

(Biblical) Creation of Value

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Keywords: value, growth, business cycles, created value, gross value added, minimum value to return

Abstract

This paper deals with the concept of economic value and proposes a definition of and an algorithm to compute the value created in an economic process. The created value is the amount of value, from the Gross Value Added, that exceeds a minimum value to return and the latter is defined as the quantity of value that, by the end of a time period, should be returned to the stock of value in order to keep constant its capacity to reproduce the same value on the next cycle. Also, the concept of value is explored by a brief epistemological analysis concluding that it reflects human knowledge. It is argued that the increase of human knowledge is mirrored by the creation of value. The creation value algorithm is applied to the Portuguese economy the results of which are compared with results of other European countries.

1. Introduction

This paper deals with the concept of economic value, in its different forms, proposing a way to quantify the amount of value created in a production process. The value created may be positive or negative (value destroyed) and it is a fraction of the gross value added (GVA), which calculation is internationally normalised for economic units and for national economies. What is here called Created Value does not comply with conservative principles. It does not originate in a transfer or in building or rebuilding along any process, it comes instantaneously from nowhere.

The biblical meaning of creation consists of making something to exist instantaneously and out of nothing. This can not happen in the world of Physics and Engineering; it is against their fundamental laws. It should be remembered here that stocks and flows of energy interact necessarily as conservative processes. So is entropy and, as such, so are information flows. Therefore, human knowledge dynamics, energy/entropy wise, should also remain conservative. And yet, knowledge, in the form of new ideas and practices, contributes to produce value that may be instantaneously created, out of nothing. It is value created in the biblical sense.

Human knowledge interrelates with Nature, through action or work, in order to produce goods. Human knowledge products, like goods to be consumed or technology and capital forms, have a value that is built or added along the production process and eventually attributed by the users at the last stage of the sale. When to those goods users recognise a larger value than the value consumed to produce it, then, there will be value created. This created value is the difference between the transaction value (price) and the value consumed in the production process. Therefore, the value created could be calculated if every item corresponding to value consumed in the production process could be objectively listed and quantified. The interesting part of this analysis is to find every term of what it was here referred to as the value consumed.

The general idea of creation of value is omnipresent through management literature but it is hardly ever quantified and when it is, it may take a number of different forms, sometimes misleading and confusing. Corporate finance and accounting formulate several forms of valuation corresponding to different views and using different methods, but they concentrate on valuation of equity, assets and shares considering the future opportunities of their businesses. This is important and necessary but it is mainly based on estimations on what will happen in the years ahead, often difficult and risky to predict.

This article proposes a definition of what is here referred to as created value, a concept that depends only on objective data and that can be applied to a firm, a sector or a whole economy. It aims at helping engineers and technology managers to understand and objectively quantify the end results of their decisions and their work. Furthermore, this concept is designed to be easily understood as it builds on some engineering principles and methodologies and it is presented in a simple fashion such that an accounting non-specialist may easily use it. This idea of creation of value is also important for investors, managers and policy makers, because the amount of value created, not simply value added, is the final and unique criterion for private and public decisions concerning development. Value creation, as it will be seen, is

univocally related to innovation and innovation is consensually recognised as the main growth engine.

The fundamental thoughts on which this paper builds are the following:

- 1- In one period of time, a society produces and consumes goods to which attributes value or, in other words, it produces value and consumes value.
- 2- Both technology and capital assets value (equity value) depreciate with time, implying the constant need for investment in new capital.
- 3- Consumption nurtures human knowledge, such that the former's decrease will eventually imply the latter's decrease as well as its corresponding social and economic value.
- 4- There are value cycles in our society that may be described using flows and stocks of value.
- 5- The society stock of value is considered as built by two different processes: (A) technological and capital assets value and (B) human knowledge value. The same model may be applied to a firm or to a sector.
- 6- In brief, firms as well as societies create or destroy value, such that their stocks of value build up or fade away along the time. The default law is that value depreciates with time.

Section 1.1 describes how most authors consider value issues when discussing criteria and decisions on management of their business areas.

At section 1.2, the idea of value is discussed. Its basic epistemology is very briefly mentioned, showing the relation between value and knowledge. Within the broad concept of value, economic value is considered as a specific branch. One main characteristic of economic value is that it is a concept more objective than the concept of value and, as such, it can be quantified.

Sections 1.3 and 1.4 show how value has been and is now accounted for and how flows and stocks of value can be described.

At section 1.5 New concepts: Minimum Value to Return and Creation of Value, several standard forms of economic value are explained as well as their definitions referenced. Then, two new forms of economic value, "Minimum Value to Return" and "Value Created/Destroyed" are introduced, suggesting they contribute to enlighten the economic process understanding. An algorithm is proposed and justified to compute the Value Created in an economic unit during a period of time.

At section 2. The case of the Portuguese economic activity (universe of firms with more than twenty employees, 1996 to 2003), the proposed algorithm to compute value creation is applied to the Portuguese economy and some conclusions are taken for economic sectors, divisions and the whole economy.

Section 3 shows created value computed for nine European countries and in Japan, for the Division Manufacturing.

Finally, Section 4 draws the main conclusions.

1.1 Management and Value

In most management journals, authors present their analyses stating, explicitly or tacitly, that whatever they show or prescribe promotes value creation. However, value, in its many forms, is seldom detailed, let alone assessed. On the other hand, there are many journals and articles advising on a large variety of value accounting forms for corporations. These two fields of knowledge hardly ever come together on the same paper. Still, one should not go without the other at most of management levels, surely not at the technological management level.

Reading what has been published on these matters, one can verify that Management often uses tacit methods of value assessment with ambiguous criteria. Three groups of publications may be considered. On the first group, criteria are rather objective relating directly or indirectly to accounting parameters like productivity, efficiency, effectiveness or growth¹. However, it is neither obvious nor explicit how to relate gains in productivity or in firm's wealth to the quantification of value creation.

On the second group, one can find analyses and criteria that are subjective² and abstract, like listing sources and types of value creation, forms of value extracting and capturing, developing business models and strategies for increasing social value, value chain, costs and logistics, decision analysis models, embedded value in individuals and in systems, intellectual property value management, patent value, and so on. These analyses don't lead to any form of value creation assessment.

On the third group, strategy and policy³, merger and acquisition and accounting papers⁴, one reads that both innovation value and the different ways value can be captured are typically mentioned. They describe corporate case studies mentioning the concept of value creation and referring, objectively, to accountable forms of value: Book and market values, shareholder value added, equity or assets value, and so on. These are related to strategic choices and implementations, like investments and innovation related decisions. They measure returns on investments, shareholder value, assets value, cash flows and discounting cash flows. All these measures depend heavily on predictions for a good number of parameters. Others⁵ are aware and understand accounting methods but wisely advise that they may be misleading. Some other authors build their criteria with fantastic definitions of value⁶ as a ratio of benefits to costs.

¹ Mayo, Andrew (2008); Chang, Shao-Chi (2008); Soto-Acosta, Pedro & Meroño Cerdan, Angel Luis (2008); Abirami, Radhakrishnan (2008); Bowman, Clif & Ambrosini, Véronique (2000).

² Amit, Raphael & Zott, Christoph (2001); Cohen, Boyd (2008); Jonsson, Katrin (2008); Striukova, Ludmila (2007); Bader, Martin A. (2008); Lee-Kelley, Liz & Sankey, Tim (2008); Eiichi, Yamamoto (2007); Bowman, Clif & Ambrosini, Véronique (2007); Dovaliené, Aisté & Virvilaitė, Regina, (2008); Gay, Claudine, Latham, William and Le Bas, Christian (2008).

³ Pitelis, Christos (2007); Kim, W. Cham & Mauborgne, René (1999).

