

The challenge of building human capital accounts starting from education satellite account. An exercise for Italy¹

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Summary

All European countries are nowadays knowledge-based economies and information societies. Therefore, human capital is becoming a more and more important asset for the present and future success and prosperity of countries. This has caused knowledge to be inserted as a strategic goal for Europe, as stated by the Lisbon European Council in March 2000, according to which Europe is to become by 2010 "the most competitive and dynamic knowledge-based economy in the world".

The growing demand of qualified information regarding statistics on educational expenditure can be satisfied in the national accounts framework compiling the education satellite account: this will guarantee the international comparability and the coherence with all macroeconomics aggregates and indicators. Satellite accounts are frameworks designed to expand the analytical capacity of the national accounts without overburdening them or interfering with their general-purpose orientation. They add details or additional information about a particular aspect of the economy, integrating monetary and physical data, providing room for analytical purposes such as productivity analysis and macroeconomic modelling.

This study designs an education satellite account integrated with the national account framework. It is based on the international standard classifications for: Government (COFOG), households (COICOP), Non Profit Institutions (COPNI) and enterprises (NACE). The preliminary analysis of the existing data sources represents the first crucial step in order to enrich the national accounts core system. The following stage consists in identifying a complete and systematic set, of economic flows regarding education: that is, public and private expenditure by level of education and by type of input (labour, capital and use of goods and services). The analysis should be widened by considering also the physical data consistent with economic aggregates: students by educational level and gender, teachers and other supporting employees, goods and services used as intermediate consumptions. The construction of such a framework will allow a better comprehension of the educational system, increase the analytical strength of national accounts and provide an information system that can be used for economic analysis.

1. Introduction²

The Lisbon Strategy was set out by the European Council in Lisbon on March 2000 as an action and development plan for the European Union (EU). Its intention was to deal with the low productivity and stagnation of economic growth in the EU through the formulation of various policy initiatives to be taken by all EU member states. Its aim was to make "the EU the world's most dynamic and competitive economy" by 2010. In this regard, the European Council of 20 June 2003 highlighted the importance of growth and stability-oriented policies to create the best economic conditions for development of European countries and, the importance of investment in human and physical capital and R&D. Consequently, knowledge and information were recognised as the key factor for growth and development.

A satellite account (SA) of education focused on financing channels and education expenditures is therefore proposed, since it allows to arrange the data in order to display all economic flows regarding education. The proposed SA is fully and coherently integrated with the main accounts, this guarantees the international comparability and the coherence with all macroeconomics aggregates and indicators.

¹ The views expressed are those of the authors and do not necessarily reflect those of the National Statistical Office of Italy (Istat).

² This study develops some ideas and concepts expressed in the paper "Using statistics to compile an Education Satellite Account for Italy" presented at the 3rd International Symposium on Economic Theory, Policy and Applications, August 4-7, 2008, Athens, Greece .

This work is a preliminary study dealing with the problems of building the SA in the field of educational services, which represents a relevant issue for national accountants. Actually, the system of national account is based on international handbooks setting conventional and shared definitions for each macroeconomic aggregate, classification rules and methodologies of estimation. On the other hand these handbooks provide only general principles for SA, leaving each country free to develop them according to its specific needs. Moreover, especially in the educational field, this tool of analysis does not have an established tradition that can help in its compilation.

This study starts with the analysis of the SA within the system of national accounts, and illustrates the peculiarity of SA for education. Next, the building of a SA is examined starting from the recognition of the international standard classifications for government, households, non profit institutions and enterprises. Classifications play an important role in defining units of analysis and the boundaries of the phenomenon. An ideal structure of an Italian SA for education is proposed and the problems connected with its implementation are described. The account proposed is composed by a set of tables describing the relevant economic flows of agents financing and producing education services. Education can be considered as human capital formation, therefore the evaluation of the output of education, is the first step towards a comprehensive human capital account.

2. The System of National Accounts and the Satellite Accounts

The *System of National Accounts* (SNA) is an integrated framework that sets consistent definitions, classifications, and accounting conventions, guaranteeing international comparability of policy variables. The original SNA took shape in the 1940s and 1950s, the 1968 revision substantially expanded its framework, the 1993 revision further widened its domain, including a general framework for SA (SNA 93, chapter XXI), important and powerful scheme for measurement and analysis useful for a variety of fields.

The SA are frameworks designed to expand the analytical capacity of the national accounts without overburdening them or interfering with their general-purpose orientation. In this role, they both organize information flow in an internally consistent way that suits the particular analytical focus at hand and maintain links to the existing national accounts. Further, given that they supplement the existing accounts rather than replace them, they can serve as a laboratory for economic accounting and modelling, providing room for conceptual development and methodological refinement.

