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## *SNA and GDP as a consilience metric method*

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### **Abstract**

What is wrong in the System of National Accounts (SNA)? This paper offers a new and simplified view of the role of national accounting methods and the metric used in empirical estimation of current economic activity (gross domestic product), inspired on previous work of A. Vanoli and F. Thomas Juster. To keep the things simple and to take the opportunity to explain this complex topic to students and people, we highly here a back to basics. We focus on the most simple idea: the notion of identity and the arithmetic theory to construct the concept of macroeconomic identity. We propose to establish a link between Euclides, Paccioli and Keynes to show the inter-temporal consilience between overlapping generations. These last use the double accounting method as a representation form of empirical economic activity. This frame deflects a generalised mistake in the contemporary literature about the idea that GDP can serve as a measure of social welfare. That is a wrong, so wrong misuse of this metric. Taking seriously Keynes, the standard GDP definition offers us a simple measure and a sound basis to have an empirical estimation of economic activity: it is a macroeconomic figure of synthesis that provides us an approach to observe the business cycle. The key point is the right side of the identity definition of 'Y= C+I', the key point is 'investment' and its inclusion in the big formula.

*Keywords:* A=A; macroeconomic identities, System of National Accounts (SNA), double accounting, business cycle and investment, *animal spirits*, Euclides, Paccioli, Keynes, consilience.

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“Philosophy consists of logic and epistemology, and of moral and political philosophy. A good grounding in logic and the theory of knowledge will make a better economic theorist. The distinction between an identity and an equality (because of the identity of indiscernibles, equality is possible only between non-identicals), elementary to a philosopher, would have saved many pages of print in the early controversy over savings and investment” (Streeten, 2002, p.14).

“There is no doubt that national accounts represent a milestone in our measurement systems. They helped in achieving economic stability and in fostering economic growth by serving as the mainstay of macroeconomic analysis” (Hall *et al.*, 2010, Box 1, p.14).

## 1. Introduction

The aim of this paper is to provide a simplified view of the notion of production and the problem of the estimation problem of economic and social performance in complex contemporary societies. Using the F. Thomas Juster’s framework that has been defined in Vanoli (1983, 1991), we propose a concise representation of the total economic activity as an outcome of the human use of diary available time that is applied or engaged in four main activities –social driven activities, home activities, pure personal and pure social activities-. This workflow produces four kinds of outputs (market goods and services, nor market good and services, voluntary and non profit production and external effects).

The old simple description of economic and social activities pictured by André Vanoli, a French national accountant, offers us to the modern statistician attached in public statistics production, economist, sociologist and policy makers a simple framework of the *vita*, easy to understand and to explain to students and people interested in knowing the current public affairs. This representation reveals also the big omissions of Gross Domestic Product (GDP) as a potential measure of well being, going beyond to the traditional Pigouvian trick.

This approach shows us the importance of the production boundary as a key concept neglected in the current debate running on the best method to define and estimate economic progress. This is a central question posed twenty years ago by the 1993 System of National Accounts, and by the contemporary debate open by Stiglitz Commission Report (2009) around the need to surpassing GDP measures and develop a new approach to think and measure social and economic performance of evolving and adaptive societies.

But the question that remains is: why do we need the GDP estimation today? How can we improve it? Our answer is twofold. Taking Keynes seriously in the 21st century, we propose going back to basics to connect here the macroeconomic thought with the representation of geometry and double accounting method developed by Euclides and Luca Paccioli. The big push in accountability of business affairs provided by the double accounting methodology in the 15th century is a very important precedent of the *tour de force* of GDP the invention for macroeconomic policies in 1930s. Accounting methods can be seen as a rational standard chosen by individuals and institutions that search the benefits of economies of scale in communication and data exchange and its content. As a public good,<sup>1</sup> the international System of National Account standard provides all users

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<sup>1</sup> See Kindleberger (1983) and David, (1985). On the path dependence as an important outcome of standards chosen in the past, see Durlauf (2008), Mahoney and Schensul (2006). Verge and Durand (2010) discuss these ideas in the world of management and Coyle (2005), in field of information library classification management. We applied this approach to the historical development of the standard metric of macroeconomic affairs.

a unique language and a background for the interpretation and analyses of the economic environment of multiple nations.