⁴ Rothenbuecher, Juergen & Schrottke, Joerg (2008); Boubakri, Narjess, Dionne, Georges and Triki, Thouraya (2008); Swaminathan, Vanitha, Murshed, Feisal and Hulland, John (2008); Ostaszewski, Adam (2008); Lloyd, W. James (2007);

⁵ Christensen, Clayton M., Kaufman, Stephen P. and Shih, Willy C. (2008).

⁶ Weinstein, Art & Barrett, Hilton (2007)

A good number of textbooks⁷ explain in detail how to measure some forms of value, like EVA (Economic Value Added), EP (Economic Profit) or CVA (Cash Value Added). These methods imply firms' valuation, in whatever form, at two different moments in time. The difference is considered as the value created or destroyed. The value forms can be shareholder value or share holder return, equity value or equity return and cash flow value and they can be based either on market value or on book value assessment and consider a number of different return rates, reflecting the finance mix used. It is not a straightforward process and depends heavily on market and productivity predictions. In this paper, a simple and objective process to evaluate the value created in a period of time is proposed.

1.2 Value and Economic Value

Value is a concept that does not apply exclusively to human related activities. All resources, like energy, are chased by every living element of an ecosystem. Trees grow up to get more sun shine and their roots look for water and nutrients. In such a system, living components strive competitively for a faster growth. One may say that heat, radiation and water have value for those entities. This is to say that, in an elemental framework, value may be understood as a metric of neediness. Therefore, as human related activities belong to the same ecosystems and as humans are a part of Nature, what society broadly understands by value must also involve this neediness or utility component.

The epistemology of value roots into the old philosophy. The concept of value is studied within Axiology⁸, which Greek etymon, *axios*, meaning to have value, is the geometrical element around which a system revolves. In the Classical Greek culture, values (*axios*) were central axis or fundamental ethic principles. The etymon of value is the Indo-European suffix⁹ *wal* which informs both German (*wert*) and Latin (*valore*) languages associated with being strong, powerful and in control. As early societies developed, they organized themselves hierarchically and the most knowledgeable and powerful classes forced their principles to all members, making those principles necessary conditions for a good society integration. As such, the concept of value developed also as a metric for ethics¹⁰.

Ethics, moral and religious contexts first evolved around the idea of the absolute truth and the proximity to God, such that the concept of value also evolved to the knowledge about the truth and about what is better for mankind. Ethics developed as law structures¹¹, also controlled by the elites, structure that became the sociological most powerful component. As such, it applied to every aspect of the social system

⁷ Fernández, Pablo (2002); Blank, Leland T. & Tarquin, Anthony J. (1989); Ross, Stephen, Westerfield, Randolph W. and Jordan, Bradford D. (1998).

⁸ Axiology – word introduced by Karl Robert Eduard von Hartmann (1842-1906) in his book *Grundriss der Axiologie* (1909) or *Outline of Axiology*.

⁹ The American Heritage® Dictionary of the English Language: Fourth Edition. 2000. <http://www.bartleby.com/61/roots/IE546.html> [Cons. March 2006]

¹⁰ Aristotle (1952), *Virtues and Vices* and Aristotle, *Nicomachean Ethic*

¹¹ Good examples are the Hammurabi Code (Hammurabi, 1780 BC) and the (Iberia Visigoth Code, 1910)

including all types of economic transactions. In fact, Political Economy was part of Moral Philosophy up to the times of Adam Smith¹².

Humanism in general and specifically Rationalism and Empiricism introduced new ways of understanding the world and their principles became part of society values, both intrinsic (the ends) and instrumental (the means). Slowly, the means to look for the truth (acquiring knowledge) became more important than the truth itself. It emerged a new scientific rationality: from Auguste Comte's (1798-1857) Positivism to Karl Popper's (1902-1994) Rational Criticism. Political democracy and individual liberty became the two most important pillars for sociological values. Accordingly, the individual and the group are understood today as two faces of the same coin, necessarily interdependent but without an *a priori* hierarchy between them.

The author concluded in an epistemological study¹³ that value is a metric that, fundamentally, takes as criteria two dimensions:

- 1- The needs and interests of individuals, reflecting both their elemental genetic determinisms and their knowledge.
- 2- The interest of the social group and their millenary accumulated knowledge, reflecting a balanced distribution through the exchange of goods and knowledge.

Value emerged as an ontological metric of goodness, this word understood as everything humans know to facilitate the best development of our species and of our societies. This metric has criteria, as mentioned above, but does not have an objective scale. Hence it does not allow quantification. Perhaps, the most important conclusion was that there is a tight link between the concepts of value and of knowledge, the latter considered both individual and social. This conclusion justifies the following somehow speculative statement: value is, after all, the metric of knowledge.

Economic value is a part of the wider concept of value. In this sub-group, parameters are better defined and criteria are objective. The most important value characteristic, in its sub-group of economic value, is that it tends to become, with globalisation, more and more an objective concept. Then, its quantification becomes possible and relevant to an increasing number of society members. How and when? Economic value only becomes visible, quantifiable and confirmed to society at one specific situation: a transaction between any two entities¹⁴.

Economic value was said to be rooted on human knowledge¹⁵ and work¹⁶. On the other hand, economic value is attributed as a function of the consumer's need and sense of utility. A very brief chronology shows that, in earlier societies, trade developed based on the mutual and coincident use value assessment of two different goods to be exchanged. Later, with more labour content goods and specific local

¹² Adam Smith was professor of Moral Philosophy at Glasgow University, 1751. According to Zúniga, 1997, Francis Hutcheson, Adam Smith's master at Glasgow University, taught Political Economy following St. Thomas Aquinas principles.

¹³ Fernandes, A. S. C., 2007.

¹⁴ The reader may find an interesting discussion on value of use and value of exchange in their seminal references, for example: Xenophon (1979), *Works on Socrates, Economics*, Chapter I; and in Adam Smith (1956), Book I, Chapter IV. See also Bowman, Clif & Ambrosini, Véronique (2000).

¹⁵ Xenophon (1979), Chapter I, section 10.

¹⁶ Xenophon (1979), Chapter I, section 16.

techniques, the production costs acquired a higher and more notable relative importance on the goods' price formation. Physiocracy¹⁷ and the Classics¹⁸ described in detail the value adding components from the production side. By then, the value added was understood as mainly built in the production process and there was a large consensus about that. When John Stuart Mill (1806-1873) synthesized the ideas of value and liberalism, he wrote¹⁹ that there was nothing more to say about value. However, a few years later, the marginalism²⁰ introduced a deep epistemological cut into the theory of value stating that it originated from the consumer side, not from production. Its main driver was the consumer sense of utility. The two theories merged as complementary in the neo-classic period²¹, on the beginning of the XX century.

Human knowledge is expressed through language, action and work. That expression is an interaction between human knowledge and Nature, which results in products of three different kinds: goods to be consumed, technological forms and capital forms. The last two kinds only aim at increasing the first kind's production efficiency. Humans have a genetic propensity to increase their knowledge, which constitutes a dynamic engine that implies a constant push for development. Therefore, they constantly devise new and better ways to acquire more knowledge, producing and using new forms of technology and capital. These forms are, after all, human knowledge embodied in material shapes, in other words, static forms of human knowledge. They all have value.

All knowledge, in its flows and stocks, are assessed and exchanged by using the concept of value as an instrument. Value became the metric of knowledge. This metric has criteria, which is the economic process, and has a scale, which is only apparent on the last stage of this process: the transaction agreement or the price²². On the other hand, human knowledge value is not measurable. Societies can only objectively assess human's work, what is referred to as labour value. We may graphically describe the knowledge-value-knowledge cycle as shown in figure 1.

1.3 Value Assessment

Volume and value accounting are as old as human society's history and constitute the very beginning of writing, by the eighth millennium BC. Treasures, land, cattle and slaves were the first forms of riches. Human migrations, empires and commerce brought together ever more population along with their respective knowledge and techniques. The participation (globalisation) of more people contributed to increase

¹⁷ Quesnay, Francois (1985) and Cantillon, Richard (1755). The last author wrote "the price and intrinsic value of a thing in general is the measure of the land and labour which enter into its production", part I, chapter 10.