The SA can add details with respect to the core national accounts or other information about a particular topic of economy; for instance, they can integrate monetary and physical data, omitting instead unnecessary details. They permit to arrange information differently, even by cutting across sectors to assemble information on both intermediate and final consumption. For example, a SA can assemble business expenditures on training, normally treated as intermediate consumption, and education-related expenditures by households and government, which are final consumption in the existing accounts, to analyze the role of education in the economy. They also permit to use a mix of different classification instead of the one adopted in the existing accounts. For example, they allow to identify expenditures on "research in education" as part of research expenditures even though they are included in education expenditures in the national accounts.

The terminology and concepts associated with SA reflect the experiences of several countries that have constructed them, largely on an ad hoc basis, for fields such as health, education, agriculture, research and development, and transportation.

Over time, SA have come to be associated with the following characteristics:

1. They are purpose-oriented.
2. They highlight data for a whole field of economic activity and provide a framework for arraying information about the field under examination in a more comprehensive way than what is possible in the main accounts.
3. They are integrated with the main accounts.
4. They present information in ways that can be different from the main accounts; definitions, classifications, and accounting conventions may differ, in order to provide the most useful presentation of information. What is counted as current or capital in the main accounts may be changed, or the boundary of production may be moved. Nevertheless, definitions, classifications, and accounting conventions have to be consistent within the account.
5. They often contain tables that answer several questions: Who is producing, and what are the means of production? Who is financing? What is the result of the expense, and who is benefiting or using the result?

6. They display monetary and physical data in an integrated way. Physical data may relate to production (the number of persons employed or stocks of equipment) or to beneficiaries (number of persons being affected by activities in the field).

The first SA were developed in France at the beginning of the 1960s. One of the earliest was a SA for housing. Since then, SA have been built or are being built for such fields as agriculture, health, research and development, transportation, trade, education, environment, natural resources and social protection.

In our country, Italian National account department has an established tradition in producing annually social protection SA, Namea, Environmental Protection Expenditure Accounts and some pilot studies have also been done for: tourism, for NPISHs, and a Social Accounting Matrix.

3. Satellite accounts of Education

Although gross domestic product includes expenditures for education, it fails to capture fully the contribution of not tradable time spent in education for future economic growth, the well-being of individuals, and society in general. Individuals with a higher level of education tend to earn higher incomes; have higher productivity in the workplace and elsewhere; they are better informed and more involved in social activities.

Up to now no conceptual framework has been officially developed and internationally agreed upon for SA of Education (SAE). It should also be added that the designing of a framework that reflects the national reality for one country may not necessary be appropriate for other countries.

The European System of National Accounts (ESA 1995) is going to be updated and it will include a new chapter that provides some general principles, in particular on functional satellites as well as a concrete set of simple and highly relevant tables suitable to diverse fields. In this chapter, it is suggested that the design of a SAE should emphasize production, uses and transfers flows.

The main purpose for compiling SAE is to provide both an important tool to analyse the education sector and to have better quality data on education for the national accounts, to understand trends in output and productivity of the education sector (public and private). It could also support decision and policy-making in the education sector. Human capital arises from education: education accounts would contain data essential for improving our understanding of how investment and the capital stock (defined more broadly to include both human and nonhuman capital) affect economic growth.

The SAE aims to put together all financial flows regarding education in a set of coherent accounts in order to evaluate the education costs for the community, to study its financing and to determine the costs of different education levels and different activities. The education field is defined by a list of teaching activities, of goods and services related to education. The education account refers to two categories of economic agents: financing units, incurring education costs, and production units, realising teaching services and linked activities using the resources supplied by financing units.

The paper discusses the components of a SAE, including inputs and outputs, focusing primarily on formal education and the significant measurement issues it involves, since data on informal education and training are limited and their magnitude and effects are rather difficult to measure at present.

To begin conceptualizing how a SA might be structured to give a more comprehensive picture of education, it is useful to identify the relevant inputs and outputs. It is not easy to measure inputs and outputs of the education process. A SAE can incorporate market and non-market inputs and outputs. Education occurs in a complex environment in which many elements may influence both the quantity and the quality of education received, and the benefits of that education for the recipients and for society. Accordingly, both conceptual and measurement issues must be confronted.

4. Satellite Accounts of Education: the proposed framework

As previously stated, the main feature of SA is to provide users with a comprehensive framework for enlarging concepts and definitions derived from the national accounts setting. The framework should be complete and systematic as more as possible, to better understand the educational system, improve the analysis of national accounts and provide an information system that can be used for economic analysis. This requires coherence of definitions and classifications to ensure comparability of the statistics of the field and enable to compare economic flows with the main economic aggregates of national account.

