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Inventory investment and sectoral characteristics in some OECD countries

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ABSTRACT

This paper discusses the effects of sectoral structure on the long run macroeconomic inventory behaviour of national economies. Data on 15 OECD countries are included in the analysis, which is based on correlation and cluster analysis methodologies. The study is part of a long-term research project exploring factors influencing the inventory behaviour of national economies.

First, we introduce some basic characteristics of macroeconomic inventory formation in the 15 OECD countries. We argue that our previous results on the existence of specific characteristic features of macroeconomic inventory investment are justified, hence it makes sense to study the factors influencing these features. We then examine the contribution of various sectors to the production of in the countries involved and the relationship between sectoral structure and inventory intensity (annual inventory change/Gross Value Added). We find that the high share of agriculture and manufacturing increases inventory intensity, that the increasing share of services has a negative effect and that the role of construction and trade is not obvious. The relatively low stability of the statistical results warns us to be cautious with our judgements. Further, case-by-case analysis would be required to obtain more solid results.

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1. Introduction

Our paper focuses on some macroeconomic characteristics of the inventory behaviour of national economies. This research field is largely unexplored. There is only one country in which it is adequately studied: the United States, from which a rich set of research results is available (for some recent studies, see Ehemann, 2004; Hirsch, 1996; Humphreys, 2001; Humphreys et al., 2001; Irvine, 2003a, 2003b, 2005; Irvine and Schuh, 2005; Stern, 2001). There are very few country-specific studies (for exceptions, see Dimelis and Lyriotaki, 2007; Guariglia and Mateut, 2010) and, as logically follows, there are very few cross-country or USA-EU comparisons (Dimelis, 2001; West, 2002). It should be noted, however, that there are interesting and recurring debates about the macroeconomic roles of inventories, especially in connection with business cycles (see Blinder and Maccini, 1991; Lovell, 1994; Chikán-Milne and Sprague, 1994; Dimelis, 2001; Malgarini, 2007).

Our interest in macroeconomic inventory behaviour dates back to the 1980s. At the First International Symposium on Inventories in 1980, a paper on the effect of the general state of the economy on inventory investment and structure was presented (Chikán, 1981). Since that time, we have largely focused on international comparisons of macroeconomic inventory behaviour. As in the paper by

Chikán and Horváth, 1999, we compared trends in 88 countries to determine the connection between the inventory intensity (inventory investment/GDP) of the individual countries and various components of GDP. The current series of papers began in 2003 (Chikán and Tátrai, 2003), when we started to examine data from 14 OECD countries. (The data are probably the most reliable inventory data available). Since that time, we have used the annual inventory investment/GDP ratio to measure national inventory intensity. In the 2003 paper, we analysed the ratio's relationship with various measures and the development, growth and fluctuation of GDP. In our research, we have used regression analysis and multivariable statistical methods. We have examined almost 20 hypothesis and found interesting results, such as the following:

Inventories relative to GDP tend to decrease in developed countries after the early 1980s.

- The inventory characteristics of developed countries converge;
- however, no general regression model that uses components of GDP usage (fixed capital investment, exports, etc.) as independent variables can be found to describe the inventory behaviour of various countries.
- Even though the tendency of the inventory/GDP ratio to decrease and converge appears to be valid across countries, the reasons for this tendency appear to vary not only by country but also by time period.

In this paper, a new dimension of the factors that influence inventory investments is analysed: the sectoral structure of the economy.

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In recent years, we have conducted a series of examinations of macroeconomic inventory behaviour using multivariate statistical methods. Results of our research (the special characteristics of which are methodological: we consequently use multivariate statistical methods) have been reported in a series of papers presented at the biannual symposia of the International Society for Inventory Research (ISIR). For the latest paper in the series, with references to earlier papers, see Chikán and Kovács, 2009.

In this paper, we continue in the same methodological tradition, but take a different perspective in our analysis: in earlier papers, we analysed national inventory behaviour in terms of output (GDP use), but we now turn to input for our analysis (GDP production). We take steps to understand the relationship between the sectoral structure of various economies and their inventory behaviour. As stated earlier, we used OECD data for the analysis—this is the relatively richest and most coherent international database for macroeconomic inventory analysis. Even this database has limitations, however, which restricted our options during the analysis. The database is accessible on the OECD website (www.oecd.org <www.oecd.org/>).

We believe we have obtained some interesting results even though several of our attempts to find relationships between various sectoral characteristics of the studied economies and their inventories have failed.

Our main hypothesis is that the sectoral structure of economies and changes in this structure influence inventory investments. We test this hypothesis by examining the relationship between the sectoral structure and inventories from various angles.

