

The analysis of gross fixed capital formation in institutional sectors accounts

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1. Introduction¹

In 2007 the Italian institute of statistics (Istat) published the revised estimates of total fixed capital formation by institutional sector. Starting from this benchmark, data are assessed with a new methodology, more coherent with the estimates of gross fixed capital formation by owner industry. Moreover, gross fixed capital formation (GFCF) in Italian national sector accounts is analysed separately for corporations and quasi-corporations (classified in Non-financial corporations sector, S.11) and small unincorporated enterprises (classified in Households sector, S.14), by industry and by type of good.

The aim of this paper is to present the new methodology and the main results obtained.

Section 2 describes the procedure that originated the data and the main sources which are integrated in a coherent framework: surveys on enterprises (structural business statistics, agricultural enterprises survey) are combined with administrative data, in particular for financial enterprises (supervisory data on balance sheets) and General government.

Section 3 provides a short description of the main results. Performing a simultaneous analysis of gross fixed capital formation by sector, industry and type of good allows to derive useful information about the productive structure of enterprises. The features of corporations and quasi-corporations may be distinguished from those of small unincorporated enterprises. More, the analysis by industry completes the study: the enterprises producing services, no doubt, strongly differ from those acting in manufacturing, as to the structure of fixed assets and the capital intensity. Therefore this kind of analysis allows to compare the investment behaviour of different sectors taking into account the different internal structure by industry.

2. Definition and methods

“Gross fixed capital formation consists of resident producers’ acquisitions, less disposals, of fixed assets during a given period plus certain additions to the value of non-produced assets realised by the productive activity of producer or institutional units. Fixed assets are tangible or intangible assets produced as outputs from processes of production that are themselves used repeatedly, or continuously, in processes of production for more than one year” (ESA95, 3.102).

Gross fixed capital formation (GFCF) is recorded when the ownership of the fixed assets is transferred to the institutional unit that intends to use them in production and it must be valued at purchasers’ prices (ESA95, 3.112), that is prices actually paid by the purchaser, including any tax – net of contributions – on the products, excluding interests or costs charged within credit conventions, additional discounts or burdens and inclusive of installation costs and any other costs for the transfer of ownership.

The aggregate is estimated by producer industry and it is classified in the following categories of assets: buildings (dwellings, other buildings and structures), machinery and equipment; transport equipment, intangible assets. It is also estimated by owner industry, that is from the viewpoint of the user of GFCF goods or services; in this case, the following types of assets may be distinguished: machinery and equipment, office machinery and computer, communication equipment and apparatus, furniture, road transport equipment, air sea and rail transport equipment, buildings (dwellings; other

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buildings and structures), software, other intangible assets and services (such as costs of ownership transfer of buildings, major improvements to transport equipment, entertainment, literary or artistic originals).

From owner point of view, the aggregate is also estimated by institutional sector:

- Non-financial corporations (S.11)
- Financial corporations (S.12)
- General government (S.13)
- Households (S.14)
- Non-profit institutions serving households (S.15).

GFCF for the Rest of the world (S.2) equals zero by definition: the aggregate consists of acquisitions, less disposals, of fixed assets realized by resident units.

By construction the value of GFCF by institutional sector is totally consistent with:

- a) The value of GFCF of Total economy (S.1), recorded in the supply and use table and published every year, in March, together with the GDP value²,
- b) The value of GFCF (total and by asset) by owner industry, that is a partition of the a) value, available, every year, in July³;
- c) The value of GFCF for General government, published every year, in March, within the consolidated annual account of General government⁴. This amount is calculated by National Accounts' Public Finance Division and it is drawn from the public Institutions' accounts.

The GFCF by institutional sector is estimated at a high level of detail (11 types of assets and 101 industries⁵).