¹⁸ Smith, Adam (1956), Book I, Chapter II and V; and Ricardo, David (1821), Chapter IXX.

¹⁹ Mill, John Stuart (1848), Book III, Chapter I.

²⁰ Carl Menger, Austrian, William Stanley Jevons, English, Friedrich von Wieser, Austrian, and Léon Walras, French.

²¹ Marshall, Alfred (1890). He wrote that there is equilibrium between cost of production and utility (offer and demand) and explained it with his famous metaphor of the pair of scissors that cut with both blades – Book V, Chapter 3, point 7.

²² See the definition of value at the OECD Glossary of Statistical Terms - <http://stats.oecd.org/glossary/detail.asp?ID=2837> [Cons. April 2008]

the available value per capita. This is so because, if value is created in one particular economic process, and if this process is to be repeated 1000 times, then a 1000 times more value will be created.

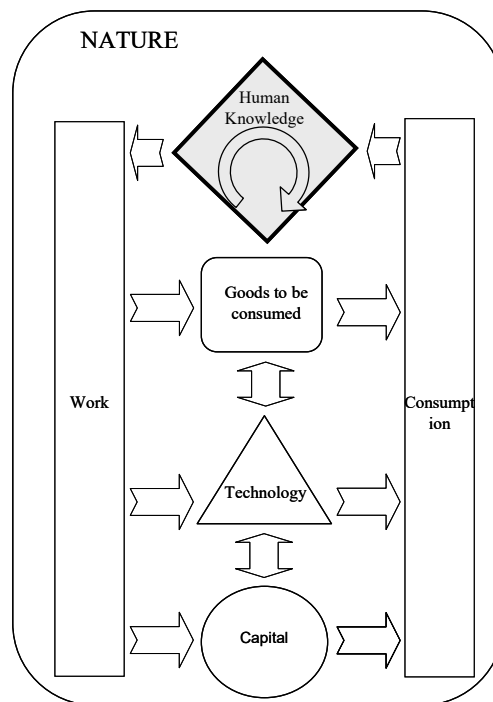


Fig. 1 Knowledge-value-knowledge cycle.

Only after the Second World War, value accounting became a fairly standardized process²³. Today, at least, all OECD²⁴ countries have comparable value accounting macroeconomic systems: the System of National Accounts²⁵ and the European System of Accounts²⁶. Such systems are based on stocks and flows, the first representing balance sheets taken as instantaneous valuations at the beginning and end of the accounting period of time, and the latter, “reflecting the creation, transformation, exchange, transfer or extinction of economic value”²⁷. The system is conservative, meaning that all flows account for the differences in stocks. So, when there is more value at the end of the period than at its beginning, one may ask where that value did come from? It was created within society.

A situation, when, along a time period, there is no change in the stock of value’s capacity to regenerate the same value, is shown in figure 2. In such a situation, the initial stock of value generates the Gross Value Added (GVA), which is also the families income value and also the value that families will expend as consumption and investment. Consumption and investment will restore the stock of value. If, by the end

²³ Henry Schultz (1893-1938), Simon S. Kuznets (1901-1985) and J. Richard N. Stone (1913-1991) are three important authors on this issue (Spiegel, 1999, Chapter 27; Blaug, 1992, Chapter 3; Stone, Richard, 1992).

²⁴ Organisation for Economic Co-operation and Development - <http://www.oecd.org/home/>. OECD, 2003.

²⁵ <http://stats.oecd.org/glossary/detail.asp?ID=2640>

²⁶ ESA, 1995

²⁷ ESA, 1996, 1.3.2. Actually, the creation of value, even if mentioned in the above description, is neither defined nor computed in ESA.

of this period of time, the final stock of value can regenerate precisely this cycle again, then there is no value created or destroyed.

In a closed economy without state²⁸, the value produced by society equals the income value received by the families and equals the expenditure value, which is what the families consume plus what they save (investment). The resources value, in the stock of value, is described on balance sheets and the value used is described on transactions accounts. The families' stock of value is unknown.

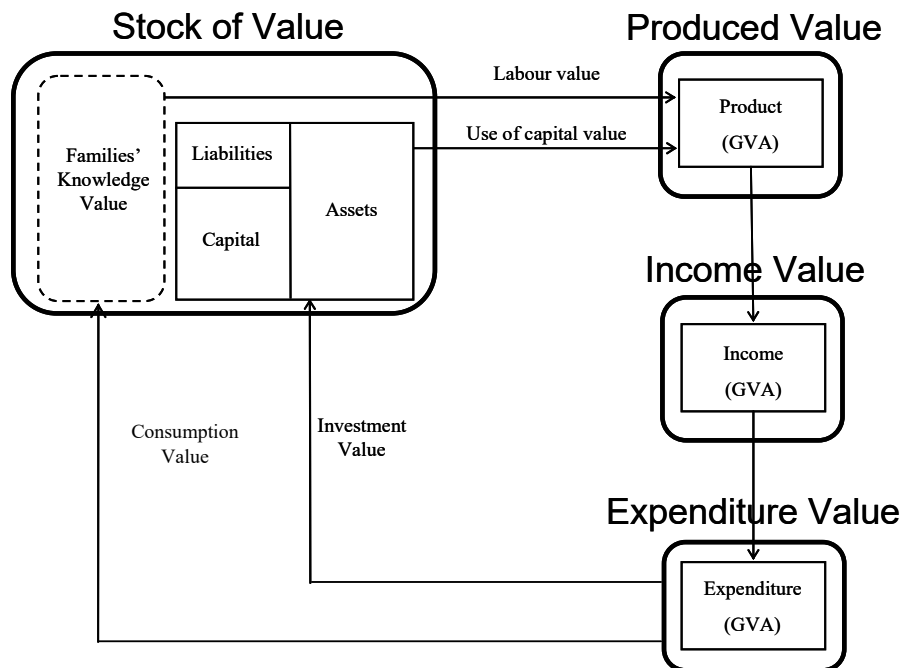


Fig. 2 Stock of Value with unchanged capacity to regenerate the same value, and the flows of value. Produced, Income and Expenditure Values are each one equal to GVA (Gross Value Added). Families' Knowledge Value is unknown. This is only rigorous in a closed economy without state. The rigorous meanings of each form of value are explained below.

1.4 Value Equations, Gross Value Added, Produced Value, Income Value, Expenditure Value and Stock of Value.

In this section, it will be described the basic and standard definitions of different forms of value, which are necessary to understand and to build the two new definitions to be introduced of Minimum Value to Return and of Creation of Value. These will be described in detail on the next section.

Macroeconomic systems can be explained from three different approaches: from the production side, the income side and the expenditure side.

²⁸ This system simplification allows an easier explanation of the points this paper aims at and brings no limitations to the final definitions and calculations. In such a system, the following identities apply:

- 1- GVA = Gross Domestic Product
- 2- GVA = Gross Final Consumption + Fixed Capital Formation (Savings)
- 3- GVA = Gross National Income
- 4- GVA = Labour Value + Gross Operating Surplus

The first approach, the production side, describes all the uses of resources and computes the production Output Value²⁹ (OV) and the Gross Value Added (GVA)³⁰. The difference between the two is the Intermediate Consumption (IC)³¹. This is true for a whole economy, a sector or just one economic activity unit, like a firm.

$$\text{Output Value} = \text{Intermediate Consumption} + \text{GVA} \quad (1)$$

Taking one firm, figure 3 describes this difference. On the right side, a product is represented as a value of 100%. At level 1, the firm's OV is 100% but the firm's GVA is only 60%, because this firm acquired goods in its supply chain by the value of 40% (one good – 24% and the other good – 16%). At level 2, one may observe that those two firms also have their Output Value of 24% and 16%, but their respective GVA was only a part of that because they, too, had to buy intermediate consumption goods in their supply chain.

