Assurances

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DEALING WITH THE INSURANCE BUSINESS IN THE ECONOMIC ACCOUNTS

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Volume 68, numéro 1, 2000

URI : https://id.erudit.org/iderudit/1105306ar
DOI : https://doi.org/10.7202/1105306ar

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Éditeur(s)

HEC Montréal

ISSN

0004-6027 (imprimé)
2817-3465 (numérique)

Découvrir la revue

Citer cet article

Harchaoui, T. (2000). DEALING WITH THE INSURANCE BUSINESS IN THE ECONOMIC ACCOUNTS. *Assurances*, *68*(1), 89–134. https://doi.org/10.7202/1105306ar

Résumé de l'article

Cet article résume et élargit le traitement des assureurs dans le système de comptabilité nationale, en mettant cependant l'accent sur la mesure de l'activité de production. Le cadre d'analyse débute avec une discussion générale, au niveau macroéconomique, sur les approches passées et présentes de la mesure de l'activité de production des assureurs dans le système de comptabilité nationale. Cependant, cette perspective macroéconomique s'avère limitée sur plusieurs aspects. En élargissant le cadre d'analyse, nous avons adopté une approche désagrégée, en insistant sur la nécessité de comprendre le comportement et de mesurer l'activité des assureurs au niveau du segment d'activité. L'approche, négligée par la littérature économique existante, fournit un éclairage supplémentaire sur la délimitation des activités dans lesquelles sont engagés les assureurs, la mesure de leurs activités et leur interaction dans un cadre intégré de tableaux entrées-sorties. À titre d'extension de ce cadre, cet article discute également de la mesure des activités régionales des assureurs et leur mesure de production au niveau de l'ensemble de la firme.

DEALING WITH THE INSURANCE BUSINESS IN THE ECONOMIC ACCOUNTS

by Tarek M. Harchaoui

ABSTRACT

This article synthetizes and extends the treatment of the insurance business in the system of national accounts, with a focus on the measurement of the production activity. The framework begins with an overall discussion, at the macroeconomic level, on the past and current approaches on the measure of the insurance business production activity in the system of national accounts. But this macroeconomic approach of the insurance business turns out to be limited in many important respects. In extending the framework, I adopt a more disaggregated approach, making a strong case on the need to understand the behaviour and to measure the activity of the insurance business at the level of the line of business. This approach, overlooked by the existing economic literature, provides many insights in terms of the delineation of insurers' lines of business, the measurement of their activity and their interaction within an integrated input-output framework. As a by product, the article also discusses issues related to the regional breakdown of insurers' activities and the unduplicated measure of the insurance firm's output.

Keywords: Output, producing units, technology.

JEL numbers: C8, L8, M4.

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He is indebted to Georges Dionne and four anonymous referees for their valuable and decisive comments made on an earlier draft.

This article will also be published in the Handbook of Insurance (Boston: Kluwer Academic Publishers, 2000), Georges Dionne (Ed.).

RÉSUMÉ

Cet article résume et élargit le traitement des assureurs dans le système de comptabilité nationale, en mettant cependant l'accent sur la mesure de l'activité de production. Le cadre d'analyse débute avec une discussion générale, au niveau macroéconomique, sur les approches passées et présentes de la mesure de l'activité de production des assureurs dans le système de comptabilité nationale. Cependant, cette perspective macroéconomique s'avère limitée sur plusieurs aspects. En élargissant le cadre d'analyse, nous avons adopté une approche désagrégée, en insistant sur la nécessité de comprendre le comportement et de mesurer l'activité des assureurs au niveau du segment d'activité. L'approche, négligée par la littérature économique existante, fournit un éclairage supplémentaire sur la délimitation des activités dans lesquelles sont engagés les assureurs, la mesure de leurs activités et leur interaction dans un cadre intégré de tableaux entrées-sorties. À titre d'extension de ce cadre, cet article discute également de la mesure des activités régionales des assureurs et leur mesure de production au niveau de l'ensemble de la firme.

Mots clés *: Sortie, unités de production, technologie.*

Classification JEL *: C8, L8, M4.*

1. INTRODUCTION

Insurance companies have historically been an important player of the 'four pillars' of developed countries' financial services sector, offering financial protection, investment products and reinsurance services. Banks (concentrating on lending to businesses, collecting households and business deposits, and offering payment services through these deposits), trust and mortgage loan companies (concentrating on fiduciary services and mortgage lending to households), and securities dealers (focussing on the underwriting and marketing of investment products) were considered the other pillars in the financial services sector.[1]

The recent years have witnessed a gradual merging of the four pillars, with much greater overlap of business lines. These developments stemmed from many factors, including globalization of financial markets, technological innovation, changing demographics, rising household wealth, and adjustments within the financial sector to shifting business prospects. Changes in the environment have been a major factor in the legislative and regulatory revisions that have widened the powers of financial institutions and placed financial groups in direct competition with each other.

Structural change in some major countries' financial system in the 1980s and early 1990s was similar to developments in many other industrialized countries. As one would expect, such forces have significantly affected the financial sector in general and the insurance business in particular. Their product lines have broadened considerably beyond the core business of financial protection. Therefore, one of roles of economists concerned with organizing economic data into meaningful formats is to ask periodically whether existing data sets of accounts adequately describe important economic trends and are useful to public and private policy-makers as possible. This is one of the objectives of this article.

The other goal of this article is to provide an overall picture of the treatment of insurance in the SNA at the micro and macro levels. The article discusses the previous and actual treatments of insurance in the system of national accounts (SNA) framework and discusses some of the ways in which the framework is applied, depending on specific country requirements. It then introduces the main categories for national accounting which draw upon the records of businesses, and the accounting rules to be followed when recording the various entries. The article then describes the activities of the producing units and their classification required for a program of economic statistics. The article also investigates the behaviour and activities of business and the transactions that take place between them within an integrated input-output framework. In particular, this article looks at shows the link between the line of business and the enterprise from the standpoint of a complete production account statement.

■ II. INSURANCE IN THE SYSTEM OF NATIONAL ACCOUNTS: A MACROECONOMIC APPROACH

□ A. Background

The SNA is implemented at different levels of aggregations: at the level of the institutional sectors and at the level of the economy. Although traditionally described as a SNA, for analytical purposes the SNA is also to be implemented at lower levels of aggregation. In order to understand the workings of the economy of some specific industries, it is essential to be able to observe and analyse the economic interactions taking place between different producing units.

Certain key aggregate statistics, such as GDP, that are widely used as indicators of the economic activity at the level of the economy, are also defined at the level of these units.

As emphasized by Bloem (1990, section 3), national economic accounts retain in general two distinct types or statistical reporting units: a) the establishment, yielding industrially homogeneous production and related data, and b) the enterprise, yielding financial and related data on a consolidated basis for the unit's total constituent establishments. (The enterprise can also yield industrially heterogeneous production data on a consolidated basis). Also, national accounts construct input-output tables reflecting aggregation and allocation of establishment-based data and flow-of-funds tables and sectoral balance sheets, reflecting aggregation of enterprise-based data.

At the higher level of aggregation, there are institutional units which a) are centres of decision-making for all aspects of economic activity and b) owns assets and incur liabilities on their own behalf. The institutional units are grouped together to form institutional sector.

The institutional units involved in insurance are pre-eminently insurance corporations. In principle it is possible for another type of enterprise to carry out insurance as non-principal activity, but usually the legal regulations surrounding the conduct of insurance mean a separate set of accounts covering all aspects of the insurance activity must be kept and thus in the SNA a separate institutional unit, classified to the insurance corporations and pension funds sub-sector, is identifiable. According to Skipper (1993, 116), in many countries, including US, regulation prevents insurers from undertaking activities not reasonably related to insurance. However, insurers that wish to engage in other activities, except banking, are allowed to do so through holding companies.

The activity of insurance is intended to provide individual institutional units exposed to certain risks with financial protection against the consequences of occurrence of specified events. It is also a form of financial intermediation in which funds are collected from policyholders and invested mainly in financial assets which are held as technical reserves to meet future claims arising from occurrence of the events specified in the insurance policies.

Is there any rational classification of the insurance business? The buyers of insurance are either private persons or business firms and their motivation for buying insurance may differ from one case to another. Borch (1981) provided an interesting classification of the insurance business into three parts:

i) *Life insurance,* i.e., annuities and ordinary life insurance with payment at death;

ii) Business insurance, the insurance bought by businessmen, covering commercial risks of all kinds;

iii) Household insurance, bought by the ordinary consumer as protection against the risks in everyday life.

Three reasons at least underline the delineation of these three classes of insurance:

i) Each class seems to require its own special types of theoretical analysis;

ii) In the market each class of insurance faces different types of competition;

iii) The government, through its regulatory authority, often takes different attitudes to these three classes of insurance.

Because of what are perceived as substantial operational and product differences, insurance regulation generally requires legally separate companies for the transaction of the life and non-life business and, hence, the maintenance of a separate set of consolidated accounts for each type of business. Unlike the approach proposed by Borch (1981), the latter corresponds exactly to the needs of the SNA's sectoring.