Basing on the input approach, a set of tables that should compose the SAE is described in what follows. The education accounts tables aim to describe:

- financing to education activities;
- financing to production sectors;
- outlays of producers by activity;
- relations between sectors.

The first necessary step (§4.1) is to establish a list of international classification that gives the boundary of the education sector defining agents (producers, financiers) and products/services provided.

The ideal framework proposed (§4.2) allows to identify a complete set of economic flows regarding education: resources and uses by producers and by products and by type of financing agent (table I, II and III). In addition the education sector is analyzed not only from the prospective of producers and financing agents, but also from the point of view of labour input underlying production (table IV). The aim is to show how these products are produced and what kind of labour is involved in the production process in order to allow some analysis on system efficiency should be possible.

4.1. Classifications of products, producers and financiers adopted

A list of classifications that fulfil the needs of SA framework has to be established in order to implement the SAE . The existing classifications at international level (the relevant codes are reported in the appendix) are:

1. ISCED, the International Standard Classification of Education. It is used by Oecd, Unesco and Eurostat in the production of statistical indicators on education for international comparison. It gives the boundary of typical products in education field.
2. NACE, the Classification of Economic Activities in the European Community used to classify producing units.
3. COFOG, the Classification of the Functions of Government expenditures according to purposes. It allows to identify government education expenditure (COFOG 09).
4. COPNI, Classification of Individual Consumption According to Purpose is used for Non Profit Institutions Serving Households (NPISHs).
5. CPA Statistical Classification of Products by Activity covering all goods and services. It is useful to identify ancillary production connected to education but not typical for the field.

The first step of the analysis consists in identifying the products of education. Following the existing classifications, four different groups of products are mentioned (box 1): three are specific of education (ep1, ep2 and ep3) and the fourth (ep4) includes other products and services that are directly connected to education but not considered in ISCED. This group is a miscellaneous of ancillary and secondary activities whose mix could be very different among countries.

Box 1: Classification of Education Products (EP)

ep1	Pre-primary and primary education (ISCED 0-1, NACE rev.1.1 80.1, COFOG 9.01, COPNI 04.1, CPA 92.1)
ep2	Secondary education (ISCED 2-3, NACE rev.1.1 80.2, COFOG 9.02-9.03, COPNI 04.2, CPA 92.2)
ep3	Post-secondary and tertiary education (ISCED 4-6, NACE rev.1.1 80.3, COFOG 9.04, COPNI 04.3-04.4, CPA 92.3)
ep4	Other products: Ancillary products and services (books, transports, canteens..., COFOG 9.05 and COFOG 9.06, COPNI 04.5-04.7)

The list of products allows to identify the institutions producing education. Following Schmidt (2003) they are defined as 'entities that provide instructional services to individuals or education-related services to individuals and other educational institutions'.

Units producing education are classified according to their economic activity (NACE, box 2).

Box 2: Classification of productive units by economic activity NACE rev.1.1³

M Education
80 Education
80.1 Primary education
80.10 Primary education

³ Nace rev.1.1 80.4 is generally excluded from the domain of education since it is not included in the boundary of typical products in education field as defined by ISCED.

80.2 Secondary education
80.21 General secondary education
80.22 Technical and vocational secondary education
80.3 Higher education
80.30 Higher education
80.4 Adult and other education
80.41 Driving school activities
80.42 Adult and other education n.e.c.

In Italian national accounts productive units are classified, according to ESA95, by main and all secondary activities, regardless if they are public or private producers. The classification by economic activity can be fully in line with the one by institutional sector (box 3), the latter is also important because the accounting items have different economic relevance relating to institutional sector. Moreover, using institutional sector classification it is possible to distinguish market from non market production and, among the last, private producer (NPISHs) from public.

The analysis of agents financing education (box 3) is based on the Institutional sector classification. Most of education is a non market service and, even when supplied by market producer, transfers and contribution play an important role among resources. Detailing financing units by institutional sector allows to analyse the most important source of finance for each producer and, at the same time, the amount each financing unit devotes to different institution producing education. The possible financers are more than the producers, since also financial corporations, rest of the world and households, which do not provide education services, can finance them.