2.1 Financial corporations

Financial corporations sector (S.12) includes enterprises which are principally engaged in financial intermediation (financial intermediaries) and/or in auxiliary financial activities (financial auxiliaries). It is articulated in the following institutional sub-sectors:

- the Central bank (S.121);
- other monetary financial institutions (S.122): banks, monetary funds and other IFM (ECB classification). A list of the units included in this sub-sector is under the responsibility of the Bank of Italy, who supervise them;
- other financial intermediaries (S.123), for the most part supervised by the Bank of Italy;
- financial auxiliaries (S.124), that is all the units classified in Nace Rev1.1 section 67 in case they have at least one employee. On the contrary they are classified in S.14;
- insurance corporations (S.125), supervised by Isvap, and Pension Funds, supervised by COVIP;
- non-profit institutions (NPIs) serving financial enterprises, namely those private bodies who control financial enterprises (ISVAP and CONSOB).

As a first step GFCF is calculated for S.122, mainly banks, whose annual financial statements are provided by the Italian Banking Association (ABI). As to the tangible assets, the detailed information reported in the "Notes to financial statements" of the banks⁶ is used: it shows the annual changes of the assets held by banks, recording the acquisitions, the major improvements and the disposals for the following types of goods: land, buildings, furniture, machinery, other (for instrumental assets) and land and buildings (for investment assets).

The introduction of International accounting standards (IAS/IFRS) in banks accounting practice, optional in 2005 and compulsory since 2006, proved to be very positive for the consistency between accounting registration of assets in the annual reports and ESA95: the IAS introduced the application

² Istat - Pil e indebitamento delle AP, www.istat.it.

³ Istat - Gross fixed capital formations by owner industry, fixed capital stock and consumption of fixed capital (Investimenti fissi lordi per branca proprietaria, stock di capitale e ammortamenti), www.istat.it.

⁴ Istat - Pil e indebitamento delle AP, www.istat.it.

⁵ In this paper the terms "industry" and "branch" are indifferently used, to mean the aggregation of NACE Rev. 1.1 codes at an intermediate level between the third and the second digit, commonly used in Italian national accounts.

⁶ "Nota Integrativa, Parte B – Informazioni sullo Stato Patrimoniale, Sezione 11 – Attività materiali, 11.3 Attività materiali ad uso funzionale: variazioni annue, 11.4 Attività materiali detenute a scopo di investimento: variazioni annue". This section is introduced by the Bank of Italy Circular 262 of 22 December 2005, "Banks' financial statements: layout and preparation", that contains the administrative provisions issued by the Bank of Italy pursuant to Article 9.1 of Legislative Decree 38/2005. These provisions govern, in conformity with IAS/IFRS, the formats of the financial statements (balance sheet, income statement, statement of changes in shareholders' equity and statement of cash flows), the notes to the financial statements and the report on operations that banks (on a solo basis) and banking groups (on a consolidated basis) are required to produce.

of a “financial criterion” to record assets on financial lease; so the material and immaterial activities registered in annual financial statements include also the assets on financial leasing (for the lessee) and operative leasing (for the lessor), in conformity with the ESA95 (“Assets acquired under a financial lease are recorded as if the user becomes the owner when he takes possession of the goods” – ESA95 3.112).

The information from bank’s financial statements is integrated with other sources; in particular to analyse gross fixed capital formation by asset we resort to the stocks recorded in the banks’ Balance Sheet and reported in the supervisory data base collected by the Bank of Italy (Matrice dei Conti - MdC)⁷; in the same data set, information is provided as to investment in software and hardware.

Information on GFCF is available on the financial statements for the Bank of Italy (S.121) and for the Cassa Depositi e Prestiti (previously classified in S13 and since 2004 included in the Financial corporations sector, S.122).

For Insurance corporations, we resorted to the aggregated annual financial statements items as provided by the Supervisory Authority on Insurance Companies (ISVAP), integrated by the annual balance accounts of the main insurance corporations to identify the gross fixed capital formation by asset.