Accordingly, the SNA defines two classes of insurance businesses in terms of the services they provide. Life insurers sell life insurance and annuities, manage pension funds and sell accident and sickness insurance. Non-life insurers offer a wide range of financial protection on all kinds of assets (automobile, property, liability insurance etc.). The way in which insurance businesses provide financial protection is to spead the risk among the other insureds and, if necessary, with other insurers by means of reinsurance. If, for example, an insurer found that there was only one particular policy of a kind being insured by him, then there might wish to share the risk with other insurers by paying a premium to them.[2] Despite the similarity of the activity of life and non-life insurance (see section III below), there are significant differences in terms of the characteristics of the product which lead to different types of treatement in the SNA.

☐ B. Measurement of the Output

There are two *non exclusive* approaches to the measurement of output: gross output and value added. Gross output can be measured either by the value of services produced, or by the sum of

income payments and other costs. Business purchases on current account from other businesses are subtracted from gross output to arrive at value-added, or gross product originating, an unduplicated measure of economic activity.

1. Nominal Output

As emphasized by Ruggles (1983b, 67) and many others, in the insurance business, much like banking, the problem of specifying the output of the business is complicated by the two factors which are not shared by goods producing industries. These are: i) the consumer's expenditures on insurance premiums are for a bundle of services plus transfers; ii) the prices and the values of the service portion are not separated from the transfer portion. For example, premiums paid for life insurance are paid partly to cover the value of services produced by the insurance company and partly to accumulate a financial asset (cash value) in the policyholder's name, and partly to pay for claims. The non-life insurance business provides a similar example—premiums cover both the value of services produced and, on an actuarial basis, claims paid out (which are not a measure of production but of transfers). In both cases, the policyholder does not know the split between payment for service and the transfer component—these are not priced separately. As a result, the output of the insurance business must be specified and their prices imputed.

a) What Do Insurers Do?

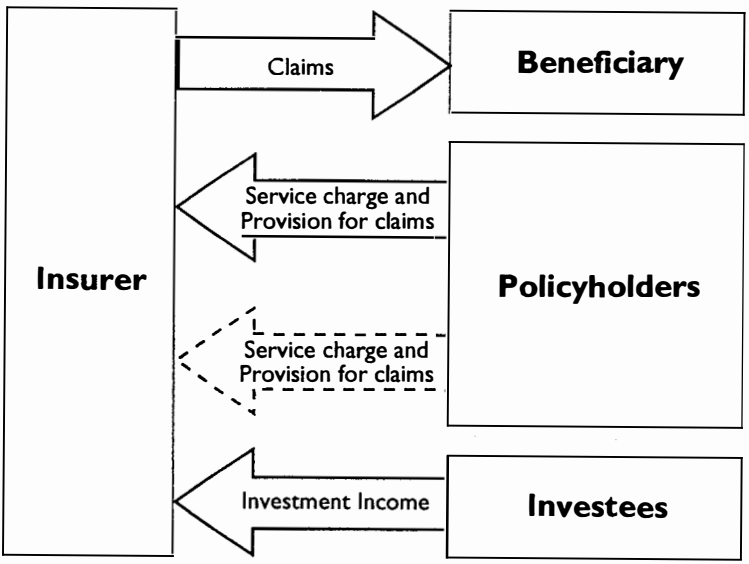
The interest of economists in insurance is probably as old as economics itself. In his *Wealth of Nations*, (Book I, Chapter 10) Adam Smith (1776) writes that «*premiums must be sufficient to compensate the common losses, to pay the expense of management, and to afford such a profit as might have been drawn from an equal capital employed in any common trade*». This is a remarkable insight as to how insurance premiums should be determined. As for the peculiarity of the insurance business itself, Adam Smith writes (Book V, Chapter 1): «*The trade of insurance gives great security to the fortunes of private people, and by dividing among a great many that loss which would ruin an individual, makes it fall light and easy upon the whole society. In order to give this security, however, it is necessary that the insurers should have a very large capital.*» More than 100 years later, Alfred Marshall defines in his *Principles* (1890) the premiums as the price one has to pay to get rid of the 'evils of uncertainty.' He also noted that businessmen paid insurance premiums «*which they know are calculated on a*

scale sufficiently above the true actuarial value of the risk to pay the companies' great expenses of advertising and working, and yet to yield a surplus of net profits».

The passages quoted above show that, although more than 200 years ago classical and neo classical economists had a good insight into the essentials of insurance, they have not addressed the issue of the value of insurance services. As it will be shown later, measuring the output of this business represents one of the building blocks of the SNA.

Insurers are engaged in the pooling of risk. Insured persons or businesses pay a premium to insurance carriers to perform this function. In addition, there is an associated function of providing annuities and managing pension funds. All of these activities involve investment of the policyholders funds. These two activities—underwriting insurance and investing funds—are reflected in two accounts — an underwriting account and investment account. From the point of view of the insurer much of the income is derived from capital gains and investment income which are not traditionally considered income from the production of goods and services in the SNA. Rather they are considered as transfers.

FIGURE I
SERVICE AND PAYMENT FLOWS INVOLVED BY THE INSURANCE BUSINESS



The various payment flows that take place between the insurer, the policyholders and any other third party are illustrated in figure 1. There is a flow of premiums between the insured and the insurer. The premium received should be considered as consisting of two parts— an amount placed in reserve to pay future claims and the remainder used to cover expenses including a return to shareholders of the insurer (service charge). The payment for future claims is a transfer to the insurer. The reserves are used to generate investment income which is used to cover expenses and claims. Between the insurer and the insured there is a barter arrangement in which the insured barters the investment income on the reserves to pay future claims to lower the overall payment for service charges and claims. There is a flow of investment income between the investee and the insurer. This investment income is a transfer between the investee and the insurer. The right to retain the investment funds represents the barter arrangement with the insured. There is a payment in respect of claims incurred in the current period between the insured and the insurer.

b) Gross Output under the 1968 SNA

Under the 1968 SNA, the gross output of insurance firms is not equal to premiums received. A large part of premium income is paid out as claims, hence the bulk of funds flowing through the insurance business are treated as transfers. By the conventions of the SNA, the gross output of the insurance business is equal to premiums less claims paid. Gross domestic product (GDP) is therefore premiums less claims less intermediate expense, or equivalently, labour compensation plus underwriting gain (surplus).

$$\text{Gros Output} = \text{Premiums} - \text{Claims}$$

$$\text{GDP} = \text{Gros Output} - \text{Intermediate Expense}$$

But not everyone agrees with the SNA approach to the measurement of insurance output. Ruggles (1983), who claims that there are several inconsistencies in the way the treatment of the insurance in the SNA, proposed the use of premiums as a measure of output. Diewert (1995) seems also to agree with this way of measuring the output. Claims are considered to be part of transactions that affect the capital account and not the current account. Ruggles' understanding of the current treatment of the insurance in the SNA is clearly summarized in the following paragraph (p. 68):

"It is apparent that the present national income accounting treatment of insurance transactions would be quite inappropriate for the accounts of the individual transactor. If this treatment were used, business suffering no loss would record the cost of insurance as the premiums actually paid, but for those having a loss the cost in insurance would equal 'net premiums,' that is, premiums paid less claims received, and could be sizable negative flow; at the same time the fire or casualty loss would appear as a large increase in capital consumption allowance. These distortions are due in part to the failure of the national income accounts to achieve a proper separation of current transactions from capital transactions, and in part to a willingness to deal with consolidated accounts for all businesses as a group."

This claim is partly true. The production account of the insurance business, based on the majority of items included in the income statement, certainly considers claims as part of the production account. They constitute the largest component of the operating expenses of the business, but unlike the other expenses, they belong neither to the category of intermediate expenses not to the primary expenses. They merely represent payout, much like dividends and experience rating refunds, that are transferred back to the consumer.

c) Gross Output under the 1993 SNA

It is not uncommon for underwriting gain and the corresponding value-added to be negative as intermediate expense (which includes commissions paid to brokers and agents of all kinds) represents one of the most important element of total expenses.

The profitability of the insurance business is preserved by net receipts of investment income which, until recently, were not included in the SNA measure of the gross output of the business. The new SNA recommends that investment income be added to the current measurement of gross output to arrive at measure of value added that is non negative.[3] The proposed approach is not necessarily new as it has been proposed almost ten years ago by Weiss (1987) and Schiltz (1987) and it has been used by US Bureau of Economic Analysis for life insurance services for many years (see Ruggles 1983a).

The rational behind this proposed treatment is the following: insurance companies usually perform two activities. First, they are engaged in a 'pure insurance' activity, i.e., they sell insurance policies for a premium on which they pay a claim with expected value. If the premium and claim payments are coincident in time, the companies' gross output in an expected value sense is. The second

activity performed by insurance companies is financial intermediation, which arises from the fact that premiums P_t are paid at time in advance of claims C_s, which are paid at time $s(t < s)$. Essentially, the problem of negative underwriting gain is caused by the error of comparing dollars of one period (P_t is valued at time t) with dollars of another period (C_s is valued at time s).