Box 3: Classification of agents financing (AF) and producing (AP) education by Institutional sectors and subsectors

AF1	AP1	General Government institutions (S.13)
AF1.1	AP1.1	Central Government (S.1311)
AF1.1.1	AP1.1.1	State
AF1.1.2		Others
AF1.2	AP1.2	Local Government (S.1313)
AF1.2.1	AP1.2.1	Regions
AF1.2.2	AP1.2.2	Provinces
AF1.2.3	AP1.2.3	Municipalities
AF1.2.4	AP1.2.4	Universities
AF1.2.5	AP1.2.5	Others
AF2	AP2	Private institutions
AF2.1	AP2.1	Non financial corporations (S.11)
AF2.2		Financial corporations (S.12)
	AP2.2	Producer households (S.16)
AF2.3	AP2.3	Non profit institutions serving households (NPISH) (S.15)
AF2.4		Households (S.14)
AF3		Rest of the world (S.2)

4.2. The proposed framework

For the vast majorities of the European economies, characterized by a predominance of public sector in the production of education services, it is important to know the financing mechanisms and the composition of expenditure for the production itself, as well as the role of government in the process of redistribution of income connected with education. Expenditures of financers constitute the resources of producers and the analysis of output is perfectly connected with the financing. The proposed tables for SAE are double entry tables having on column heading the service's producers or products and in the rows resources, uses and, as a residual, a balancing item.

Referring to heading, the first table (table I) answers to the question of "who is producing?" and emphasizes the institutional sectors according to the classification mentioned before (see box 3). The classification of resources and uses by institution producing education services is of particular interest, since it allows to give a full picture of the service itself and of the kind of institutional framework connected with its provision.

The first column in the table's heading has been labelled to general government (S.13, box 3). A further analysis by its sub-sectors is very useful in order to recognise the different role of each sub-sector in education production, strongly connected to the different level of education service provided. Given Italy as an example, central government (S.1311) has the responsibility of providing education

up to the secondary level, by directly engaging itself in production's activities. On the other hand local government's production (S.1313) is more focused on higher education, since universities are the main producers of education's services at the local level and in some supporting activities that are functional to central government's production. Furthermore local government has the predominant part of gross fixed capital formation for education.

The other producers considered in the table are private producers as a whole. Also in this case institutional sectors provide a guide to classify these producers between market producers, non-financial corporations that produce education on market basis, and NPISHs that, on the other hand, produce education on non market basis and put it fully at disposal of households without charging any relevant price for the service.

Having a look at the national accounts figures (Table1) it can be observed that, on average for the period 2000-2007, the production of education can be attributed as follow: general government 81%, NPISH 0,5%, private producers, 18,5%.

Table 1: Percentage contribution of each institutional sector to education output, value added and intermediate consumption 2000-2007

	2000	2001	2002	2003	2004	2005	2006	2007
General Government								
Production	80.1	80.8	80.3	80.9	80.0	82.3	81.2	81.7
Value added	85.7	85.7	85.9	86.0	84.8	86.4	86.1	86.4
NPISH								
Production	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7
Value added	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Non financial corporations								
Production	19.3	18.7	19.1	18.6	19.3	17.1	18.1	17.6
Value added	13.8	13.8	13.6	13.5	14.7	13.1	13.4	13.0

Table I: Resources and uses by institution producing education

	Institutions producing education						
	Total producers	General Government S13	Central Government S1311	Private producers S11+S15	Non financial corporations S11	NPISHs S15
RESOURCES							
Current transfers/contributions from financing agents (AF)							
AF1							
AF1.1							
...							
Income from sales							
ep1							
ep2							
...							
Capital transfers from financing agents							
AF1							
AF1.1							
...							
Other incomes							
USES							
Output of non market sector							
Intermediate consumption							
Consumption of fixed capital							
Taxes on production							
Compensation of employees							
net operating surplus (market activities)							
Output of market sector							
Taxes on income etc							
Current transfer to other sectors and subsectors							
AP1							
AP1.1							
..							
Other expenditures							
Gross fixed capital formation							
Balancing item							

Table II maintains the same row's structure (resources/uses items) as table I but it has different headings. It presents the resources and uses by economic activity (according to NACE rev1.1, see box.2) and regroups the producers by their nature, distinguishing the public from the private ones. Ideally it is possible to think about a producers classification that includes at the same time institutional sector and economic activity, but it seems hard to think to find the appropriate indicators to split each economic flows with such a level of detail.

Table II: Resources and uses by main economic activity of producers.