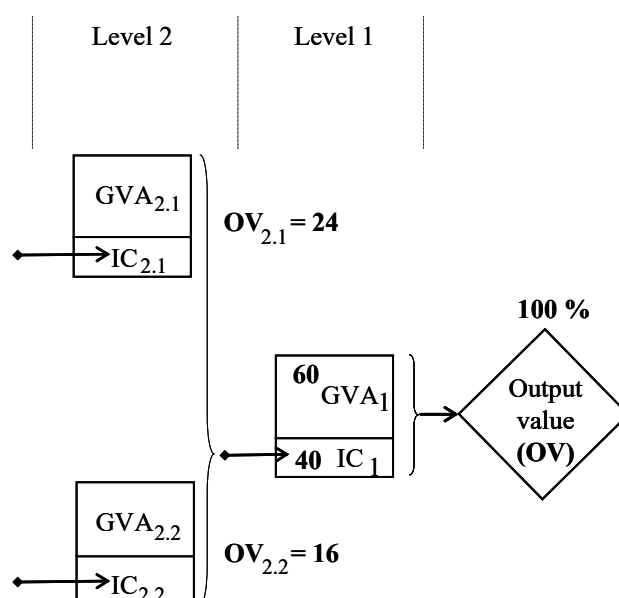


Fig. 3 Value supply chain with two levels. OV is Output Value and IC is Intermediate Consumption Value.

GVA is value added during production because it accounts for the value that is added in one period of time and so we may refer to it as produced value. Please note that added value is not necessarily created. If there is value created, it will be found within the added value, but there can be no value created and there can be value destroyed in the amount of added value. This very general identity does not allow yet the identification of value creation, what will be done in the next section. The sum in a whole economy of all contributions to the GVA in each economic unit is the total GVA, meaning the total added value or produced value in a sector or in an economy.

$$\text{Produced Value} = \text{GVA} \quad (2)$$

²⁹ ESA 1995, 3.14 and <http://stats.oecd.org/glossary/detail.asp?ID=1968> [Cons. April 2008].

³⁰ ESA 1995, 8.11 and 8.12; and <http://stats.oecd.org/glossary/detail.asp?ID=1184> [Cons. April 2008].

³¹ ESA 1995, 3.69; and <http://stats.oecd.org/glossary/detail.asp?ID=1429> [Cons. April 2008].

The income approach describes what families receive by their participation in the production activity, both by their work (labour costs³²) and the Gross Operating Surplus³³, the latter including the return to the capital that was made available by the owners to be used in production. The value produced (GVA) also equals the income value.

$$\text{Income Value} = \text{GVA} \quad (3)$$

The expenditure approach describes all categories of what buyers pay to sellers in exchange of goods and services. The main expenditure components are Final Consumption (FC)³⁴ and Investment (I) (Savings³⁵). The expenditure value also equals the income value and the GVA.

$$\text{Expenditure Value} = \text{GVA} = \text{FC} + \text{I} \quad (4)$$

The Stock of Value in an economy is here described with two main terms: (1) the knowledge value, which lies within human minds and can not be objectively quantified and (2) the net stock of capital³⁶ value, which is the difference between assets and liabilities values. Macroeconomic balance sheets³⁷ describe the latter and there is no way of quantifying the former. It is nevertheless important to explicitly consider the human knowledge value because labour value originates in human knowledge and final consumption returns value to this human knowledge stock. Also and most important, because innovation is triggered directly from human knowledge and, as it will be explained, innovation is the key to value creation.

1.5 New concepts: Minimum Value to Return and Creation of Value

The concept of Minimum Value to Return is here defined as the amount of value to be returned to the stock, in one period of time, such that the stock of value maintains its capacity to regenerate the same value on the next cycle. This means that the stock of value keeps constant its Present Value, from the beginning to the end of the period. A constant Present Value implies that there must be a value returned that equals the value expended and a minimum return to the initial capital stock value. The latter will still have to be analysed and assessed. This concept may be applied to a firm, an economic sector or a national economy.

Figure 2, above, showed the cycle of produced value and the value returned to the stock. On the situation described in the paragraph above, the Produced Value equals the Minimum Value to Return. This is reproduced again in figure 4, where the Minimum Value to Return is also showed to be the value of consumption and investment. The former contributes to compensate the value depreciated within human knowledge and the latter compensates Fixed Capital Consumption³⁸, which is the used

³² <http://stats.oecd.org/glossary/detail.asp?ID=1485> [Cons. April 2008].

³³ <http://stats.oecd.org/glossary/detail.asp?ID=1178> [Cons. April 2008].

³⁴ <http://stats.oecd.org/glossary/detail.asp?ID=951> [Cons. April 2008].

³⁵ <http://stats.oecd.org/glossary/detail.asp?ID=2387> [Cons. April 2008].

³⁶ <http://stats.oecd.org/glossary/detail.asp?ID=1752> [Cons. April 2008].

³⁷ ESA 1995, Chapter 7.

³⁸ <http://stats.oecd.org/glossary/detail.asp?ID=430> [Cons. April 2008].

assets value (fixed assets depreciation) and the cost of financial capital (minimum return to capital). This last compensation is done by investing in new Gross Capital Formation³⁹.

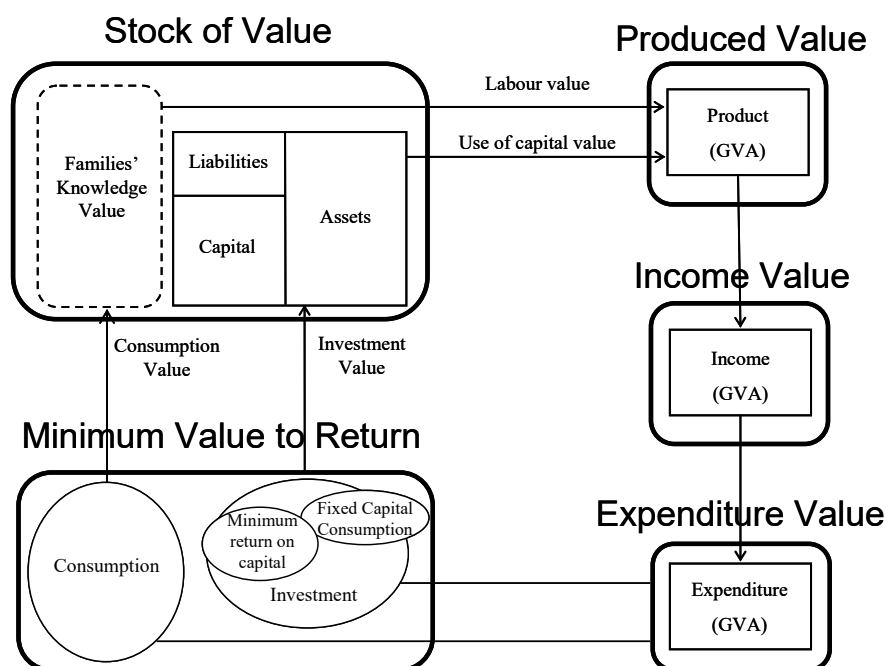


Fig. 4 Flows of value showing a stock of value that may regenerate, in the next cycle, the same value, which is the definition of Minimum Value to Return.

This way to define the Minimum Value to Return allows its quantification in any part of the cycle, because it equals the Produced Value, the Income Value and the Expenditure Value. And it also equals GVA.

There is, however, one uncertain element in this cycle, which is the Families' Knowledge Value. As this value is not assessable, the accounting systems do not reveal this balance. We will see that this is not impeditive for computing the Minimum Value to Return and the Value Created, even if it introduces some degree of ambiguity.