The expression $P_t(1 + r)$, where r is the (certainty equivalent) interest rate, represents premium revenue properly expressed in dollars of the same time period in which claims are paid. Clearly, the 1993 UN SNA recommends that the financial intermediation activity of P&C insurance companies be made explicit via an imputation equal to $P_t \cdot r$, the investment income, to be added to interest receipts, premium income and interest payments.

d) The SNA Approach in Practice

In an elegant multisectoral framework, Hartwick (1997) proposed a measure of value added of the insurance business that departs significantly from the new SNA. His concept of value added (payment to the primary inputs adjusted for the risk premium demanded by shareholders) corresponds roughly to the new SNA concept of gross output (premiums *minus* claims *plus* investment income) (see his equation (16), p. 15). However, this result looks peculiar, as it is not clear how his model treats intermediate expenses to arrive at the value added. The same ambiguity in the treatment of intermediate expenses can also be found in Cummins and Weiss (1998) where all expenses are supposed to be part of value added (see their equation (14)).[4] However, intermediate expenses composed of commissions of all kinds paid to non employees and purchased goods and services can be as high as 30 percent of gross output. Thus, ignoring them may be grossly in error.

Although the SNA approach to the measurement of output is still in its infancy, it has been successfully applied in areas such the analysis of costs structures of the insurance business (Bernstein 1992) and productivity measurement (Bernstein and Geehan 1988; Bernstein 1997 and Harchaoui 1997). Analyses of productivity are, however, only as good as the real output measure on which they are based. Unfortunately, the estimates of real output and, accordingly, productivity based on national accounts estimates are extremely poor. In some instances, the real output of insurance in national accounts is no more than an index of factor inputs, with the result that productivity change is, by definition, zero. In other instances like in Canada, the deflation leads to volatile estimates of labour productivity (see Lal 1990).

Griliches (1992) has suggested that an important source of the differential in productivity growth between goods and services is measurement error. He argued that problems in defining service-sector outputs and identifying price versus quality changes, as well as paucity of data on services, have resulted in underestimation of service-sector output. One of the most serious problem that face statistical agencies is the measurement of meaningful price series for financial services industries. For example, of the finance, insurance and real estate subsector, commercial banking is the only industry for which the US Bureau of Labor Statistics publishes a productivity measure (see Dean and Kunze 1992, 85).

Real output is generally measured in either of two way: by deflating current dollar values with an aggregate price index or by projecting base year values using an index of quantities (in which case real output is the ratio of current period quantities multiplied by base year prices divided by base year values). Either approach requires the specification of output in terms which clearly separates quantities from prices. The second approach has been applied by Weiss (1986). The first approach requires the construction of a consistent time series on prices indices.

With the exception of Jensen and Morrisey (1990), there has been no attempt to measure the problem of quality change in the insurance business using the hedonic approach which turned out to be particularly useful in many areas where prices were suspected not to measure the pure price change. Reece (1993) has developed an ad hoc measure of life insurance price indices that builds on the availability of series on number of policies by product line. The idea, which has been applied by Bernstein (1997) and Harchaoui (1997) to the measurement of the real output of the Canadian life insurance business, consists of the following steps:

a) for every product line i calculate the (average) nominal price:

$$p_i = \frac{V_i}{N_i}$$

where

V_i = nominal gross output of the product line i;

N_i = number of policy of the product line i;

b) construct an aggregative index where the weights are based on the face value of the policy i, that is

$$\ell np_t - \ell np_{t-1} = \sum_{i=1}^{n} \overline{\omega}_{i,t} \left(\ell np_{i,t} - \ell np_{i,t-1}\right)$$

where $\overline{\omega}_{i,t} = \frac{1}{2}\ (\omega_{i,t} + \omega_{i,t-1})$ and $\omega_{i,t} = \frac{V_{i,t}}{V_t}$.

■ 2. Nominal Value-added

National economic accountants take the value-added approach of output and construct from them a set of accounts showing production and distribution. The inception of the concept of value-added in national accounts goes back to Fabricant (1940) in his early work on US national accounts:

> *"The ideal index of the net physical output of an industry would measure the changes in the aggregate value of net output attributable exclusively to changes in the physical quantities of the final products and to changes in the quantities of the materials and other commodities consumed in the fabrication of the final products..."*

The nominal value-added of industries represents the value which industries add to commodities that they processed. That value is equal to the primary input costs of the industries, taken generally to be the cost of their labour and capital services. The primary input costs are to be contrasted with the intermediate input costs, that is the costs of goods and services purchased by industries from *upstream* supplying industries.

The nominal notion of value-added in terms of costs and sales may be closely associated with the idea of a real production process. Industries may be seen as jointly contributing, by using their capital and labour resources, to the production of the commodities delivered to final demand. In that production framework, each industry is viewed as contributing only partly to the production of some final demand commodity (ies). The contributions of each industry to all final demand commodities may consequently be seen as its contribution to the final output of the economy or as its real value-added.

■ 3. Double Deflation

Measured growth rates for insurance industries are generally lower than the rates obtained for manufacturing industries. However, as emphasized by Bernstein and Geehan (1988) in the Canadian context, this finding is suspect, because of the difficulties in using official statistics to measure real output of insurance industries. In the SNA the process of eliminating price change from a time series to lay bare the underlying real movements in production is known

as deflation. The removal of price change from current price value series series is an attempt to provide a proxy for the sum of the real quantities embodied in the series. Aggregating physical commodities of differing nature (eggs and automobiles) is clearly an impractical proposition. Employing an underlying principle that involves holding prices of commodities fixed at some selected base year, and from that period forward valuing production in the prices of that base year, yields values for diverse products that are both proportional to real production and additive.

A large variety of different methods have been devised by countries to estimate real value added of insurance industries. Double deflation, one of the method which has been proposed to measure the real industry value-added, involves the deflation of the gross output of commodities and the deflation of intermediate inputs (see David 1962; David and Sato 1966). That subtraction is closely linked to the Laspeyres index number formula. Consequently, in the application, double deflation is generally based on a fixed base year Laspeyres index number formula. The base year applies to a delimited number of years before being moved forward. Then either the whole historical series are entirely based on that new base year (historical series are re-based on the new set of relative prices) or historical series are statistically linked to the new estimates while still based on the set of the past relative prices of their previous base year.[5]

Other methods of estimating real value-added have also been proposed in the past such as the single deflation method (see Hill 1971 for an overview), yet double deflation remains by far the most commonly used amongst OECD countries for the financial sector (see OECD 1998).

Despite its popularity, the double deflation approach has been at the centre of several criticism by the economic literature, including Sims (1969), Sato (1976) and Bruno (1978), as it does provide a meaningful measure of real output only under stringent assumptions. Other contributions, such as Denny and May (1977, 1978), have shown that for the Canadian manufacturing industries the double deflation' underlying assumptions are unlikely to be satisfied in the real world. Diewert (1978) finds that these conditions are unlikely to be satisfied empirically, in particular, because of the rapid relative price increase of energy following the 1973 oil shock. The second oil shock followed by the changes in the prices of computers prevented the conditions to be satisfied in recent years either. Durand (1994) proposed an alternative approach to double deflation which displays better theoretical properties. The new approach does

not rest on the stringent assumptions of double deflation. In particular, it does not rest on the separability condition between intermediate and primary inputs. Empirically, the proposed approach does not have the major defects of double deflation, including negative real value-added when nominal value-added is positive or real value-added higher than gross output. The real GDP estimates obtained under this approach displays less volatility than the standard estimates obtained under the double deflation approach, particularly for the industries where output is hard to measure.

■ III. A MICROECONOMIC APPROACH OF THE INSURANCE BUSINESS IN THE SYSTEM OF NATIONAL ACCOUNTS

□ A. Background

In many developed countries, insurance firms correspond largely to institutions which are governed by regulations. Institutions are legally constituted but usually belong to enterprises that are involved in activities in addition to those usually reserved to those institutions. The boundaries created by regulation may not correspond to the way a business organizes its operations. Furthermore, in recent years the institutions have been expanding their activities into areas previously reserved to other institutions. This creates two related problems. An industry based on institutions may contain a number of unrelated activities. Secondly, like activities are not grouped within the same industry if industry classes are based on institutions.

This section has two related goals:

a) To propose a delineation of the insurance business along the various producing units. In this business data are usually collected at the level of institution, accordingly, there is very little experience with the organization of operating units. It is necessary to decide which of these units are technical units (or profit centres) and which are auxiliary units (cost centres). Technical units must have an industrial class into which to place them. Support units, depending on the conceptual approach, do not necessarily have to be classified to their own industry; they may be classified to the major industrial activity of the business. An additional problem is that the organization of activities and products

into organizational units may vary from one business to another. Therefore, it is necessary to propose a general framework that encompasses the major characteristics of the business.