After this brief introduction, section 2 describes a compact history of National Accounts around the big formula of Gross Domestic Product (GDP): income and economic activity is the sum of final consumption and investment ( $Y = C + I$ ). In the section 3 we propose a simple framework to represent human action and all economic and social activities in which can engage all days is presented in section 3. If this framework of the production boundary is accepted, the main problem of statistic institutes and national authorities is financing and offering the economic and human resources to develop and integrate total economy system.

However, the gap in terms of experience and divergence method in the U.S. and the EU since 1997 (Hartwig, 2005, pp. 17-22; Ward, 2006, p. 334) are evidence that current international comparisons of economic performance documented in national estimations could be biased by methodological differences in the compilation methods of key macroeconomic variables (deflators, gross value added, jobs, hours worked and so on). The political economy of the arithmetic metrics is analysed in the final paragraph (section 4), with a request in favour of more consilience in social sciences, *à la* Wilson (1998) view.

## **2. Deconstructing GDP noise: the short run macro and the long run macro in a nutshell**

The historical development of National accounts System is well-known and well written.<sup>2</sup> But, as a techno-scientific knowledge, the accurate interpretation and sound use of macro aggregates has been questioned since the seventies of last century. This is a turning point considering that the interpretation of GDP as a measure of welfare has gained a new role. Studies in the long run economic development studies and international comparisons level, the new economics of growth revival in 1980's, and the increasing use of the output gap concept, the potential output and NAIRU, in short run macroeconomic policies, added a new role on the supply side view in macroeconomic analysis of aggregates, in short run macroeconomic policies.

We can enunciate three very important applications of macroeconomic aggregates estimations with a big success: growth accounting, long term studies in developing countries and convergence analysis, international comparisons of the economic development level (and the purchasing power parity theory and the index price theory connected with this research field). In this study area, there is a consensus that recognizes the GDP limitations of and other empirical aggregates definitions to picture a complete representation of all aspects drawn in the economic development. In our opinion, these are the reasons for a bipolar view of GDP macroeconomics estimates: the right-hand side and the left-hand side of the identity show us the same figures, but it can be decomposed in multiple forms and for very different purposes, in applied studies:

“Although the primary purpose of national accounts was to assist public policy makers smooth business cycles, they are now being used increasingly as a measure of social welfare. There are legitimate reasons for GDP and other aggregate standard national account statistics to be used as a measure of social welfare” (Clarke and Islam, p. 3).

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<sup>2</sup> See Vanoli (2002, 2008), Box (2003, 2009).

The basic idea to keep in mind is simple: we need to look back to see GDP *demand* definitions and estimations of current economic activities as a good empirical measure to observe the short run macro business cycle. The spirit of GDP macroeconomic aggregates is to sum up all economic activities developed in a figure. The measured figures were not exhaustive to capture economic welfare, because original interest of economist and national accounts officers were to offer a good evaluation of total activity and the cyclical economic position of the whole economy. Why do National Accountants and Keynes have decided to include gross formation of capital at the right-hand side of GDP identity? The right side of GDP aggregate in the Keynesian definition of is the key point to understand GDP as an empirical construct. With saving, investment is the key variable in short run analysis of animal spirits that drive the economy.

“Two incidents fostered the final breakthrough of national accounting: first, J. M. Keynes’s General Theory of Employment, Interest and Money (1936) encouraged thinking in terms of macroeconomic aggregates such as consumption and investment demand. Also, Keynes proposed an appropriate delineation for these aggregates to show that production, distribution and appropriation aspects of national income are in fact inextricably interwoven” (Hartwig, 2005, p. 3).

These estimates are the first step to evaluate the current position of economy and design macroeconomic policies concerning to the stabilization of the whole economy. But this point is long to be accepted today by all economists, because the training on macro is a brief standard course in the bachelor with a limited understanding of the methods used to construct the accounting view to represent the economic activity.

In the Kuznets’ tradition, GDP was a very useful tool to describe and to study modern economic growth and the consequences of economic progress. The focus on literature about economic development (Simon Kuznets, Colin Clark, Rosenstein-Rodan, Tibor Scitovsky, Albert Hirschman, François Perroux) was the trend and the structural transformations, and not the short run position of the economy. The statistical development was very limited in the Forties and Fifties of the 20th Century and GDP measures opened very interesting analysis of the supply side forces. GDP measures and input-output techniques were very useful for the leading economists of development theory.