Actually, it is precisely within the Human Knowledge where the possibility of value creation may be triggered. How does that happen? It happens by what we call innovation. This happens when human knowledge devises a process or a product that originates value creation. Figure 5 describes this situation. In this cycle, there are an Initial Stock of Value and a Final Stock of Value, which can regenerate a larger produced value than the initial one. The Value Created originates in an innovation process or product, devised by human knowledge.

³⁹ <http://stats.oecd.org/glossary/detail.asp?ID=1158> [Cons. April 2008].

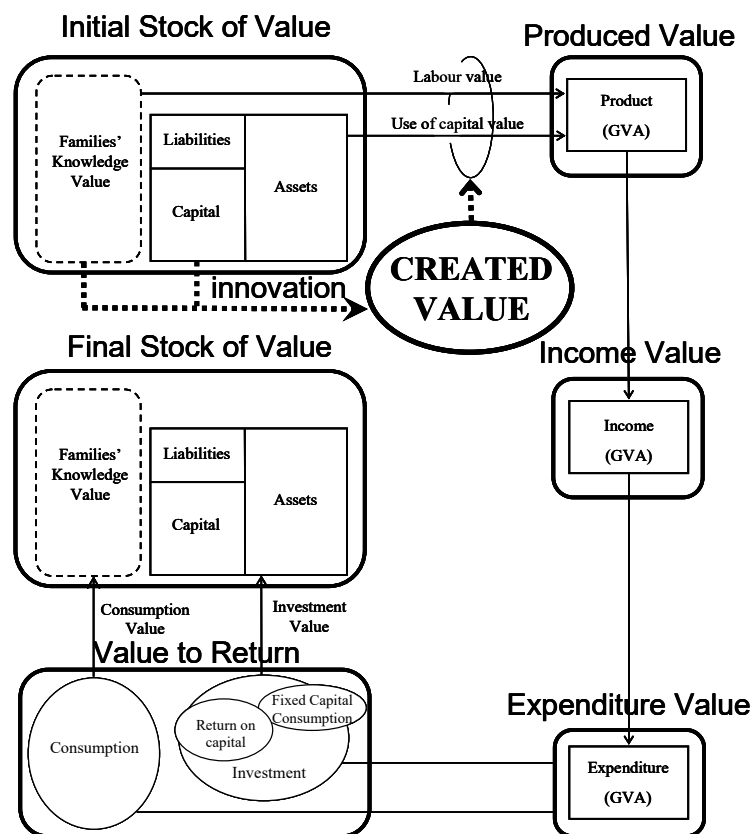


Fig. 5 Flows of value showing an increasing stock of value. Innovation triggers value creation, which most probably also increases GVA.

Innovation, by definition⁴⁰ and in whatever form, should originate value creation. It should originate an increase in the Operating Surplus⁴¹ which, for a constant GVA means a decrease in costs and, for a constant value of those costs, it means an increase of GVA. In order to define value creation and account for it, it is important to understand how GVA is built and, within GVA, how created value can be found and computed.

1.5.1 Gross Value Added

GVA was defined at the beginning of section 1.4. It is the difference between Output Value (OV) and Intermediate Consumption (IC) value. This definition, made as a difference between two types of value, does not reveal its terms. Alternatively, it can be defined showing its constitutive parts. For that, the European Commission's Economic and Financial Affairs database: BATCH⁴² and its Profit and Loss Account layout can be used as a reference. For one economic unit, like a firm, accordingly,

⁴⁰ Innovation is defined in many ways in different contexts. You may find the definition from OECD Glossary of Statistical Terms is (<http://stats.oecd.org/glossary/detail.asp?ID=6865>) [Cons. April 2008]. My opinion is that this definition lacks a very important aspect: Innovation should originate value creation. As it is in this glossary, it may originate the destruction of value and still be called innovation, what does not make sense.

⁴¹ <http://stats.oecd.org/glossary/detail.asp?ID=1912> [Cons. April 2008].

⁴² BACH – Bank for the Accounts of Companies Harmonised. http://ec.europa.eu/economy_finance/db_indicators/db_indicators8648_en.htm

GVA can be calculated by the following expression, where the different terms refer to account codes (in *italic*):

$$GVA = 6+7+I3+Y+21-[(16+9/11)-(12+17)] \quad (5)$$

This equation reads as follow: GVA equals the sum of (6) wages and social security costs, plus (7) depreciation on fixed assets and provisions, plus (I3) Interests and other charges on financial debts, plus (Y) taxes on profits, plus (21) Profit for the financial year, minus [(16+9/11)-(12+17)]. This last term is income minus costs of financial and extraordinary activities and so is the profit of financial and extraordinary activities. In simpler words, GVA is the sum of staff costs, depreciation and provisions, interests on financial debts, profits from the ordinary activity and taxes on all profits.

As it was written above, the value created is part of the GVA and it can be positive or negative. That will depend on the Minimum Value to Return.

1.5.2 Minimum Value to Return and Creation of Value

There is Creation of Value when the GVA is higher than the Minimum Value to Return. To compute the value created it is necessary to evaluate these two types of value and subtract one from the other. GVA is calculated as explained in **GVA = 6+7+I3+Y+21-[(16+9/11)-(12+17)]** (5).

The Minimum Value to Return (MVR) was defined in the beginning of section 1.5 and so is calculated as shown in identity (6). The Minimum Value to Return (MVR) is the amount of value expended to pay wages, capital depreciation, borrowers, government and shareholders and, as such, to keep constant the capacity to regenerate the same value in the next cycle.

$$MVR = 6+7+I3+Y+r.C \quad (6)$$

This identity reads as follows: The Minimum Value to Return equals the sum of (6) wages and social security costs, plus (7) depreciation on fixed assets and provisions, plus (I3) interests and other charges on financial debts, plus (Y) taxes on profits, plus a new term (r.C) that reflects the minimum return on the net capital used in the economic process under evaluation. C is the capital⁴³ net value and r is the return on capital coefficient and both parameters have to be valued according to the local situation, like inflation and objective investment opportunities. In other words, the MVR is the amount of value expended – (6) wages were paid to labour, (7) technology and assets that were consumed in the process, (I3) costs of debt to banks or other borrowers that were paid, Y taxes paid to government and a minimum return on the capital that shareholders invested on the process.

How much should this last return be? This question can have a very complete and sophisticated answer or it may be simplified to an uncomplicated working number. The first approach may consider different types of capital, like, cash, technologies,

⁴³ Accordingly to BACH nomenclature, Capital and Reserves has the account code *L*. Hence, for C, the value of *L* is considered.

buildings and so on and consider a specific return coefficient r for each one. Also, for technological and other capital forms, the book value or the market value may be considered. On the other hand, the market value will have to consider the specific investment opportunity to which those assets are committed and the corresponding discounted cash flows (DCF). This approach becomes very easily dependent on tricky forecasts. The second approach, which is favoured in this paper, considers for r (interest rate) an average national number for each year and, for C (Capital and Reserves), its book value. It is proposed in this paper to use the year's average EURIBOR interest rate⁴⁴ at 12 months.

In brief, the Minimum Value to Return is the sum of two groups of costs: (1) objective costs like staff, plus depreciation and provisions, plus financial interests, plus taxes on profits; and (2) a minimum return on the firm's capital net (book) value.

When comparing identities $MVR = 6+7+13+Y+ r.C$

$$(6 \text{ and } GVA = 6+7+13+Y+21-[(16+9/11)-(12+17)])$$

(5, it is clear that the difference comes from comparing the part of profits in GVA, which is $\{21-[(16+9/11)-(12+17)]\}$ with the minimum return that should be received from the firm's capital use, which is calculated as $[r.C]$. As such, the Created Value (CV) is

$$CV = GVA - MVR = \{21-[(16+9/11)-(12+17)]\} - [r.C] \quad (7)$$

This identity reads as follows: the Created Value equals the difference between the firm's ordinary activity profit and a minimum return to the firm's capital use.