Collecting the data at the level of the various producing units offer two kinds of advantages. From an operational perspective, there will be a consistency in the unit of observation across the business sector, as the data will be collected at the level of the producing unit from all kinds of industries, including those traditionally regulated. From the analytical perspective, the move away from the institutional framework is merely driven by the fact that a broad range of issues simply cannot be addressed without microdata on producing units and the firms that own them. As emphasized by McGuckin (1995), for many problems, the producing unit is a sensible unit of analysis. For example, from the standpoint of the production decision, the choice of inputs for use in output creation is often made at the plant level. Although the firm is the ultimate decision maker and thus the preferred unit of analysis for many problems, producing units have very different behavioural patterns, even when owned by the same firms. Thus producing units data are also necessary to understand the behaviour of the firm. The behaviour of one producing unit is not completely differentiated from other simply by the identity of its owner. Producing units data are also necessary to estimate the marginal impact of some event—for example, a purchase or divestiture of assets—on the firm. Focusing on the production relationship, one can see that their establishments are the primary purchasers of inputs. Even though primary resource-allocation decisions are often made at the firm level, producing unit data are useful in analysis of technical change because technical change is characterized by changes in the production relationship.

b) To analyse how the company-establishment problem, which has a long history in the national economic accounting literature, can be overcome in the particular context of the insurance business. The problem is of key importance in a paper by Sigel (1955) together with comments of Jaszi (1955). Their discussion is concerned with the technical issues of relating establishment-based input-output tables to a company-based flow-of-funds accounting system. This theme and others also turn up in the Report of a Conference

on the Proposals for Revision of the United Nations of National Accounts (see Tice 1967). Copeland's (1957) classic challenge to Leontief to show how the input-output system could be synthetized with money-flows certainly implies respect for the company-establishment problem. A particularly clear statement of the problem, in a more general setting, appears later in Jaszi (1971): production and related statistics are best reported on the basis of industrially homogeneous units, the individual establishment; financial and related statistics come naturally from the (heterogeneous) legal entity responsible for and controlling their constituent establishments. More recently the company-establishment problem is the centre of attention in the debate between Ruggles and Ruggles (1982a, b) and a number of commentators concerning a proposed Integrated Economic Accounts for the United States.

□ B. Dealing with the Insurance Business at the Producing Unit Level

■ 1. The Literature on Multiunit Firms

The modern multiunit business firm is one of the most prominent and significant innovations in the organization of production of recent years. For most of the two previous centuries, firms were organized as traditional single-unit firms. These firms operated in a local or regional market, produced a single product line, and were owned and managed by a single individual or a partnership. During the last two decades of the nineteenth century, the multiunit business firm emerged and began to displace the single-unit firm in a number of industries. The multiunit firm operated plants in many regions, produced various product lines, and were controlled by a hierarchy of managers. During the twentieth century, the predominance of multiunit firms grew domestically and internationally in the form of multinational firms.

For economists, the analysis of the rise of the modern multiunit firm, and of firm size in general, is based on transaction cost theory of the firm. This theory, originating from Coase (1937), revived and popularized by the works of Williamson (1975, 1985), Alchian and Demsetz (1972), and Klein, Crawford and Alchian (1972), argues that firms internalize production because they incur greater transaction costs when they use markets. The analysis of the rise of multiunit firm has been influenced by the works of Chandler (1977, 1990), who combined the elements of the traditional industrial

organization literature and the transaction cost literature to explain the rise of the modern business firm. Chandler (1990, 17-18) argued that firm size is determined by transaction costs, but that these costs are, in turn, linked to technology:

> *"Transaction cost economies are, of course, closely related to those of scale and scope. The economies of scale and those of scope within a single unit of production or distribution permit that unit to expand the output of goods and services, which in turn, increases proportionately the number of recurring commercial transactions and contractual relations the enterprise may carry on with other operating units."*

Although the modern multiunit enterprises have been heralded by Chandler (1977, 1990) and others as a major and important phase of organizational change, and a significant source of growth, the prevalence of the multiunit firm engaged in financial services has been neglected by the economic literature. Bohman (1979), one of the few attempts that looked inside the insurance firm's black box, developed a framework that captures the transactions that take place between the two funds that compose the insurance firm—the insurance fund and surplus fund. But these two funds are not considered as producing units with the result that measurement of production was overlooked in his contribution. In the next section, we extend Bohman's framework along the following lines: a) the insurance firm is separated into various lines of business on the basis of the concept of production; the production of the various lines of business is measured and the transactions flows that take place between them is outlined; b) we show how the production account of each of these producing units can be used to arrived at the production at the enterprise level; c) finally, the delineation of the different lines of business is assessed.

■ 2. Implementing the Multiunit Concept in the Insurance Business

a) Framework

The insurance industry is in general dominated by large multi-product and multi-activity institutions. The large institutions, which operate a network in many regions, are generally engaged in direct insurance, reinsurance and investment activities. However, these activities often take place in separate organisations of the institution. What makes them insurers is that they are primarily involved in financial protection and diversification of risks although increasingly they are also engaged in all kinds of financial activities. They

may have both domestic and foreign clients for any of these services provided by these activities. As multi-regions implies, most of the dealings with clients are through a network of agents, brokers and claims adjusters. For other customers seeking for reinsurance and investment services, the dealings may be through the head office where the bulk of the decisions take place.

As previously indicated, there is nowhere a tradition of dealing with the insurance business at the level of producing units and this holds true for the whole financial sector. Therefore, this section, based on the work of Harchaoui (1998) for the Canadian banking industry, provides not only background material but also a framework for a proposed delineation of the insurance business at the level of the line of business. But what precisely constitute a line of business (or producing unit) reporting and its motivation? Large diversified insurance corporations are motivated to break down their operations into units of manageable size. The existence of such units creates a need on the part of the corporate management to know and appraise the performance of the units. The organization of corporation along producing units (or lines of business) has become increasingly popular and dominant in recent years (Reece and Cool 1978).

The particular context assumed here is the large multi-establishment multi-industry corporation whose industrial origins, strategy and structure are so well described in Williamson (1981). What are the natural organizational units of the large multiproduct and multiactivity enterprise featuring decentralized decision-making? There are essentially three (see Kaplan 1982, chapter 13): Cost centers are units that are responsible for satisfying externally given demands subject to a cost-minimizing efficiency standard. The cost of materials used and labour employed are controlled, but production sales revenue may not even be known. Revenue centers are units organized with the goal of attaining certain sales targets or market shares. These units may set the prices and choose product-mix, but are not directly concerned with cost of materials or labour employed in production. When output is difficult to measure and not necessarily related to inputs, then the organizational unit becomes a cost centre (e.g. general and administrative service departments). The cost centre is reminiscent of the national economic accountants' ancillary unit. The unit typically serves other (internal) units of the enterprise. If the management of an operating unit is given responsibility both for obtaining required inputs and for choosing and selling well-measured outputs, then this particular unit is know as a profit centre. Thus a profit centre combines the tasks of the standard cost centre and revenue centre.

For our purpose, a producing unit will refer to a business unit which combines the scope of the profit centre with at least for the units' working capital and physical asset base. A producing unit is conceptually capable of reporting all the production-related information of an establishment. Producing units reports *per se* usually contain industrially-specified production (or operating revenue) data and the various costs of materials used and labour employed are detailed. On the other hand, the production statement tends to be complete in the sense that intermediate service input expenses charged are accounted for (these are mostly corporate overhead and indirect expenses charged to individual units). There certainly are common cost allocation problems to be resolved in producing unit reporting, but these problems are handled internally by corporate management accountants in a position of full information. In addition, the producing unit's gross operating surplus may be further refined by explicitly deducting depreciation.

b) Delineation of the Units

Recent decades have seen trends towards greater complexity and multiform legal structures of the institutions participating in the economic process. A number of factors have played role in this respect. First of all, in many countries there is trend towards formation of larger and larger units. Mergers led to large conglomerations of enterprises which often had a variety of activities. The roots of this development were, among other things, the need to spread risks, a wish for additional financial possibilities and the desire for product differentiation. Secondly, this desire for product differentiation led to enterprises turning their attention to various production processes and entering new markets.

While there are variations in structure among the major insurers, the internal organization of insurers is usually composed of two major divisions each performing various activities—head office operations and branch or field operations. The head office may be structured along vice-presidential lines on a activity basis. The direct insurance vice-president usually has actuarial, agency, advertising, sales promotion and field force supervision under his direction. The financial vice-president is usually responsible for investment operations, the management of the portfolio of the company's or various clients' assets. The reinsurance vice-president performs essentially functions that allow the insurance company to increase its underwriting capacity through reinsurance assumed and/or reduce it through reinsurance ceded and retrocession. The administrative vice-president is usually responsible for internal audit,

controllership, banking and accountancy functions and general service departments of the corporation. Among the other units that potentially could be auxiliary units because they provide support services to the principal activities of insurance are investment, general and administrative services where one can finds human resources, advertising, promotion and public relations etc.