“National and international systems of national accounts explain that the aggregates they define and calculate are measuring notably the economic production, within a given definition of its field and with some conventions as usual, as well as the final consumption and, more generally, the different uses (consumption, fixed capital formation, etc..) for goods and services that have been generated by production activities. National accountants have always clearly stressed the point that these aggregates were not meant to measure welfare and that their changes in volume (at constant prices) could not be interpreted as changes in welfare of the society as a whole. Although Simon Kuznets’ position was that National Income should be a measure of economic welfare, his view was not retained when National Accounting started to emerge in the Forties and Fifties of the 20th Century. The latter notably appeared with the remarkable contribution of Richard Stone and James Meade in the United Kingdom and the work of the US Department of Commerce’s new team (Milton Gilbert, etc...), from which Kuznets started to depart, for that reason among others” (Vanoli, 2010, p. 5).

The sixties marked some of the most important turning points in the 20th century: the crisis of the spirit, the concept of the Euro-centric and Occidental vision of the modernization and the values of an open pro-market society. Environmental costs of economic growth and the increasing evidence about the existence of important

externalities associated with the economic development were the central critics of the emergent ecological movement.

The Lucas` critique to Keynesian policies and the current debate in macroeconomic theory about the effectiveness of the fiscal policies and the revival of the economics of growth in the eighty`s and nineties (Romer, Lucas, Barro, Xala, Mankiw, Jones, Prescott, Acemoglu, Rodrik, Galor...) demark a new paradigm in contemporary macroeconomic theory.

However, all economic schools of macroeconomic theory use the metric latent in the *General Theory* (1936) and the SNA system formulated by Richard Stone in 1947 and 1953. This general architecture has been the meeting point, the steady state of convergence, the grammar of macro, for very different ways of thinking in economics. Why? In the fourth section we propose a possible answer to this question.

### **3. GDP versus Social Welfare or Weil-Being: a total measure of human economic activities**

The bipolar view of macroeconomic uses of aggregates can be surpassing with a more general and comprehensive presentation of the production notion and a coherent proposal of its uses. In this paragraph we present a simple framework of use of the total social time in the personal life and the flow of goods and services that we can produce with them, using different kind of complementary capital assets. This framework was presented by F. Thomas Juster forty years ago. He knew a very smart simplification proposed by the professional in national accounts named André Vanoli in 1980s. Vanoli is one of the main architects in the development of the 1993 System of National Accounts (see Ward, 2006, p. 329), that is the first universal standard system.

Vanoli (1983; 1991) discusses the proposal of extension and modification of the accounts based on A. Thomas Juster (1970, pp. 14-16; see also Juster, 1973, pp. 42-50) in a brief but very important article published only in French and Spanish. André Vanoli surveys all ideas in the history of thought about the production notion in order to demarcate the production boundary that is a key question of the 1993 SNA. At the end of the article, he summarises the most important ideas related to this concept in a compact form and, particularly, the Juster`s thought in a simplified table (see table 1).

In general terms, economic and social output can be thought of as *a flow* of satisfactions or utilities generated by the services of various types of capital assets:

1. Reproducible tangible wealth (structures and durable equipment).
2. Reproducible intangible wealth (the stock of disembodied socially useful knowledge).
3. Human wealth (the stock of skills and knowledge embodied in persons).
4. Natural physical resource wealth (the stock of mineral, forest, water, climate, etc., assets).
5. Sociopolitical wealth (the stock of personal and national security, freedom, equity, privacy, health, social and economic mobility, heritage,...).

The classification by ownership is the familiar one: (1) Enterprise wealth including nonprofit organizations, (2) Personal and family wealth, (3) Common property (government) wealth.

Table 1 shows schematically the set of concepts around the notion of production based on the type of business and the goods or services produced with the exception of illegal activities. Personal activity is pure consumption, that is to say, an individual cannot perform by someone else in his place actions like eating, sleeping.<sup>3</sup> Domestic activity covers internal household activities, other than purely personal activities.