	Producers by main economic activity								
	TOTAL PRODUCERS			General Government producers			Private producers		
	Pre-primary and primary education (NACE rev.1 80.1)	Secondary education (NACE rev.1 80.2)	Post-secondary and tertiary education (NACE rev1 80.3)	Pre-primary and primary education (NACE rev.1 80.1)	Secondary education (NACE rev.1 80.2)	Post-secondary and tertiary education (NACE rev1 80.3)	Pre-primary and primary education (NACE rev.1 80.1)	Secondary education (NACE rev.1 80.2)	Post-secondary and tertiary education (NACE rev1 80.3)
RESOURCES									
Current transfers/contributions from financing agents									
AF1									
AF1.1									
...									
Income from sales									
ep1									
ep2									
...									
Capital transfers from financing agents									
AF1									
AF1.1									
...									
Other incomes									
USES									
Output of non market sector									
Intermediate consumption									
Consumption of fixed capital									
Taxes on production									
Compensation of employees									
net operating surplus (market activity)									
Output of market sector									
Taxes on income etc									
Current transfer to other sectors and subsectors									
AP1									
AP1.1									
..									
Other expenditures									
Gross fixed capital formation									
Balancing item									

Table III is equivalent to an incomplete supply and use table which takes into account from one side the availability of different products in education and on the other side the main uses of education products which can be not only intermediate and final consumption but also capital formation. This item includes R&D performed by universities (tertiary education institutions) and financed by enterprises⁴. Two groups of specific products should be distinguished: characteristic products, that are typical for the field, and connected products relevant for a specific function without being typical. The list of typical products respects the international classification of education (ISCED) but is broadened in order to include additional products related with education but not included in the ISCED (see box 1). The set of products to be considered depends on the economic institutional organization of each country.

⁴ In the SNA93 R&D expenditures are classified among intermediate consumption while the updated SNA, that is going to be released by next year, classifies this item as capital formation.

Table III: Supply and use table for education.

	Products			
	ep1	ep2	...	ep4
SUPPLY				
Output at basic prices (producers of education)				
AP1				
AP1.1				
..				
Taxes less subsidies on products				
Imports of education products				
Total supply of education products at purchasers' prices				
USE				
Intermediate consumption				
Final consumption				
Households (S16)				
Government (S13)				
individual				
collective				
Exports of education products				
Capital formation				
Total use of education products at purchasers' prices				

Coming to the description of rows, it can be observed that on the resources side of the tables, financing can come from both current income and from the use of wealth (capital transfers). The production of these figures is probably one of the most difficult area in which the compilation of the SA will have to deal with. This is particularly true for the government for which the production of the public services is financed out of taxation, without constraint in the use of resources. This means that, as taxes and contributions are the main sources for financing government' activities, it should be generally assumed that it does not exist any direct link between the revenues of government and the amount of services provided. This means that the different bundle of public services put at user's disposal depends on political choices, other than on demographic trends. The absence of a direct link between the resources that finance and the use of those resources makes it possible, in theory, the use of a certain degree of freedom in the management of public expenditure.

In this sense the actual calculation of the first set of resources for government (current transfers/contributions from financing agents) is extremely difficult, in that it requires the attribution of public revenues to specific functions performed by government, such as the case of education.

A common solution is to assume that the government's financing of its own produced education is equal to the production of public education itself. It should be noted that, without this assumption, it is impossible to calculate the balancing item of this account for government. This calculation also matches with the principle, set up in national accounts according to ESA95 rules, used for the calculation of government output at current prices, as the sum of the costs incurred for the production itself.

Incomes from sales represent a typical item related to market production. Also non market institutions (such as general government and NPISH) can have market production, consisting of ancillary products like books, other school material, internet services or canteen services (ep4, box1).

Capital transfers, as revenues, are related to particular kind of transfers that should affect the accumulation of non-financial assets of receivers. They can derive from donations and other forms of non-recurrent/occasional transfers. Other incomes are, typically, residual items on the resources side.

On the uses side of the tables we have the analysis of output, according to its component. In this case a relevant difference can be observed between the non-market producers and the market ones. As mentioned above, by convention the non market output is estimated as the sum of the production costs: compensation of employees, intermediate consumption, consumption of fixed capital and taxes on production. It does not exist any operating surplus, unless there is a secondary market production inside non market units.

The case of market production is different because the existence of a gross operating surplus is explicitly foreseen, being related, by definition, to market activities. Market services of education provided by private producers (S.11+S.16) are valued on the basis of the actual flows received and paid by the household for their own consumption.

As for the other items it can be observed that their importance is strictly connected with the institutional framework providing the services. As for the revenue side the "other expenditure" contains residual elements.

A correct estimation of the gross fixed capital formation is relevant, because of the role that non financial assets has for future development of production. It shouldn't be forgotten that its evaluation is functional for producing figures on consumption of fixed capital (one of the production costs).

The balancing item is the residual item of the analysis, it shows the result of education, considered as an economic activity.