TABLE I
DELINEATING THE UNITS OF THE INSURANCE BUSINESS

Type of Unit or Account	Highest Level Unit	Activity
Core Business Lines	Direct Insurance	Underwriting insurance policies; Retail Network: Agents, Brokers and Claims Adjusters
	Reinsurance	Reinsurance ceded; reinsurance assumed; retrocession
	Investment	Portfolio management
Support Business Lines	General Administrative and Corporate Services	Finance
		Human Resources
		Computer Services
		General Administration: Legal Services, Public Affairs and Treasury
		Other Corporate Services

Branch or field operations may be carried out by a branch office system or a general agency and broker system. The branch office system consists of branch managers, known as agents, who are sales experts directing agents who market their product line of one insurance company only. In contrast, a broker runs his own office, pays his own expenses and may represent one or more insurance companies and carry life and non life product lines. Berger, Cummins and Weiss (1997) and Cummins and Weiss (1998) treat direct insurance, investment and branch operations as services and not as lines of business. This is incorrect for two reasons: a) there are clearly identifiable inputs that operate within each of these lines of business and b) each of these lines of business sells for profit different kinds of services.[6]

The internal organization of a typical insurance form is mainly important in delineating and valuing flows and perhaps in determining industrial classification (more on that below). If, for example, a

unit supports direct insurance exclusively, then the only flows of services should be to direct insurance. In addition, its industrial classification should be the same as the direct insurance units. In general, the delineating of flows has two aspects: the delineation of flows to ultimate customers and the delineation of internal flows between units in the same enterprises.

■ 3. The Production Account at the Level of the Line of Business

Consider an economy with two regions A and B and an insurance firm which operates with three producing units: direct insurance, investment and reinsurance. Assume that the head office of the firm is located in the region A, where all the decisions related to direct insurance and reinsurance take place; the network of the firm which provides retails services to consumers is located in both regions.

a) Direct Insurance Activity with a Regional Network of Agents

Measurement of output can be derived from the income statement. The basic identity underlying the income statement is profit before income tax which is equal to its revenue less its costs. In the income statement shown in table 2, operating revenue comes from premiums and from investment income earned on interest and dividends-paying securities (including gains (net of losses) on sales on fixed assets and securities). Operating expenses includes insurance claims paid, wages and salaries, purchased goods and services and investment service fees (for the sake of simplicity, policyholder dividends, depreciation and amortization, indirect business taxes and home office overhead are assumed equal to zero).

TABLE 2
INCOME STATEMENT OF AN INSURANCE FIRM

	Direct premiums earned	1,000	
Plus:	Investment income	100	
Equals:	Operating revenue	1,100	
Less:	Operating expenses	750	
	Insurance claims paid	500	
	Wages and salaries (total)	75	
	• Head office (province A)		25
	• Network (province A)		25
	• Network (province B)		25
	Purchased goods and services (total)	125	
	• Head office (province A)		105
	• Network (province A)		10
	• Network (province B)		10
	Investment service fees	50	
Equals:	Profit before income tax	350	

Rearranged and modified, the income statement provides the production account, which records the production attributable to the firm in terms of services produced and the income payments and other costs arising in the production. The derivation of the production accounts is described in two steps: 1) The rearrangement of the business accounting statements into the T-account form and 2) the modification of the T-accounts to obtain economic accounts that measure production. The production account shows, on the right side, the value of the firm's production in terms of services produced and, on the left, the value added by the firm in terms of income payments to primary inputs.

To the extent that all the decisions related to the insurance business take place at the head office, located in region A, it then makes sense to attribute all the value of output to that region. Indeed, the network located in the two provinces are essentially cost centres whose *raison d'être* is to support direct insurance activity. Under this assumption, the production account of direct insurance is shown in table 3.

TABLE 3
THE PRODUCTION ACCOUNT OF THE DIRECT INSURANCE ACTIVITY IS ASSUMED TO TAKE PLACE ONLY IN REGION A

Uses		Sources	
Wages and salaries	75	Gross Output	600
Profit before income tax	350	*Equals:*	
		Direct premiums	1,000
		Plus:	
		Investment income	100
		Less:	
		Insurance claims incurred	500
		Less:	
		Purchased goods and services	125
		Less:	
		Investment Service Fees	50
Charges against output	**425**	**Value Added**	**425**

The problem with the above assumption is that all the insurance production will be assigned to one region. In some countries where regions constitute an important level of decisions and where the provincial breakdown of output represents an important tool for policy makers, this assumption is clearly unrealistic. Therefore, one needs to assume that production is attributed to the region where the inputs are expensed. In other words, the network itself generates retail services for which it receives an explicit service charge. Assume that the head office pays $45 in terms of commissions to each network for services rendered (we assume that the commissions, which represent 9% of premiums, are equally distributed between the network A and B).[7] Under this new scenario, as shown in tables 4, we will have three production accounts: two for the region A (one for the direct insurance activity and another for the network located in that region) and one for the network located in region B.

TABLE 4A
THE PRODUCTION ACCOUNT OF DIRECT INSURANCE LOCATED AT THE HEAD OFFICE IN REGION A

Uses		Sources	
Wages and salaries	25	Gross Output	600
Profit before income tax	330	*Equals:*	
		Direct premiums	1,000
		Plus:	
		Investment income	100
		Less:	
		Insurance claims incurred	500
		Less:	
		Purchased goods and services	105
		Less:	
		Investment service fees	50
		Less:	
		Commissions to agents	90
Charges against output	**355**	**Value Added**	**355**

TABLE 4B
THE PRODUCTION ACCOUNT OF THE NETWORK LOCATED IN REGION A

Uses		Sources	
Wages and salaries	25	Gross Output (commissions)	45
Profit before income tax	10	*Less:*	
		Purchased goods and services	10
Charges against output	**35**	**Value Added**	**35**

TABLE 4C
THE PRODUCTION ACCOUNT OF THE NETWORK LOCATED IN REGION B

Uses		Sources	
Wages and salaries	25	Gross Output (commissions)	45
Profit before income tax	10	*Less:*	
		Purchased goods and services	10
Charges against output	**35**	**Value Added**	**35**

b) Introducing Reinsurance and Investment Activities

Let us now introduce the reinsurance and investment activities, the other two major activities of insurers very often neglected by the economic litterature. Essentially, reinsurance activity under-

takes the following operations: It assumes reinsurance of a third party located in a foreign country (in which case this we are dealing with exports of reinsurance services) and cedes reinsurance on behalf of direct insurance activity. The following flows involve reinsurance activity:

- Premiums, claims and investment income associated with reinsurance assumed, respectively, $300, $150 and $30;
- Reinsurance activity cedes a portion of the direct insurance activity to a third party: $100 of premiums ceded; $50 of claims ceded and $10 of investment income. The reinsurance activity incurs the following expenses: wages and salaries for $70, purchased goods and services for $50, investment service fees for $10.

Using this information, the production account of reinsurance activity is displayed in table 5 which shows the supply of reinsurance services by this activity. The demand side of this market is represented by direct insurance activity and the foreign sector. Owing to a lack of the required price of reinsurance services, the measurement of the elasticity of supply and demand of reinsurance services constitutes a major gap in our understanding of the reinsurance market. An important attempt has been made recently by Froot and O'Connell (1997) who concluded that in the market of catastrophic reinsurance services, the supply is by far more elastic than the demand side.

TABLE 5
THE PRODUCTION ACCOUNT OF REINSURANCE ACTIVITY LOCATED IN REGION

Uses		**Sources**	
Wages and salaries	70	Gross Output (reinsurance assumed)	180
Profit before income tax	110	*Equals:*	
		Premiums assumed	300
		Plus:	
		Investment income	30
		Less:	
		Insurance claims incurred	150
		Gross Output (reinsurance ceded)	60
		Less:	
		Purchased goods and services	50
		Less:	
		Investment Service Fees	10
Charges against output	**180**	**Value Added**	**180**

An important aspect of the reinsurance market is its international scope. As stressed by Wasow (1986), international trade in insurance occurs in good part through reinsurance, as residents do not directly by insurance abroad nor do non-residents travel to a foreign country to buy insurance. Carter and Dickinson (1992) and United Nations (1993b) indicate that the reinsurance activity has been historically less subjected to the constraints affecting delivery of insurance and the regulatory barriers to international transactions observed in life and non-life industries. Consequently, the most important developments in international insurance transactions have taken place in the reinsurance industry.

As for the investment activity, the following transactions are recorded in its production account shown in table 6:

- In terms of revenue, the investment activity charges a service fee to direct insurance and reinsurance activities for a total of $60 ($50 for direct insurance and $10 for reinsurance); it also charges $40 to a client for the management of his pension fund.
- It pays $20 of wages and salaries, $20 for purchased goods and services.