Social activity is pure social activity other than the economic activity socially organized. The cell IX also covers the satisfaction flows generated by the assets non-economic (for example, socio-political assets).

The cell III corresponds to the hypothesis that part of the subsistence economy (other goods and services voluntarily obtained) is “socially organized”. If we put all the subsistence economy in the cell IV, the cell III would be empty.

An example of VI could be the pollution of a river by a factory, VII: the noise of a mixer, VIII: the snoring of a sleeper, X: violence during a street demonstration; a terrorist attack.

**Table 1. Micro-meso and macro unified:  
all Economic and Social Value in a Table**

<i>Kind of activity: Generating:</i>	Social driven Activity	Household Activity	<i>Pure Personal Activity</i>	<i>Pure Social Activity</i>
Goods and services traded on the market	I			
Non market goods and services traded and produces with inputs and goods and services traded on the market	II			
Non profit good and services	III	IV	V	IX
External effects	VI	VII	VIII	X

*Source: André Vanoli (1983), “Las distintas interpretaciones de la noción de producción”, Información Comercial Española, 1991, nº 698, p. 115.*

Taking into account the current methodology for the National Accounts, the GDP includes the first and the second cells, and a little part of the third and the fourth cells.

<sup>3</sup> A very important question in aging societies with decreasing personal autonomy and increasing dependency of other people.

The implication is clear: to construct the social accounts of well-being or progress, we need to invest more resources in the literature development about satellite accounts to separate these flows, outputs and outcomes, and funds/assets. This knowledge is not free, because there are not free lunches: we need to pay and we should to collect the taxes to finance these public goods (Hernández Muñiz, 2003, pp. 344-345). Once a public good is produced, everyone can consume without making payment, but previously everyone has to pay through government taxes (cell II).

The release of the Stiglitz report commissioned by French President Sarkozy in September 2009 proposes a new appropriate metric to measure economic and social progress. We think that Stiglitz Commission should have taken into account the proposals developed by Vanoli and Thomas Juster in order to reduce the noise/confusion and help to define the notion of production.

We think the social scientists know what we measure and why -to observe the economic cycle- and we know that the best things in life, the ones that matter in the long run, they are outside the metric accounts because they are not relevant to stabilize economic policy in the short term (for the recognition and control of recessions in the classic Keynesian sense).

#### **4. The Political Economy of a metric. *Consilience* for a Universal Standard**

All economics students and citizens should be aware of the GDP limitations: although it is contaminated by productions that do not generate welfare (in section I, congestion, security services costs, prisons, insecurity, drugs, prostitution ...), this and other complex macro aggregates (potential GDP, the output gap or total factor productivity) should be measured for political reasons and economic needs.<sup>4</sup>

We need to pay more attention about the transcendence of common methods and basic information to have accurate estimations of strategic aggregates. This information and the results are the material input in economic and social diagnostic and the analysis that stimulates public policies. The World Economics Association has a good opportunity to disseminate these ideas about a good basic metric of the economic performance. In this paper we defend the linking between Keynesian thought and with a background and a legacy more profound.

We demand here more consilience between overlapping generations that use a simple metric:<sup>5</sup> Euclides representation of space [the identity,  $A=A$ ], Boecio, Al-Khwarizmi, Llull, Paccioli (the translator to Italian of Euclides *Elements*'), Pascal, Petty, Quesnay, Bernoulli, Condorcet, Smith, Ricardo, Carnot, Babbage, Marx, Walras, Menger, Bortkiewicz, Hollerith, Pigou, Popov, Leontief, Kuznets, Clark, Meade, Hicks, Hoover, Stone, Torp, von Neumann, Shannon, Jaynes... a so long list of *accountant thinkers* continued by (Baumol, Hirschman), Arrow, Debreu, Samuelson, Solow, Sraffa, Morishima, Okishio, Kaldor, Tinbergen, Diamond, Denison, Kendrick, Ruggles, Jorgerson, Tobin, Ward, Hill, Vanoli, Diewert, Maddison, van Ark, Timmer, Dietzenbacher, Los, Weitzman, Nordhaus...

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<sup>4</sup> See Hauptmeier *et al.* (2009), Hulten (2000) and Felipe and McCombie (2007).