The value of services provided may be connected to the input of labour, the most important production factor. As it is shown in table IV the input of labour, measured with jobs or full time equivalent units, is distinguished in teachers and other type of employment and, at the same time, by professional status: employees or self-employed. Showing the different type of labour involved in the production process allows some analysis about efficiency of education system.

Table IV: Labour input

	Producers by main economic activity								
	TOTAL PRODUCERS			General Government producers			Private producers		
	Pre-primary and primary education (NACE rev.1 80.1)	Secondary education (NACE rev.1 80.2)	Post-secondary and tertiary education (NACE rev.1 80.3)	Pre-primary and primary education (NACE rev.1 80.1)	Secondary education (NACE rev.1 80.2)	Post-secondary and tertiary education (NACE rev.1 80.3)	Pre-primary and primary education (NACE rev.1 80.1)	Secondary education (NACE rev.1 80.2)	Post-secondary and tertiary education (NACE rev.1 80.3)
Employees									
Teachers									
Other employees									
Self employed									
Teachers									
Other self-employed									

4.3 Implementation of the proposed framework in Italy

The tables presented require to provide figures with a high level of detail both for the financing agents and for the producers of the service itself.

The preliminary analysis of the existing data sources in order to enrich the national accounts core system represents the first crucial step of the implementation of the proposed framework.

Italian national accounts produces output, value added and compensation of employees at a two digit of NACE detail level and by institutional sector distinguishing between market and non market production. This allows to already have details of these economic aggregates as required in table I and II.

The labour input figures of Italian national account are estimated at a high level of detail: four digits NACE rev.1.1 for jobs and full time equivalent units, distinguished by professional status (employees and self employed) and by institutional sector. It means that table IV can be filled in, but labour input can not be distinguished in teachers and other type of employment.

Being general government the most important producer of educational services, the use of statistics on government functional classification of expenditure allows to fill a relevant part of education SA. Actually the statistics by function are obtained according to a bottom-up approach by summing detailed data about each government sub-sector. All expenditures by sub-sector are classified by purpose following the international standard classifications for government (COFOG), that is compiled

and disseminated by COFOG groups (2 digit), that is to say according to the second level of classification. Moreover as for the evaluation at constant prices for non market services, that enters in the GDP calculation in volume terms, an output method is used⁵.

The most relevant problem are those related to the side of financial agents, in particular “who is financing who”. More details about some economic flows, like current and capital transfers from financing agents are indispensable to assign the values to the items of the tables.

Some of the items currently estimated in national accounts by economic activity and institutional sector are the constrains of the main economic flows analysed in tables I II and III. It is possible to experiment a top-down approach to decompose this flows. For this purpose, a variety of data, monetary and non monetary, from different sources, can be used as indicators.

In case of general government, both monetary and physical (students and teachers by education level) data regarding education have a high level of detail. For NPISHs and market producers it is possible to use data coming from enterprises archives integrated with balance sheet data base where units are classified by four digit NACE. Combining economic information with physical data allows to set up a group of appropriate indicators for the evaluation of economic flows.

5. From education to human capital account

Human capital can be broadly defined as the productive capacity embodied in individuals, it includes knowledge, know-how, skills, experiences and abilities that people gain and offer on the market in exchange for compensation. As for physical capital, human capital can be considered as a produced asset even if it is not included in the list of produced asset by Esa95. Also human capital can be accumulated throughout an investment process, that lead to give up present incomes in return of future benefits. Human capital theory focuses on the relationship between education and wages, since formal education is considered the main input in the human capital formation, together with training, experience, innate ability, parents care, etc. Therefore compiling SAE is the first step towards estimating the human capital account. A comprehensive account of human capital, even when limited to formal education, would need to integrate an evaluation of both the input and the output of the education process. This requires identifying the main items included in the two sides of the account and solving specific measurement problems on the input as well as on the output side.

Market inputs include paid labour, materials, and fixed capital; non-market inputs include volunteer labour, students' and parents' time. Students learn more with teachers, books, facilities, and help from others than without these inputs. Information is available on market inputs to education, such as teachers, buildings, books and facilities. The most important categories are the monetary expenditures of both households and educational institutions for paid work, intermediate inputs and capital inputs. All these items are detailed in the SAE framework proposed which is based on the input approach because it is coherent and fully integrated with the existing main accounts; it goes more in depth in classifying products, producers and financiers.

Also non market inputs should be considered as long as they also contribute to increase the output value. The non market inputs are mainly related to time that both parents and children devote to education activities out of school hours, such as student time spent doing homework or parent time spent assisting children with homework. Obviously estimating time inputs in educational activities is not straightforward and moreover there is no consensus on the best methodologies to be implemented. In general an opportunity cost concept is applied to estimate the value of student time⁶, while a replacement (or opportunity) cost concept to estimate the parent time value⁷.