TABLE 6
THE PRODUCTION ACCOUNT OF INVESTMENT LOCATED IN REGION A

Uses		**Sources**	
Wages and salaries	20	Gross Output (Service fees)	100
Profit before income tax	60	• Direct Insurance	50
		• Reinsurance	10
		• External Client	40
		Less:	
		Purchased goods and services	20
Charges against output	**80**	**Value Added**	**80**

In reality, the measurement of investment activity's output is not always that easy. In facts, the output of this activity is one the hardest to measure as it transforms liabilities (policyholders' deposits) into earning assets (loans through different financial instruments). The measurement of the investment unit output is hindered by the inapplicability of standard national income accounting procedures.[8] Here the experience gained in the area of measurement of banking output may be useful.

The role of the investment unit as a financial intermediary suggests that deposits accounts should be considered as inputs since the unit acquire these funds in order to acquire earning assets. But as Sealey and Lindley (1977) recognized, deposits are not inputs in the same sense as labour and capital; they are in effect a technical output of the unit. Nevertheless, because deposits are used to produce earning assets, Sealey and Lindley argued that earning assets should be viewed as the final output of financial intermediaries. The problem with this view is that it misses the importance of the financial services attached to deposit accounts.

Until recently, the striking feature of the input-output issue was the absence of a mechanism that determines inputs and outputs. Hancock (1985) established such a mechanism through the application of the user cost of money concept developed in Barnett (1980). The user cost of money is analogous to the user cost of capital and measures the net benefit of a particular way of holding money. In general, the user cost measures the economic cost of providing the financial services attached to investment unit output. Accordingly, the user costs are the signals by which the investment unit allocates resources to provide the financial services and therefore qualify as service process. Because the user costs can be either positive or negative, the prices are defined in terms of the absolute value of the user costs. The variability in the sign of the user cost creates a way to determine input-output status endogeneously. A positive user cost indicates that the financial service is an input while a negative user cost indicates that the financial service is an output. With the nominal measure of investment unit output the user cost of the assets is given by $u = \frac{(\rho - h)}{(1+\rho)}$ while the user cost for the liability is given by $u = \frac{(h - \rho)}{(1+\rho)}$, where u denotes the user cost of the asset (liability), ρ is the bank's opportunity cost and h the holding cost or revenue for the financial good.

To provide some of the intuition underlying the expression for the user cost, consider the case where the only concerns of the investment unit are the interest rate and the opportunity cost of capital. Suppose that the unit has only bonds with a face value of V^0 in period 0. If the investment unit's holding of bonds remains fixed the value of its holdings in period 1 is $V^0(1 + \pi)$ where π is the interest rate on bonds. The investment unit decides between selling bonds in period 0 and holding them until period 1. The user cost in effect is the difference between the two alternatives, that is

$$\text{Net Return} = V^0 - \left[V^0 \frac{(1+\pi)}{(1+\rho)} \right] = V^0 \frac{(\rho - \pi)}{(1+\rho)}$$

and thus the user cost per bond dollar is simply $\frac{(\rho - \pi)}{(1+\rho)}$. Similar reasoning would apply to the derivation of the user cost for a liability. Observe that in this example the sign of the user cost is determined by the difference between the two rates of return. Since the investment unit would maintain its bonds holdings only if π was greater then ρ it follows that the user cost for bonds should be negative and they are therefore classified as a financial output; that is, the purchase of bonds by the investment unit (making a loan) is a financial output.

The production account of direct insurance activity, which now should record the flows of services purchased from reinsurance and investment activities, is shown in table 7.

TABLE 7
MODIFIED PRODUCTION ACCOUNT OF DIRECT INSURANCE LOCATED AT THE HEAD OFFICE IN REGION A

Uses		**Sources**	
Wages and salaries	25	Gross Output	600
Profit before income tax	270	*Equals:* Direct premiums	1,000
		Plus: Investment income	100
		Less: Insurance claims incurred	500
		Less: Purchased goods and services	105
		Less: Commissions to agents	90
		Less: Purchased reinsurance services (Premiums *minus* Claims *plus* Investment Income of reinsurance ceded)	60
		Less: Investment Service Fees	50
Charges against output	**295**	**Value Added**	**295**

4. Integrating All the Lines of Business

a) The Consolidated Production Account

In constructing national economic accounts, it is necessary to add together corresponding accounts belonging to two or more transactors and, occasionally, to add together two or more accounts belonging to the same transactor. In the aggregate account, an entry may occur twice, either once on each side of the account, or twice—with opposite signs—on the same side. If such entries are netted out, the aggregate account is a consolidation; if these cancellations are not made, the aggregate account is a combined account.

Production account of the insurance firm (table 8) is obtained by adding together the production account shown for all producing units in tables 4-7. The account is prepared on a consolidated basis. The entries for a transaction between two producing units cancel, leaving only transactions between the producing unit and units outside the firm. These entries are: direct insurance (– \$90 for commissions) and agency (+ \$90); direct insurance (– \$60 for reinsurance

TABLE 8
PRODUCTION ACCOUNT OF THE INSURANCE FIRM

Uses		Sources	
Wages and salaries	165	Gross Output (direct insurance)	600
Profit before income tax	460	*Equals:* Direct premiums	1,000
		Plus: Investment income	100
		Less: Insurance claims incurred	500
		Gross Output (reinsurance assumed)	180
		Equals: Premiums	300
		Plus: Investment income	30
		Less: Insurance claims incurred	150
		Gross Output (Investment)	40
		Less: Purchased goods and services	195
		• Direct Insurance	105
		• Reinsurance	50
		• Investment	20
		• Agency	20
Charges against output	**625**	**Value Added**	**625**

ceded) and reinsurance (+ $60); direct insurance (– $50 for purchase of investment services) and investment (+ $50) and reinsurance (– $10 for purchase of investment services) and investment (+ $10).

It is important to note that the sum of value added generated by the different lines of business (see tables 4b-7) is equal to the value added calculated at the consolidated level of the insurance firm (table 8). Therefore, given this property of additivity, the sum of value added generated by the different lines of business constitutes a sufficient statistics to estimate an unduplicated measure of production activity at the level of consolidation (i.e., the insurance firm).

b) Input-Output Accounting

Information on the flows of goods and services that make up the production relationships between insurance industries and the rest of the economy is missing from the income and expenditures accounts (IEA), but is provided by the input-output (I-O) accounting. I-O accounting can be viewed as a deconsolidation, along detailed industry lines, of the subsectoral production account of table 7, with a separate production account presented for each industry. Both IEA and I-O accounts present GDP in terms of final product flows (final demand, using I-O terminology) and in terms of charges against GDP (value added, using I-O terminology). The distinctive feature of the I-O accounts is the presentation of detailed information for each industry on the consumption of purchased materials and services that cancelled in arriving at an unduplicated measure of production for the business sector. This detailed information is presented in a matrix—an I-O table.

In the I-O table, each column records the gross output of an industry and the inputs used by that industry in production; that is,

Gros Industry Output = Consumption of Purchased Goods and Services
+ Value Added

Each row records the gross output of a good or services (commodity in I-O terminology), the consumption of the commodity by producing industries, and the final demand for the commodity, where final demand consists of sales of the commodity to final users, the change in inventories of the commodity held by both the producing and consuming industries, less imports of the commodity; that is,

Gros Commodity Output = Consumption by Producing Industries
+ Sales to Final Users
+ Change in Inventories
– Imports.

To illustrate the derivation of the I-O Account, tables 9-13 present production accounts for the four hypothetical insurance industries—agency and brokerage, direct insurance, reinsurance and investment—and the rest of the business sector that make up the whole business sector. Unlike the production accounts derived above, these accounts record production on a gross basis; that is consumption has not been subtracted from both sides. Also, these accounts provide a breakdown of purchased goods and services shown in tables 4b-7 in terms of services transacted between the insurance lines of business and goods and services purchased outside the insurance firm. For the rest of the economy, table 13 presents a single consolidated production account.