<sup>5</sup> See Vanoli (2010) for a complete analysis of this Report.

Modern System of National Accounts is a big large intellectual effort to quantify, in a comprehensive and holistic manner, the total economy around the World, and its parts. The spirit of this idea connects us with the most important thinkers of the history of thought, of the history of political economy and social sciences (Ward, 2006, p. 337).

We propose a consilience representation, an exhaustive description of flows in a simple table with ten cells (in Romanian numbers), but not the disputable problem of finding a true social value for flows and funds, outputs and outcomes, and capital assets:

“Value theory tell us what is good and how good is it, what appreciate and why, and that all these value judgements are actually measured in our economy and how is done. What is wealth, and what is well-being? Why are we willing to spend money on something, and what is really spent is money is spent? Economic and moral questions seem to be inseparable of practice” (Reich, 2001, p. 1).

In this paper we have presented a few simple steps to enunciate a complete metric of social facts-micro, meso and macro. We have not indicated how you need to measure the flow values, or suggested ways to break the flow of the cells boxes V to X in price and quantity vectors. We simply call attention *Urbi et Orbi* and we notice the importance of simplifying the problem and reduce everything to such simple parts. Vanoli proposal has allowed us to define the sample space of observation in an accountant manner, to postulate a solid measure of the economy and social life. In this way, it is started to establish a foundation that will enable a universally accepted standard of observation, supported by national accounts. A standard that makes possible to carry out the best reflection on the political economy, in a world always uncertain.

## 5. Bibliography

Artal, Lluís and Sales, Josep (2010): “Historia del uso de los números en la economía”, chapter one of *Hipotecas y ecuaciones. Las matemáticas de la economía*, Rodesa (Villatuerta: Navarra), RBA coleccionables, 2011, pp. 9-30.

Bos, Frits (2003): *The National Accounts as a tool for analysis and policy: past, present and future*, Netherlands.

Bos, Frits (2009): *The National Accounts as a tool for Analysis and Policy. In view of History, Economic Theory and Data Compilation Issues*, Social Science Research Network.

Clark, Matthew and Islam, Sardar M. N: “The Misalignment of Standard National Accounting Aggregates with Sustainability Objectives”, *Encyclopedia of Life Support System, Development and Economic Sciences*, Unesco (<http://www.eolss.net/Sample-Chapters/C13/>).

Coyle, Karen (2005): “Standards in a time of constant change”, *The Journal of Academic Librarianship*, vol. 31, n° 3, pp. 280-283.

David, Paul A. (1985): “Clio y la economía del QWERTY”, *RAE Revista Asturiana de Economía*, n° 37, septiembre-diciembre, 2006, pp. 23-31 (Spanish translation of “Clio and the Economics of Qwerty”, *American Economic Review*, vol. 75, n° 2, mayo, pp. 332-337).



Durlauf, Steven (2008): “Path dependence”, in Steven N. Durlauf and Lawrence E. Blume (eds.), *The New Palgrave Dictionary of Economics*, second edition, Palgrave Macmillan, pp. 318-320.

Felipe, Jesús and McCombie, John L. (2007): “Is a theory of Total Factor Productivity needed?”, *Metroeconomica*, vol. 58, nº 1, pp. 195-229.

Hall, Jon; Giovannini, Enrico; Morrone, Adolfo and Ranuzzi, Giulia (2010): “A framework to measure the progress of societies”, *OECD Statistics Working Papers*, number 5.

Hauptmeier, Sebastian *et al.* (2009): *Projecting Potencial Output. Methods and Problems*, ZEW y Phisica-Verlag, Springer, Heilderberg.

Hartwig, Jochen (2005): “On Misusing National Accounts Data for Governance Purposes”, Working Paper number 101, KOF-Swiss Institute for Business Cycle Research at the Swiss Federal Institute of Technology.

Hernández Muñiz, Manuel (2003): “Estadística”, en Arce Janáriz, Alberto (coor.), *El Estatuto de Autonomía de Asturias. Estudio sistemático*, Junta General del Principado de Asturias, Llanera, pp. 343-347.

Hulten, Charles R. (2000): “Total Factor Productivity: A Short Biography”, Cambridge, NBER Working Papers Series No. 7471.