2. The case of the Portuguese economic activity (universe of firms with more than twenty employees, 1996 to 2003)

The algorithm to evaluate Created Value was applied to the firms of the Portuguese economy. Data was made available to this research project by the Portuguese national statistic institute⁴⁵ (INE). It concerns the universe of firms with more than twenty employees of most of economic activity NACE⁴⁶ divisions, from 1996 to 2003.

GVA, equation (5, was computed⁴⁷ within the data base BDTec vs. 5.1, developed by this project, with the INE data. The MVR, equation (6, was computed using the values of C and r as follows: C is the Capital and Reserves value and r , for 1999 to 2003,

⁴⁴ Euribor® (Euro Interbank Offered Rate) is the rate at which euro interbank term deposits within the euro zone are offered by one prime bank to another prime bank. <http://www.euribor.org/default.htm> [Cons. May 2008].

⁴⁵ INE - Instituto Nacional de Estatística - <http://www.ine.pt/>.

⁴⁶ NACE – Nomenclature of Economic Activities in the European Union. The study considered only the universe of firms with more than twenty employees for all CAE rev. 2 (NACE 4 rev. 1 or ISIC rev. 3) divisions, except: Secondary – Division 10, Mining of Coal...; Tertiary – Division 65, Financial Intermediation...; Division 66, Insurance...; Division 67, Activities auxiliary to financial...; Division 75, Public administration...; Division 91, Activities and membership organizations NEC; Division 95, Private households...; Division 99, Extra-territorial organizations....

⁴⁷ Using the Portuguese system accounting codes (POC), GVA at basic prices is computed as follows: $GVA_{bp} = 632+64+66+67+68+86 + \{88-[(76+78+79)-(65+69)]\}$.

equals the EURIBOR⁴⁸ at 12 months, and, for 1996 to 1998, it equals the official interest rate for time deposits at 3 months, given by the Bank of Portugal⁴⁹. The values of r are shown in Table 1.

	1996	1997	1998	1999	2000	2001	2002	2003
EURIBOR(12 months)				0,031862	0,047794	0,040907	0,034944	0,023335
TD(3 months)	0,068342	0,047332	0,036103					

Table 1 Values of r - Interest rate: Time Deposits (TD) at 3 months, for 1996 to 1998; EURIBOR at 12 months, for 1999 to 2003.

2.1 Division results (CAE rev. 2.1)

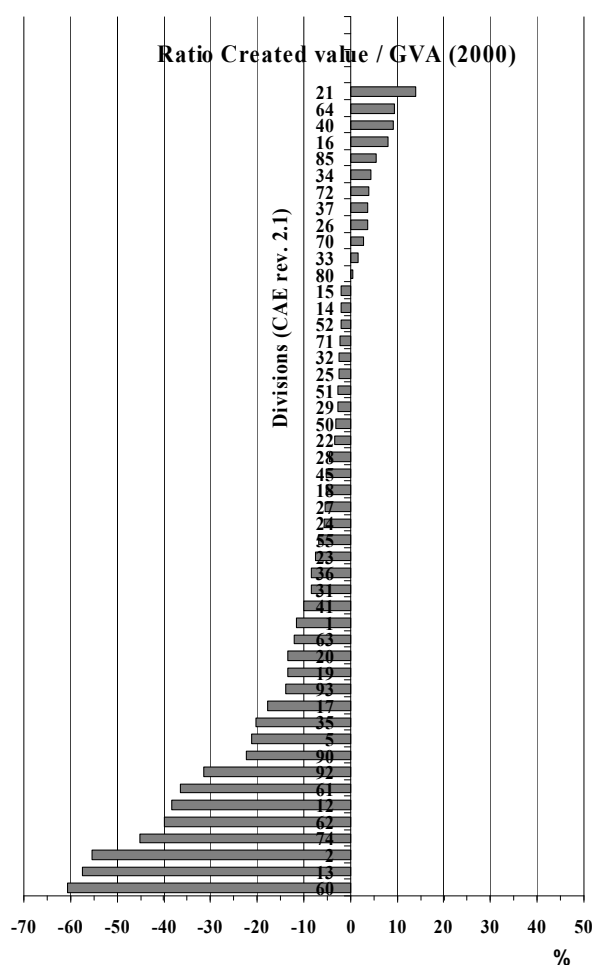


Fig. 6 Ratio Created Value/GVA (%) for 49 divisions of the Portuguese economic activity, on the year 2000.

An example of results of this computation is depicted in **Fig. 6**. It shows the ratio between Created Value and Gross Value Added (in %) on the year 2000 for the 49 divisions studied. The higher value is of division 21 – Manufacture of pulp, paper and

⁴⁸ EURIBOR - http://www.euribor.org/html/content/euribor_data_previousyears.html [Cons. April 2008].

⁴⁹ <http://www.bportugal.pt/stats/download/b1131a.csv> [Cons. Febr. 2008].

paper products, where this ratio was 14.1 %. The worst division was 60 – Land transport, where the ratio was -60.7%. From the 49 divisions, only 12 have created value on that year, the other 37 destroyed a considerable amount of value.

2.2 Section results

A study of the firms for each of the 13 Sections, revealed that the best section during this period was E – Electricity, Gas and Water Supply and the worst section was O – Other Community, Social and Personal Service Activities. Fig. 7 depicts, from 1996 to 2003, how 6 of the total 13 Sections created or destroyed value. Section E- Electricity, Gas and Water Supply created value except on the years of 1996 and 2002. The others destroyed value in every year of that period. The section O-Other Community, Social and Personal Service Activities destroyed an average of more than 40% of its Gross Value Added.

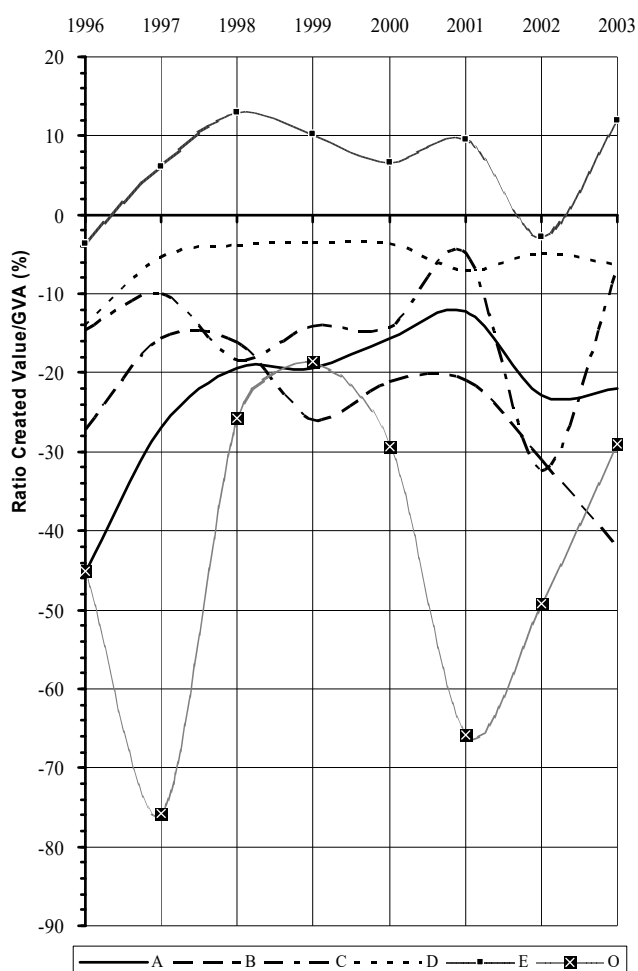


Fig. 7 Ratio Created Value/GVA (%) for 6 Sections of the Portuguese economic activity, on the period of 1996 to year 2003. The following sections are shown: A – Agriculture, Hunting and Forestry; B – Fishing; C – Mining and Quarrying; D – Manufacturing; E - Electricity, Gas and Water Supply; and O - Other Community, Social and Personal Service Activities. Only universe of firms with more than 20 employees.