2. Characteristics of inventory investment in developed countries

The starting point of our analysis was to examine inventory investments in OECD countries where appropriate data were available. The focus of our study is the relative inventory investment, i.e., the proportion of change in inventory level in a given year compared with the Gross Value Added (GVA) of the country in the same year. We wanted to know whether there is a relationship between this figure (which reflects the proportion of GVA invested in inventories in any given year) and the sectoral structure of the economy (measured by the contribution of various sectors to the production of GVA). The relative inventory

investment ratio ($IC/GVA = \text{inventory change}/\text{Gross Value Added}$) is positive in the case of increasing inventory and negative in the case of inventory disinvestment.

We had a nearly complete time series of the IC/GVA ratio of 15 countries from among the most developed economies of the world for the 1987–2007 time period. (There are a few countries for which the time series is a bit shorter, but even for these countries, the time series are no smaller than 17 subsequent years, a length that is adequate for our analysis.)

It must be mentioned here that, considering the high volatility of inventories, the use of data that is more disaggregated, e.g., a quarterly time series, would greatly increase the importance of our results. Such data are, unfortunately, unavailable in any international data systems, so we had to compromise with annual data.

However, this is not a major problem for our research because we are interested in long-term trends and aggregate behaviour. In fact, registering quarterly movements might have detracted from the long-term view of our work. Therefore, the use of annual data is both a necessity (due to the lack of more frequent registering of inventories in national and international statistics) and an advantage (making it necessary and possible to focus on lasting effects).

Fig. 1 shows the graph of the IC/GVA ratio of all 15 countries. It can be seen that although the IC/GVA ratio varies substantially by year in each country, the changes remain in a well-definable range that shows a tendency of getting narrower over time. This is an illustration of the tendency that we discussed in an earlier paper (Chikán et al., 2005); namely, that in every country, there exists a kind of “normal” level of inventories around which the annual data fluctuate (for an explanation of such norms, see Kornai, 1980). It is a very interesting discovery that these norms seem to converge in the developed countries. It is also noteworthy that these normal levels have no clear tendency towards decline despite the much-celebrated improvements in companies’ inventory management. It appears that the analysis in Chikán (1994) still holds true.

Fig. 2 shows the long-term averages (the “norms”) of the individual countries and their volatility over the 21 years in the sample. Countries in the figure are arranged in an increasing order of IC/GVA. There are no outliers. Only Germany had a negative average, which was due to its serial inventory disinvestments in the new millennium. The total range of the IC/GVA ratios is .884

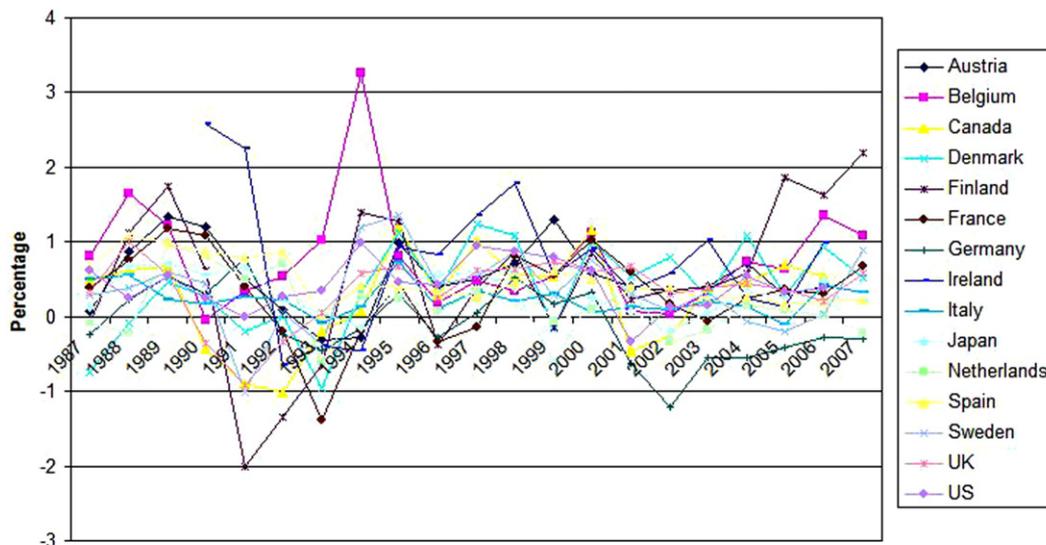


Fig. 1. Changes in inventory per Gross Value Added (%) 1987–2007.

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