TABLE 9
AGENCY INDUSTRY

Uses		**Sources**	
Consumption		Sales of agency services	
Intermediate expenses		To producers	
Agency services		Agency industry	0
Direct insurance services	10	Direct insurance industry	90
Reinsurance services		Reinsurance industry	0
Investment services		Investment industry	0
Other goods and services	10	Rest of the economy	0
Less:		To final users	0
Change in raw materials inventories		Change in work-in-process and finished goods	
Agency services			
Direct insurance services		Inventories	0
Reinsurance services		*Less:* Imports of agency services	0
Investment services			
Goods and services			
Value added	70		
Charges against gross output	**90**	**Gross output**	**90**

TABLE 10
DIRECT INSURANCE INDUSTRY

Uses		Sources	
Consumption		Sales of direct insurance services	
Intermediate expenses		To producers	
Agency services	90	Agency industry	10
Direct insurance services	10	Direct insurance industry	10
Reinsurance services	60	Reinsurance industry	10
Investment services	50	Investment industry	10
Other goods and services	95	Rest of the economy	160
Less:		To final users	400
Change in raw materials inventories		Change in work-in-process and finished goods	
Agency services	0	Inventories	0
Direct insurance services	0	*Less:*	
Reinsurance services	0	Imports of direct insurance services	0
Investment services	0		
Goods and services	0		
Value added	295		
Charges against gross output	**600**	**Gross output**	**600**

TABLE 11
REINSURANCE INDUSTRY

Uses		Sources	
Consumption		Sales of reinsurance services	
Intermediate expenses		To producers	
Agency services	0	Agency industry	0
Direct insurance services	10	Direct insurance industry	60
Reinsurance services	0	Reinsurance industry	
Investment services	10	Investment industry	
Goods and services	40	Rest of the economy	
Less:		To final users	180
Change in raw materials inventories		Change in work-in-process and finished goods	
Agency services	0	Inventories	0
Direct insurance services	0	*Less:*	
Reinsurance services	0	Imports of reinsurance services	0
Investment services	0		
Other goods and services	0		
Value added	180		
Charges against gross output	**240**	**Gross output**	**240**

TABLE 12
INVESTMENT INDUSTRY

Uses		Sources	
Consumption		Sales of investment services	
Intermediate expenses		To producers	
Agency services	0	Agency industry	0
Direct insurance services	10	Direct insurance industry	50
Reinsurance services	0	Reinsurance industry	10
Investment services	0	Investment industry	0
Goods and services	10	Rest of the economy	40
Less:		To final users	0
Change in raw materials inventories		Change in work-in-process	
Agency services	0	and finished goods	
Direct insurance services	0	Inventories	0
Reinsurance services	0	*Less:*	
Investment services	0	Imports of investment services	0
Other goods and services	0		
Value added	80		
Charges against gross output	**100**	**Gross output**	**100**

TABLE 13
REST OF THE ECONOMY

Uses		Sources	
Consumption		Sales of goods and services	
Intermediate expenses		To producers	
Agency services	0	Agency industry	10
Direct insurance services	160	Direct insurance industry	95
Reinsurance services	0	Reinsurance industry	40
Investment services	40	Investment industry	10
Goods and services	10	Rest of the economy	10
Less:		To final users	100
Change in raw materials inventories		Change in work-in-process	
Agency services	0	and finished goods	
Direct insurance services	0	Inventories	20
Reinsurance services	0	*Less:*	
Investment services	0	Imports of goods and services	10
Other goods and services	0		
Value added	65		
Charges against gross output	**275**	**Gross output**	**275**

Several features of the illustration in tables 9-13 should be noted: a) each industry produces a single commodity and that commodity is not produced by any other industry; b) the commodities produced by agency, direct insurance, reinsurance and investment industries are services, therefore, they are not inventoried; the commodity produced by the rest of the business sector is inventoriable; c) producing units in each industry purchase inputs from other units in the same industry.

Table 14 illustrates the construction of the I-O table from the information contained in tables 9-13. The first five columns on the left side of the matrix record the consumption of intermediate inputs, as well as value-added, by the producing industries. For each industry, consumption is derived from the left side of the industry's production account in tables 9-13 as the purchase of the commodity less the change in raw material inventory. Value added is also taken from the left side of the industry production account. Three columns, further to the right, record the components of final demand. Sales to final users are obtained from the right side of the production accounts in tables 9-13.

TABLE 14
INPUT-OUTPUT TABLE

Distribution of output / Composition of inputs	Producers					Final demand					
	Agency	Direct insurance	Reinsur-ance	Invest-ment	Rest of the economy	Total Interme-diate use	Sales to final users	Change in inven-tories	Imports	Total of final demand	Gross commodity output
Agency services	0	90	0	0	0	90	0	0	0	0	90
Direct insurance services	10	10	10	10	160	200	400	0	0	400	600
Reinsurance services	0	60	0	0	0	60	180	0	0	180	240
Investment services	0	50	10	0	40	100	0	0	0	0	100
Goods and other services	10	95	40	10	10	165	100	20	-10	110	275
Total intermediate inputs	20	305	60	20	210	635	–	–	–	–	–
Value added	70	295	180	80	65						690
Gross industry output	90	600	240	100	275	–	680	20	-10	690	–

C. Assessing the Delineation of Insurance Producing Units

a) Set Up

So far I have delineated the insurance firm is viewed as a set of integrated producing units performing different activities. The question is now how meaningful are these activities. Following Clarke (1989), I investigate how well the proposed delineation of the insurance business separates groups of insurance firms into economically distinct activities. The maintained hypothesis is that there are input shares that are more similar among producing units that occupy the same industry than among units that are in more remotely connected industries.

The delineation of insurance industries is said to be significant if, and only if, the production units of an industry react the same way to any exogenous shock (industry-wide or economy-wide). For this to be true, the production units of this industry must have similar technologies. However, the similarities diminish within coarser industrial groups. To test this proposition, I use a variation of the diversification concept developed by Gollop and Monahan (1991), which allows me to quantify the extent to which an industry's production units have similar technologies.

The properties of a technology are captured in parameters defining the relationships among inputs, outputs and costs. Identical cost function parameters across producing units suggest homogeneous technologies while different parameters specify heterogeneous technologies. Identifying and measuring these parameters is the key to designing a statistical measure that can be used to assess the delineation of the insurance business. It turns out that, under reasonable assumptions, the information required for identifying these technology parameters can be extracted from data commonly available in industrial accounts. To show this, consider the following cost function of a production unit i defined in (1)

$$G_j(w, Q, R, t) \tag{1}$$

where w, Q, and R represent, respectively, vectors of input prices, output, and any other input peculiar to the activity of the production unit[9]; G_j represents the minimal cost incurred by the production unit j in order to produce a vector of output Q under given market conditions, and any idiosyncratic aspect represented by w and R, respectively. The simplest parameterization of this cost function is to assume that it has the Cobb-Douglas form

$$\ell nC_j = \sum_f^J \beta_{j,f} \ell nw_{j,f} + \sum_\kappa^I \lambda_{j,\kappa} \ell nQ_{j,\kappa} + \sum_\tau^M \alpha_{j,\tau} \ell nR_{j,\tau}, \qquad (2)$$

Assuming competitive (input and output) markets, the Cobb-Douglas parameters $\beta_{j,f}$ and associated $\alpha_{j,t}$ with the inputs are equal to the corresponding revenue shares (using Shephard lemma)

$$\beta_{j,f} \equiv \frac{\partial \ell nC_j}{\partial \ell nw_{j,f}} = \frac{w_{j,f} \cdot X_{j,f}}{V_j} = s_{j,f}$$

$$\alpha_{j,\tau} \equiv \frac{\partial \ell nC_j}{\partial \ell nR_{j,\tau}} = \frac{z_{j,\tau} \cdot R_{j,\tau}}{V_j} = \omega_{j,\tau} \qquad (3)$$

$$\lambda_{j,\kappa} \equiv \frac{\partial \ell nC_j}{\partial \ell nQ_{j,\kappa}} = \frac{p_{j,\kappa} \cdot Q_{j,\tau}}{V_j} = \vartheta_{j,\kappa}$$

so that $\sum_f^J s_{j,f} + \sum_\tau^M \omega_{j,\tau} = 1$ where

$w_{j,f}$ = the price of the input f,

$z_{j,\tau}$ = the (shadow) price of the input τ,

$X_{j,f}$ = the quantity of the input f used by the $j-th$ production unit,

$R_{j,\tau}$ = any other input τ used by the $j-th$ production unit,

V_j = the nominal output produced by the $j-th$ production unit,

Q_j = the quantity of output produced by the $j-th$ production unit,

$\alpha_{j,\tau}$ = the (shadow) revenue service share of any of the $\tau-th$ inputs in the total nominal output of the $j-th$ production unit,

$\lambda_{j,\kappa}$ = the revenue share of the $\kappa-th$ output in the total nominal output of the $j-th$ production unit.

If one considers another producing unit, say h, which performs the same activity and uses a Cobb-Douglas technology, this technology will correspond to parameters $\beta_{h,f}$, $\alpha_{h,\tau}$ and, accordingly, to input shares $s_{h,f}$, $\omega_{h,\tau}$. If both production units have the same technology, then one may expect to obtain $s_{j,f} = s_{h,f}$ and $\omega_{i,\tau} = \omega_{h,\tau}$. Otherwise, none of these equalities would hold. Differences in input cost

shares and output shares among producing units, which, therefore, quantify differences among parameter technologies, can be used to calibrate the extent of heterogeneity among producing units within an industry. The heterogeneity index has the following form

$$\Delta = \sum_{j}^{J} \mu_j \Delta_j \tag{4}$$

with

$$\mu_i = \frac{V_j}{\sum_j V_j}, \tag{5}$$

and

$$\Delta_j = \sum_{h} \mu_h = \left(\frac{\sum_j \left| s_{j,f} - s_{h,j} \right|}{2} + \frac{\sum_\tau \left| \omega_{j,\tau} - \omega_{h,\tau} \right|}{2} \right) \tag{6}$$

The symbol $|\cdot|$ refers to the absolute value. Dividing by two prevents double counting and ensures that the index Δ is bounded in the zero-one interval, $0 \leq \Delta \leq 1$. As differences among the parameters increase, Δ increases. As the differences decrease, the index Δ approaches zero. It turns out that the heterogeneity index is simply a weighted sum over differences in cost function parameters describing the technology structures employed by producing units within an industry, where the weights μ_j and μ_h are defined as the shares of the $j-th$ and $h-th$ producing units in the industry's nominal output. For any given difference in the input shares of the $j-th$ and $h-th$ producing units, the overall effect on industry Δ is determined by the relative importance of the $j-th$ and $h-th$ producing units. Therefore, input differences between large producing units have more impact on Δ than do input differences between small establishments. The share variables μ_j and μ_h insure this result.