2.3 Primary, Secondary and Tertiary activity

For the three Sectors, Primary, Secondary and Tertiary and for the overall economy the results are shown on Fig. 8. The three Sectors show a negative Created Value or destroyed value every year along the period of 1996 to 2003. For the whole economy, along those eight years, the average⁵⁰ ratio of created value over GVA was -8.6 %.

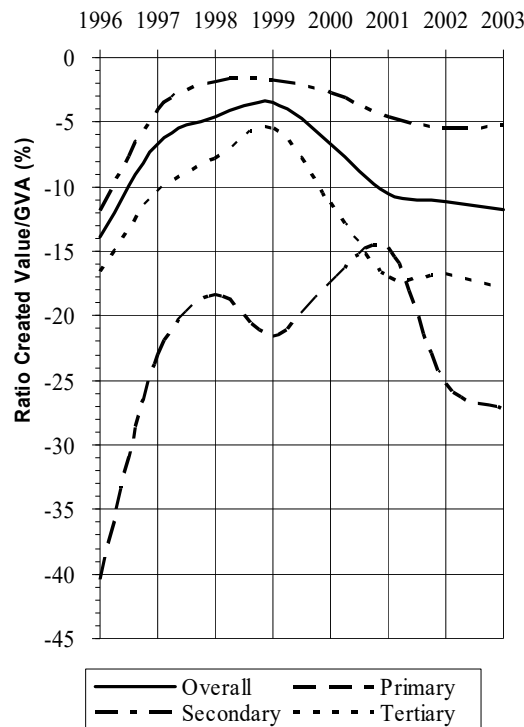


Fig. 8 Ratio Created Value/GVA (%) for the overall and for the 3 Sectors of the Portuguese economic activity, on the period of 1996 to 2003: Primary, Secondary and Tertiary. Only universe of firms with more than 20 employees.

2.4 Analysis of results

An immediate analysis tells that the value added on those years was less than the value that should have been added in order to maintain the capacity to regenerate the initial value. In other words, a good part of the value those firms had at the beginning of the period was destroyed. The amount of destroyed value was, in average, 8.2% of GVA. With the exception of a few Sections, like M, G and E (the latter showed on Fig. 7), all other Sections destroyed value every year on that period.

In order to understand the main determinants of the parameter Created Value, two different analyses were performed. The first is a correlation with both the Gross Value Added (GVA) and the Minimum Value to Return (MVR). The second is a correlation of Created Value (CV) with Profits from the Ordinary Activity (POA) ($\{21 - [(16 + 9/11) - (12 + 17)]\}$). In order to normalise these analysis, parameters GVA, MVR and CV will be substituted by their ratio with the respective value of Capital (C).

⁵⁰ This is computed averaging, along 8 years, each year's ratio of Created Value over GVA.

For the first analyses, data from the 13 Sections was collected and depicted on Fig. 9. The parameter considered is CV / C , which is correlated with the two parameters GVA / C and with MVR / C . Identities (7, (5 and (6 were used plus the respective values of C . This analysis shows no meaningful correlation between the Created Value and either the Gross Value Added or the Minimum Value to Return.

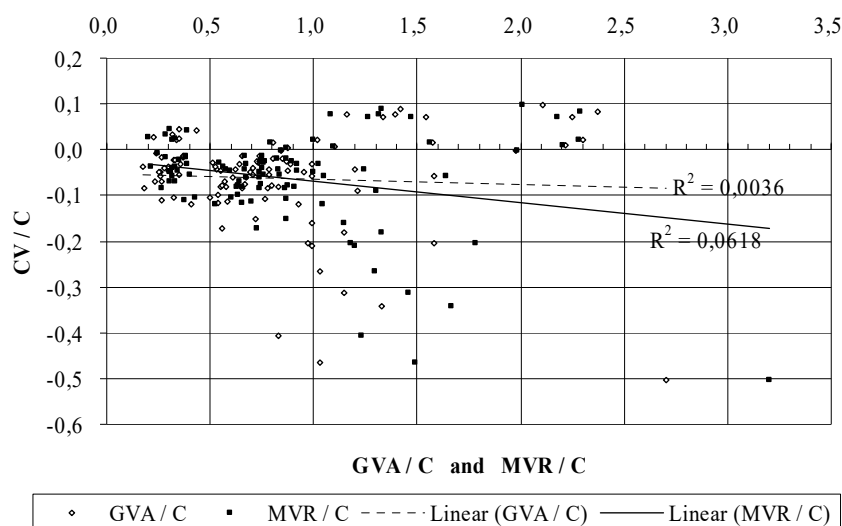


Fig. 9 Correlation between Created Value over C (CV/C) with Gross value Added over C (GVA/C) and with Minimum Value to Return over C (MVR/C). 13 Sections of the Portuguese economic activity, from 1996 to 2003. Universe of firms with more than 20 employees.

For the second analyses, data from the same 13 Sections was collected and depicted on Fig. 10. The parameter considered is Created Value over C (CV / C), which is correlated with parameter Profit of Ordinary Activity over C (POA / C). A very strong correlation shows that the amount of Created Value depends mainly on firms' Profits.

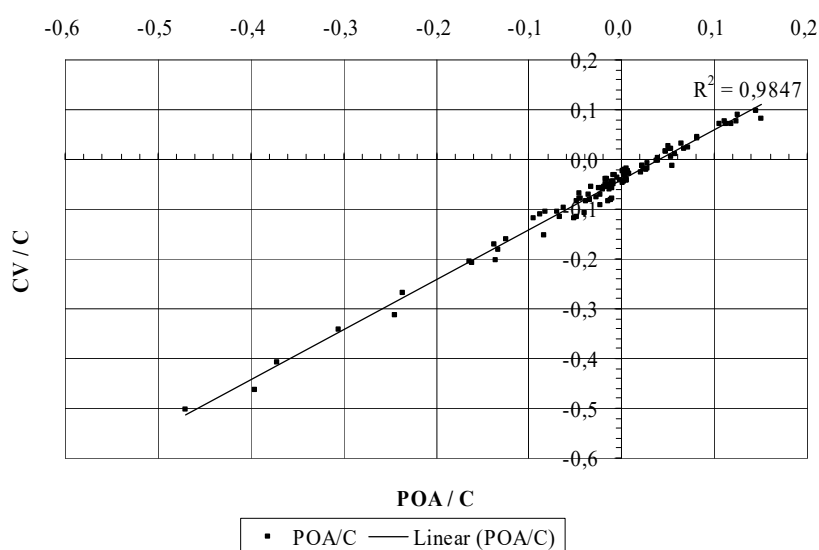


Fig. 10 Correlation between Created Value over C (CV/C) with Profit of Ordinary Activity (POA/C). 13 Sections of the Portuguese economic activity, from 1996 to 2003. Universe of firms with more than 20 employees.

Finally, it is easy to understand, from identity (7, how elastic the Created Value is in relation to the r (the interest rate considered to calculate the Minimum Value to Return). To see how the ratio CV would change with the change of r , we may write the derivative of identity(7 in respect to parameter r . If everything else remains constant, what is not likely to happen, this result shows that the CV changes inversely with r , as shown by identity (8:

$$\Delta (CV) = \Delta (\{21 - [(16 + 9/11) - (12 + 17)]\}) - \Delta r \cdot C = - \Delta r \cdot C \quad (8)$$

If the interest rate increases, CV tends to decrease. This is an oversimplification of the economic model because a change in the interest rate induces a number of important changes in the whole economy, as we know from monetary policies; however, that conclusion illustrates the basic idea that when interest rates fall, the created value tends to increase. A correlation description of the ratio of Created Value over Gross Value Added (CV/GVA) with the interest rate (r) is shown on **Fig. 11**. It shows approximately no correlation.

