	4.5	3.4	10.0	-5.4
Private consumption of non-durables .....	4.1	4.5	11.9	-6.5
Private consumption of services .....	4.7	3.7	12.7	-3.0
Private consumption of non-durables and services .....	4.3	3.2	9.5	-4.5
Private consumption of durables .....	6.7	9.1	28.7	-12.8
Public consumption .....	6.1	4.7	25.5	-0.8
Investment .....	6.1	10.3	30.4	-20.6
Gross Fixed Capital Formation (GFCF) .....	5.8	9.8	22.0	-21.1
GFCF (machinery) .....	8.0	10.2	33.1	-19.7
GFCF (transport equipment) .....	8.2	17.8	45.9	-28.2
GFCF (construction) .....	4.6	12.6	33.9	-27.0
Domestic demand .....	4.9	4.4	13.1	-8.7
Exports of goods and services .....	8.4	7.7	27.8	-14.4
Exports of goods .....	9.1	8.1	29.4	-15.9
Exports of services .....	6.4	11.4	31.2	-19.8
Exports of consumption goods .....	8.8	8.1	23.5	-10.2
Exports of non-durable consumption goods .....	8.1	8.2	25.3	-10.9
Exports of durable consumption goods .....	19.1	20.0	92.6	-24.1
Exports of investment goods .....	15.0	16.8	54.6	-26.4
Exports of intermediate goods .....	7.9	9.0	31.3	-17.3
Exports of energetic goods .....	78.7	411.2	2 667.1	-50.6
Overall demand .....	5.4	4.0	12.5	-9.6
Imports of goods and services .....	9.0	9.5	34.5	-22.4
Imports of goods .....	9.4	9.4	28.6	-23.8
Imports of services .....	7.1	19.1	84.3	-41.3
Imports of consumption goods .....	12.2	16.0	46.3	-26.7
Imports of non-durable consumption goods .....	13.3	20.2	82.5	-29.6
Imports of durable consumption goods .....	11.9	18.6	59.9	-39.0
Imports of investment goods .....	10.2	15.7	43.6	-30.2
Imports of intermediate goods .....	9.2	10.0	27.1	-24.6
Imports of energetic goods .....	6.7	7.8	23.6	-9.1
<b>c) Employment, unemployment and productivity</b>				
Labour Force .....	0.9	0.9	3.3	-0.9
Total Employment .....	0.8	1.3	3.4	-2.3
Employment — Agriculture, Forestry and Fishing .....	-2.4	2.4	3.8	-7.7
Employment — Industry .....	1.2	2.8	6.4	-4.6
Employment — Construction .....	3.0	5.7	16.5	-6.9
Employment — Services .....	2.4	1.8	6.3	-2.1
Unemployment .....	5.4	22.4	86.2	-29.1
Productivity .....	3.6	2.6	10.4	-2.9
Productivity — Agriculture, forestry and fishing .....	4.2	8.7	28.3	-11.9
Productivity — Industry .....	4.7	5.2	15.3	-8.7
Productivity — Construction .....	-0.2	6.0	11.1	-22.9
Productivity — Services .....	2.1	1.9	7.0	-2.7
<b>d) Wages and disposable income</b>				
Total compensation per employee .....	4.0	4.8	12.1	-12.7
Disposable income .....	4.7	4.1	14.2	-6.0

## Annex 2

## DESCRIPTIVE STATISTICS

## Ratios

	Average	Standard deviation	Maximum	Minimum
<b>a) Current account ( as a % of GDP)</b>				
Current account .....	-1.8	3.8	3.5	-12.9
Goods and services .....	-7.1	3.6	-1.3	-17.3
Goods .....	-8.7	4.0	-2.9	-19.0
Services .....	1.6	1.8	5.0	-2.6
Income balances .....	-1.0	1.9	0.7	-6.2
Transfer balances .....	6.3	2.6	10.7	2.0
<b>b) Unemployment</b>				
Unemployment rate .....	5.0	2.5	9.9	1.4
<b>c) Savings</b>				
Savings rate (as a % of disposable income) .....	18.0	7.5	30.5	3.7
<b>d) Income distribution</b>				
Labour share .....	55.6	5.7	73.8	48.8
Profit share .....	44.4	5.7	51.2	26.2