The output of education is educated individuals who are more productive and thus earn higher incomes and also contribute to society in other, less tangible, ways, for example citizens are better informed and more capable of interacting with others. The outputs cannot be measured easily. Counting numbers of students enrolled is not the same as measuring the amount of education received, although years of schooling is a strong predictor of earnings and other economic outcomes. Frequently, the value of educational output is set equal to the cost of education inputs, but if output is measured independently the value of inputs may not balance the value of outputs, differently for other aggregates measured by the core accounts. Discrepancies may reflect the failure to measure all relevant inputs or resources allocation failures.

⁵ OECD (2007).

⁶Kendrik (1974), Garrison and Krueger (2004).

⁷ Jorgeson and Fraumeni (1989), Eisner (1989).

While there is a wide literature to estimate non market input (mainly related to unpaid time), drawing precise boundaries of the education output is challenging, since it is a process that engenders wide-ranged externalities. Leaving aside concerns about intangible assets and concentrating instead on the relationship between education and compensation, in the literature there is a general consensus on using the “income-based approach” to measure educational output. According to this method⁸ educational output is measured by the flow of potential incomes of individual classified by gender, age (or age group) and education level. For each year during lifetime, the expected income is given by the earnings received by a worker of the same gender and education level, adjusted for increase in real income and survival rates. The income based approach sum the stream of discounted lifetime expected incomes. Although the computation is highly sensitive to the level of the discount rate and to the real income adjustment method, researchers on human capital are increasingly oriented to use this method. Also the OECD is setting up a project, involving a large number of countries, to build a database to compute comparable estimation of human capital based on shared definition and methodological assumptions, using the income approach method⁹.

The data base has to include all the relevant information required for the estimates:

- population
- employment rates (on employees and self employed)
- unemployment rates
- school enrolment rates
- annual labour compensations

All variables should be cross-classified by:

1. gender
2. age or age groups
3. education levels

In order to implement this method, the Italian statistical context offers different sources of information. The *Population census* contains all information about population, cross-classified by gender, age and education level. To update infra-census data, it is possible to use *Labour force survey* and *Educations statistics* (Istat and Ministry of education and research), this last data source supply as well data about school enrolment. Data relating employment and unemployment rates can be gathered from the *Labour force survey*. Data on labour compensations are available from the Istat income survey *Social and living condition-EUSILC*, and from the Bank of Italy *Survey on households income and wealth*. They both contains information about personal income together with demographic variables.

After identifying the data requirement needed to implement the preferred approach, in order to build a data base the process of coherently integrate all available sources may be burdensome and may require to overcome many statistical problems.

6. Conclusion

In the proposed framework, education is analyzed from the perspective of producers and financiers. The consistency with definition and classification used in national account was established as a priority in order to ensure the international comparability. Anyway this does not prevent each country to undertake the analysis referring to a different framework. The implementation of such a structure would be a step towards the improvement of database about education

The next step will be the evaluation of economic flows as displayed in the tables. Facing the problem connected with measurement, the preliminary stage is defining the boundaries of education field. The definition of boundaries means to choose not only the set of products that can be considered typically as education or, in some way, connected to education services, but also the economic activities to be included. For example, it is not trivial to decide whether training on the job should be considered among education services.

To complete the SAE, the link between education and human capital formation should be stressed. Education is in fact the main determinant of human capital growth. Developing measure of human capital would allow not only to better asses its contribution to growth and well-being but also to project its evolution.

The described SAE is strongly integrated to national account flows therefore it is constrained to ESA95 definition, classification and evaluation methods. On the other hand, dealing with human

⁸ Jorgenson and Fraumeni (1989).

⁹ OECD (2009)

capital, the lack of an agreed framework and of standard definition limits cross-country comparisons and policy discussion.

This paper aims to plan the conceptual reference frame in order to build a SAE for Italy. The next actions are mainly two. The first is related to the implementation of the framework proposed that implies the difficult task of breaking-down the involved national account flows. It means studying the available statistical sources, finding suitable indicators and making them coherent with the proposed classification. Secondly, implementing the income approach method implies to build the described database: in this case the process of integration of different sources would be even harder. These steps are in the agenda of future research.

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APPENDIX: Classifications

Table A1: ISCED classification: level of education

Level 0: Pre-primary education

Pre-primary education is defined as the initial stage of organised instruction. It is school- or centre-based and is designed for children aged at least three years.