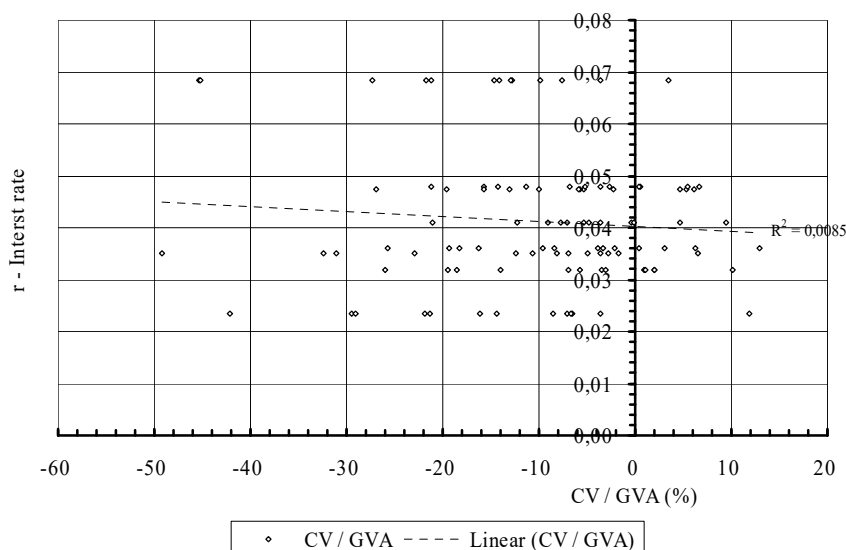


Fig. 11 Correlation between Created Value over GVA (CV/GVA) with interest rate (r). 13 Sections of the Portuguese economic activity, from 1996 to 2003. Universe of firms with more than 20 employees.

3. Value Created in firms of other European countries

Using data from the new BACH⁵¹ European database, the Created Value was computed for Section D – Manufacturing of nine European countries and of Japan, during the period of 2000 to 2005. The results are shown on **Fig. 12** for the ratio CV/GVA.

For the Section D-Manufacturing, Poland and Spain have value created every year and also Finland, excepted for 2002 and 2003. The Netherlands, France and Portugal

⁵¹ http://ec.europa.eu/economy_finance/db_indicators/db_indicators8648_en.htm [Cons. May 2008].

show destroyed value in the first years of the period and starting to create value on the later years. Belgium, Italy and Germany destroyed value along the whole period. Japan, in 2004 and 2005, destroyed about 15.3% of its Gross Value Added.

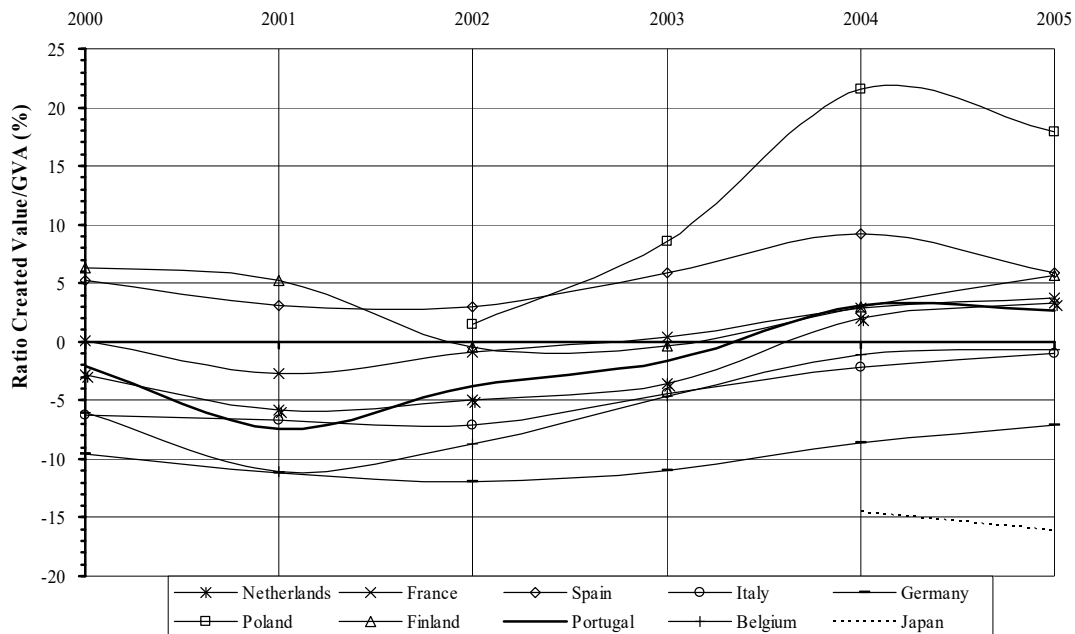


Fig. 12 Ratio Created Value/GVA for the Section D – Manufacturing of 9 European countries and Japan.

The interest rate r was considered equal to EURIBOR (12 months) for European Countries. For Japan, the interest rate considered was from Bank of Japan Average Interest Rates Posted at Financial Institutions - 180 to 359 days⁵². The values are shown on Table 2.

	2000	2001	2002	2003	2004	2005
r (EURIBOR 12)	0,0477944	0,0409074	0,0349443	0,0233351	0,0227706	0,0233324
Bank of Japan					0,0005666	0,0007831

Table 2 Values of r - Interest rate: EURIBOR at 12 months, for 2000 to 2005. For Japan, the interest rate considered is the Average Interest Rates Posted at Financial Institutions - 180 to 359 days – Bank of Japan.

Conclusions

The concept of Created Value was proposed in order to identify and quantify the most important part of the value adding process, the only part that is attached to the ideas of innovation and growth. Economic growth means more value available, which is measured in the stocks of value. Those stocks are of two kinds: Human knowledge value and capital value. The former is not quantifiable but it is assumed that it keeps its value constant with an appropriate level of consumption. The latter is measured on the economic units' balance sheets. Along a time period, there are flows of value

⁵² http://www.boj.or.jp/en/type/stat/dlong/fin_stat/rate/cdab0730.csv [Cons. May 2008].

running between the corresponding stocks. Economic units produce value and society consumes value.

The produced value is called Gross Value Added (GVA), which is a standardized parameter and may be computed either for one economic unit, as a firm, or for a Sector, or for a whole economy. The Created Value (CV) is defined as the difference between the GVA and the Minimum Value to Return (MVR). The MVR was here introduced and defined as the quantity of value that, by the end of a time period, should be returned to the stock of value in order to keep constant its capacity to reproduce the same value on the next cycle. Hence, the Created Value is the amount of value, from the Gross Value Added, that exceeds the Minimum Value to Return. The GVA, the MVR and hence the CV are all computed at the same moment in time. For that, it is needed only the profit and loss account for a specific production and the capital value involved in the production process.

It was found that the proposed algorithm is simple to apply and the data needed is easily available. An application was made to firms of the Portuguese economy and comparisons were made between different European countries, showing that the destruction of value was, on that period, a widespread situation.

Brief epistemological notes on the concept of value, namely economic value, lead to the conclusion that value reflects human knowledge. Consumer goods have a value because they contribute directly to regenerate and to develop human knowledge. Labour has a value that is directly linked to human knowledge. Technology and other forms of capital also have a value because they represent human knowledge embodied in material forms. As such, value is the metric of knowledge. This metric has the economic transformation process as criteria and has the price as its scale. Value became the knowledge flows vehicle between society members. Society has two stocks of value: Human knowledge value, latent within human brain, and net capital stocks of value, measured in balance sheets of whole economies. The former is very difficult to assess; however, the latter can be known and it is here speculatively suggested that it mirrors the former. If this is true, economic growth should reflect human knowledge growth and business cycles are signs of an oscillating continuous process of conformity between the two.

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