Juster, F. Thomas (1970): “On the Measurement of Economic and Social Performance”, in NBER, *Economics: A Half Century of Research 1920-1970*, 50th Annual Report of NBER, New York, pp. 8-24 (<http://www.nber.org/books/annu70-1>) (French Translation as “La mesure des performances économiques et sociales. Propositions pour de futures recherches”, *Analyse et Prévision*, Futuribles, nº 3, mars, 1973, pp. 361-384).

Juster, F. Thomas (1973): “A Framework for the Measurement of Economic and Social Performance”, en Milton Moss (ed.), *The Measurement of Economic and Social Performance*, Columbia University Press for NBER, pp. 23-110 (<http://www.nber.org/chapters/c3613.pdf>).

Keynes, John Maynard (1936): *Teoría General del interés, el empleo y el dinero*, segunda edición, México, Fondo de Cultura Económica, 1965.

Kindleberger, Charles P. (1983): “Standards as Public, Collective and Private Goods”, *Kyklos*, vol. 36, nº 3, pp. 377-396.

Mahoney, James y Schensul, Daniel (2006): “Historical Context and Path Dependence”, in Robert E. Goodin and Charles Tilly (eds.), *The Oxford Handbook of Contextual Political Analysis*, The Oxford Handbooks of Political Science, Oxford, Oxford University Press, 2008, pp. 454-471.

Meyerson, Émile (1908): *Identité et réalité*, Paris, 1951.

Reich, Utz-Peter (2001): *National Accounts and Economic Value. A Study in Concepts*, Houndmills, Palgrave.

Rojo, Luis Ángel (1974): “Macromagnitudes”, chapter 2 of *Renta, precios y balanza de pagos*, Madrid, Alianza Editorial, 1984, pp. 11-53.

Stiglitz, J. E.; Sen, A. y Fitoussi, J. P. (2009): *Report by the Stiglitz Commission on the Measurement of Economic Performance and Social Progress*, Paris.  
([http://www.stiglitz-sen-fitoussi.fr/documents/rapport\\_anglais.pdf](http://www.stiglitz-sen-fitoussi.fr/documents/rapport_anglais.pdf))

Streeten, Paul (2002): “What is wrong with contemporary economics?”, *International Journal of Interdisciplinary Science*, vol. 27, nº 1, pp. 13-24.

Torra, Viçent (2010): “La Europa medieval”, chapter two of *Del ábaco a la revolución digital. Algoritmos y computación*, Rodesa (Villatuerta: Navarra), RBA coleccionables, 2011, pp. 57-75.

Vanoli, André (1983): “Las distintas interpretaciones de la noción de producción”, *Información Comercial Española*, nº 698, pp. 99-115 (Spanish Translation of “Les tracés divers de la notion de production”, *Économie et Statistique*, nº 158, september, 1983 ([www.persee.fr](http://www.persee.fr))).

Vanoli, André (2002): *Une histoire de la comptabilité nationale*, La Découverte, Paris (English Translation as *A History of National Accounting*, Amsterdam, IOS Press, 2005).

Vanoli, André (2008): “History of National Accounts”, in Steven N. Durlauf y Lawrence E. Blume (eds.), *The New Palgrave Dictionary of Economics*, second edition, Palgrave Macmillan.

Vanoli, André (2010): “On the Report by the Commission on the Measurement of Economic Performance and Social Progress (2009). The viewpoint of a retired national accountant”, German Data Forum, Federal Ministry of Education and Research, Working Paper number 162 ([www.germandataforum.de](http://www.germandataforum.de)).

Verge, Jean-Philippe y Durand, Rodolphe (2010): “The Missing Link Between the Theory and Empirics of Path Dependence: Conceptual Clarification, Testability Issue, and Methodological Implications”, *Journal of Management Studies*, vol. 47, nº 4, pp. 737-748.

Ward, Michael (2006): “An Intellectual History of National Accounting. Review of *A History of National Accounting*, by André Vanoli”, *Review of Income and Wealth*, vol. 52, nº 2, june, pp. 327-339.

Wilson, Edward O. (1998): *Consilience. La unidad del conocimiento*, Barcelona, Galaxia Gutenberg-Círculo de Lectores, 1999.