Level 1: Primary education

Programmes normally designed to give students a sound basic education in reading, writing and mathematics. This level begins between four and seven years of age, is compulsory in all countries and generally lasts from five to six years.

Level 2: Lower secondary education

The lower secondary level of education generally continues the basic programmes of the primary level, although teaching is typically more subject-focused, often employing more specialised teachers who conduct classes in their field of specialisation. Usually, the end of this level coincides with the end of compulsory education.

-2A: Programmes designed to prepare students for direct access to level 3 in a sequence which would ultimately lead to tertiary education, that is, entrance to ISCED 3A or 3B.

-2B: Programmes designed to prepare students for direct access to programmes at level 3C.

-2C: Programmes primarily designed for direct access to the labour market at the end of this level (sometimes referred to as 'terminal' programmes).

Level 3: Upper secondary education

The final stage of secondary education in most countries. This level generally begins at the end of compulsory education. The entrance age is typically 15 or 16 years. Entrance qualifications (end of compulsory education) and other minimum entry requirements are usually needed. Instruction is often more organised along subject-matter lines than at level 2 and teachers typically need to have a higher level, or more subject-specific, qualification. There are substantial differences in the typical duration of ISCED 3 programmes both across and between countries, typically ranging from 2 to 5 years of schooling.

-3A: programmes at level 3 designed to provide direct access to ISCED 5A;

-3B: programmes at level 3 designed to provide direct access to ISCED 5B;

-3C: programmes at level 3 not designed to lead directly to ISCED 5A or 5B. Therefore, these programmes lead directly to labour market, ISCED 4 programmes or other ISCED 3 programmes.

Level 4: Post-secondary non-tertiary education

These programmes straddle the boundary between upper secondary and post-secondary education from an international point of view, even though they might clearly be considered as upper secondary or post-secondary programmes in a national context. These programmes are often not significantly more advanced than programmes at ISCED 3 but they serve to broaden the knowledge of participants who have already completed a programme at level 3. The students are typically older than those in ISCED 3 programmes. They typically have a full-time equivalent duration of between 6 months and 2 years.

-4A: Programmes at level 4, designed to provide direct access to ISCED 5A.

-4B: Programmes at level 4, designed to provide direct access to ISCED 5B.

-4C: Programmes at level 4 not designed to lead directly to ISCED 5A or 5B. These programmes lead directly to labour market or other ISCED 4 programmes.

Level 5: First stage of tertiary education

Programmes with an educational content more advanced than those offered at levels 3 and 4.

-5A: Programmes that are largely theoretically based and are intended to provide sufficient qualifications for gaining entry into advanced research programmes and professions with high skills requirements. Duration categories: Medium: 3 to less than 5 years; Long: 5 to 6 years; Very long: More than 6 years.

-5B: Programmes that are generally more practical/technical/occupationally specific than ISCED 5A programmes. Duration categories: Short: 2 to less than 3 years; 3 to less than 5 years; Long: 5 to 6 Years; Very long: More than 6 years.

Level 6: Second stage of tertiary education

This level is reserved for tertiary programmes that lead to the award of an advanced research qualification. The programmes are devoted to advanced study and original research (Ph.D. or doctorate).

Table A2: COFOG

- 09 Education
- 09.1 Pre-primary and primary education
 - 09.1.1 - Pre-primary education (IS)
 - 09.1.2 - Primary education (IS)
- 09.2 Secondary education
 - 09.2.1 - Lower-secondary education (IS)
 - 09.2.2 - Upper-secondary education (IS)
- 09.3 Post-secondary non-tertiary education
- 09.4 Tertiary education
 - 09.4.1 - First stage of tertiary education (IS)
 - 09.4.2 - Second stage of tertiary education (IS)
- 09.5 Education not definable by level
- 09.6 Subsidiary services to education
- 09.7 R&D Education
- 09.8 Education n.e.c.

Table A4: COPNI

- 04 - Education
- 04.1 - Pre-primary and primary education
- 04.2 - Secondary education
- 04.3 - Post-secondary non-tertiary education
- 04.4 - Tertiary education
- 04.5 - Education not definable by level
- 04.6 - R&D Education
- 04.7 - Other educational services

Table A5: CPA

- 92 - Education services
- 92.1 - Primary education services
 - 92.1.1 - Preschool education services
 - 92.1.9 - Other primary education services
- 92.2 - Secondary education services
 - 92.2.1 - General secondary education services
 - 92.2.2 - Higher secondary education services
 - 92.2.3 - Technical and vocational secondary education services
- 92.3 - Higher education services
 - 92.3.1 - Post-secondary technical and vocational education services
 - 92.3.9 - University and other higher education services
- 92.9 - Other education and training services