■ b) Empirical Results

Once the delineation has been completed, the issue is whether production units in each industry operate under the same technology or not. This question is crucial since firms specialized in the same product line can use a different technology or different input mix. This, in turn, means that they will not react identically to a common

shock. For this purpose, the heterogeneity index appears to be helpful. It enables us to examine whether or not there is a large dispersion in the technology of production units that are members of the same industry by using information on the input shares of each of them. This index also indicates whether or not the industrial classification is becoming more accurate by progressive refinements to the structure of the classification. For example, does it suggest that the heterogeneity in the technology of producing units substantially decreases as we move from a classification based on institutions to another based on producing units? If so, this implies that it is likely that the production units that are members of the institutions display different technologies.

TABLE 15
HETEROGENEITY INDEX APPLIED TO INSURANCE INDUSTRIES

Insurance		88
Life Insurance		85
Agency	33	
Direct insurance	64	
Reinsurance	79	
Investment	45	
Non-Life Insurance		93
Agency	42	
Direct insurance	66	
Reinsurance	48	
Investment	74	

Table 15 summarizes the application of the heterogeneity index Δ at the different level of refinement for both life and non-life insurance using data from the Office of Superintendent of Financial Institution, the regulator of the insurance business in Canada. Although the results are based on 1994 data, they do seem to be fairly stable over time. The level of the heterogeneity index for the whole insurance subsector is fairly high at .88. Making the distinction between life and nonlife insurance industries at the institutional level (i.e. the insurance firm) somehow reduces, albeit not dramatically, the level of heterogeneity. Although the level of heterogeneity still remains high for both types of insurance, life insurance industry displays a slightly lower level of heterogeneity that non-life insurance industry (.85 versus .93). Separating the insurance firm

into distinct lines of business significantly decreases the level of heterogeneity for both life and non-life insurance businesses. In both instances, agency industry display the lowest level of heterogeneity in comparison with other industries. Owing to the small number of producing units accounted for in the sample in comparison with other insurance industries, reinsurance and investment industries display a relatively high level of heterogeneity, respectively, for life insurance and non life insurance. Despite the refinement made to the insurance business through these four industries, direct insurance industry still shows a high level of heterogeneity for both life and non-life insurance businesses. This tends to suggest that a further refinement can be implemented in this particular industry through the distinction between multiproduct and monoproduct producing units.[10] Finally, it is important to note that the level of the heterogeneity index is not significantly different between pairs of the same industry that belong to life and non-life insurance. This clearly suggest that, on the basis of the technology, the distinction between life and non-life insurance businesses is irrelevant. What is more relevant, however, is the delineation of the various lines of business which happen to display the same technology across the type of insurance.

In most cases, the results indicate that heterogeneity in technology tends to increase when n-digit level of refinement is coarsened into $(n - 1)$-digit level refinement. These results suggest that the delineation of the insurance business proposed in this paper is quite robust as a method to separate insurers' production units into very refined groups based on similar technologies. Since the latter level is the one that most economists view as being close to economic industries, the proposed approach turns out to be successful at delineating economic industries.

■ IV. CONCLUDING REMARKS

This article reviews and extends the measurement framework of the insurance business at both macro and micro levels. The main results of this framework are easily summarized. First, the SNA consists of a coherent, consistent set of macroeconomic accounts and tables designed for a variety of analytical and policy purpose. Nevertheless, certain key aggregates of the system, such as industry GDP, have acquired an identity of their own and are widely used by users of all kinds as summary, global indicators of economic and welfare. Movements of such aggregates, and their associated price

and volume measures, are used to evaluate the performance of the economy and industries. The first part of the article applies illustrates this framework using the insurance sub-sector as an example.

Second, although the SNA was born in the world of macroeconomics, its roots have been in the data relating to individual decision-making units in the economy. Since its inception, both the complexity of the economic system and the concern with new analytical problems have increased. Currently, governments are faced with the need to evaluate both the macro and micro aspects of their policies in many areas. The national accounts alone are not sufficient for this task. Both the need and technical feasibility of linking the macro framework with micro data have increased.[11]

The second contribution of this paper is to unravel the behaviour of the various activities performed by insurance firms, with a special focus on the interactions between the various production units, their output and the characterization of their behavioural functions. The need to go beyond the concept of insurance firm builds on the tradition initiated by Coase. Just recently, in his Alfred Nobel Memorial Prize in Economic Sciences' lecture, Coase (1992, 714) emphasized once again the need to go beyond the traditional "black box" concept of firms:

> *"What is studied (in the mainstream theory of firm) is a system which lives in the minds of economists but not on earth. The firm in mainstream economic theory has often been described as a 'black box.' And so it is. This is very extraordinary given that most resources in a modern economic system are employed within firms, with how these resources are used depended on administrative decisions and not directly on the operation of a market. Consequently, the efficiency of the economic system depends to a very considerable extent on how these organizations conduct their affairs, particularly, of course, the modern corporation."*

On the other hand, the practical reasons that motivate this option are numerous. In North America, like in many other developed continents, the financial services business corresponds exclusively to regulated institutions, legally constituted, and often members of enterprises with a wide variety of activities. The concept of institutional entity is far from unambiguous and that the motives for legal structures are often other than purely organizational. They are often associated with tax-legislation and regulation, rather than reflecting economic reality. It is questionable whether the chosen legal structure corresponds with the way in which economic agents perceive reality themselves. It is even very likely that their view of economic reality is a very different one.

At least three areas of the analysis of the insurance business remain fertile ground for further research. First, I suggest that the analysis of the insurance production structures at the level of the line of business should be listed to the top of the agenda in applied econometrics and determine which production units drive the economic performance of the insurance firm. While many studies documented the fact that the life insurance industry shifted from financial protection services to investment products (see Poterba, 1997), no contribution has ever tried to determine the difference in the economic performance between financial protection (direct insurance) and financial intermediation (investment activity).

The other remaining areas for further research concern the economic performance of the investment activity and reinsurance. This last item includes issues such as the turbulence in the insurance business in terms of entry-exit, concentration by product line, pricing and a cross country comparison in the structures, conduct and economic performance of insurers lines of business.

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Notes

1. The co-operative credit movement is sometimes cited as a "fifth pillar", offering banking and other financial services to households. Other financial institutions include pension funds, mutual funds, finance companies and leasing companies.

2. Reinsurance is a process by which the reinsurer (the first party) in consideration of a premium agrees to indemnify the reinsured (the second party) against a risk insured by the reinsured under a policy in favour of the insured (a third party).

3. Changes in actuarial reserves are not considered in this chapter for the sake of simplicity.

4. "*The total value-added, (...), thus equals the insurers expenses plus the owners's profit charge for bearing insurance risk*". (p. 26)

5. The historical growth rates of industries' value added are preserved and the series are projected backward from the new base year on that basis while the following years are established on the basis of the relative prices of the new base year.

6. Direct insurance sells financial protection for various kinds of assets; reinsurance provides diversification of risks on various kinds of financial protection; investment provides various kinds of investment advises to different clients.

7. In practice, if this information is not available, one may use the commissions rate that insurers apply to independent brokers.

8. Specifically, the use of standard national accounting procedure to measure the output (gross output or value added) originating in financial intermediation would yield a figure that would be too low without the addition of an imputed value of financial services rendered (see Berger and Humphrey 1992; Fixler and Zieschang 1991). To illustrate, suppose that the GDP for the investment unit was calculated simply by summing wages, profits and net interests (where net interests are interest earned on loans and interest paid to the direct insurance for funds loaned). A characteristic of the investment unit is that interest received typically exceeds interest paid; it typically pays below market interest rates on liabilities. The interest rate differential serves as an implicit payment for services rendered. Without the explicit addition of the value of these implicit payments the GDP for investment would be understated.

9. The variable could represent reinsurance ceded for direct insurance production unit.

10. The new North Americain Industrial Classification System for the Canadian insurance business actually does introduce this distinction between multiproduct and monoproduct producing units. See Statistics Canada (1998).

11. The UN SNA (1993) states explicitly its position concerning the relation of the macro accounts to micro data: "*Nevertheless, as a general objective, the concepts, definitions and classifications used in economic accounting should, so far as possible, be the same at both a micro and macro level of facilitate the interface between the two kinds of data*". (p. 12).