No aggregated and detailed information is available for the other financial intermediaries classified in S.123. As a consequence, their GFCF is estimated by applying to the GFCF of banks the ratio between the output of S.123 to the output of S.122 (both net of FISIM).

To estimate the gross fixed capital formation of financial auxiliaries we use the estimates produced by owner industry for the units classified in Nace Rev1.1 section 67. The allocation between S.12 and S.14 is based on the methodology used to divide S.11 and S.14 described in paragraph 2.3.

2.2 Non-profit institutions serving households

Non-profit institutions serving households (NPISHs) sector (S.15) includes all non market private non profit institutions. They are cultural and sport associations, foundations, politic parties, trade unions, religious bodies (covering all kind of religion), etc. Households benefit from the services, free or partially free, produced by these units. The principal resources of S.15 are transfers from Households, General government, Rest of the world.

Per capita values of GFCF, by branch and size class, have been estimated from Census of Non Profit Institutions with reference to the year 1999⁸; these values are, then, currently updated using the average value of GFCF per employee derived by branch and size class from business surveys: the survey on economic and financial accounts of large enterprises (SCI⁹) and the sample survey on small and medium enterprises (PMI¹⁰). The total gross fixed capital formation is then obtained by multiplying these per capita values by the relevant employment in FTEUs (full time equivalents¹¹).

2.3 Households and Non-financial corporations

As explained above, GFCF by institutional sector is consistent with the estimate of the total GFCF by owner industry and by asset: in every branch, the value of GFCF by asset has to be allocated to all the sectors engaged in that activity. So, from gross fixed capital formation value by industry and by asset the value of General government, Non-profit institutions serving households and of Financial corporations is subtracted. The remaining part has to be attributed to Non-financial corporations sector (S.11) and to Households sector (S.14).

The Households sector covers individuals or groups of individuals as consumers and also as entrepreneurs producing market goods and non-financial and financial services (market producers). It also includes individuals or groups of individuals as producers of goods and non financial services for exclusively own final use (ESA95, 2.75). Inside the Households sector Istat distinguishes between

⁷ A standard classification of assets has been introduced by the new Banks’ financial statements. See footnote 4.

⁸ Istat - Istituzioni nonprofit in Italia - i risultati della prima rilevazione censuaria, Informazioni, n. 50, 2001.

⁹ Istat- Survey on economic and financial accounts of large enterprises (Sistema dei conti delle imprese, SCI), www.istat.it

¹⁰ Istat - Survey on small and medium enterprises (Rilevazione sulle piccole e medie imprese e sull’esercizio di arti e professioni, PMI), www.istat.it

¹¹ FTEUs are obtained by adding to the main jobs, part-time and multiple jobs transformed into full-time units by means of coefficients (defined as the ratio of total hours worked divided by the average annual number of hours worked in full-time jobs) that differ by industry and group of jobs.

Consumer households (S.14 HC), whose main function consists in consumption and output of goods and services for own final use, and Producer households (S.14 HP), that includes all the market activities of the sector. According to the Italian National Accounts' definition, only as own account workers, sole proprietorships ("imprese individuali") and "società semplici" and "società di fatto" with up to 5 employees and financial auxiliaries with no employees are classified in Households sector as producers.

Non-financial corporations and quasi corporations are market producers whose principal activity is the production of goods and non-financial services (ESA95, 2.21). In Italian National Accounts this sector consists of all incorporated enterprises ("società per azioni", "società in accomandita per azioni", "società a responsabilità limitata", "consorzi") and cooperatives; it also includes some kind of unincorporated enterprises, that is all partnerships ("società in nome collettivo", "società in accomandita semplice"); sole proprietorships ("imprese individuali") and "società semplici" and "società di fatto" with more than 5 employees, which are classified as non financial quasi-corporations.

2.3.1 Dwellings

Non-financial corporations and Producer households acquire all types of gross fixed capital formation assets, while transport equipment and other machinery and equipment acquired by Consumer households are not considered capital formation but final consumption (ESA95, 7.15). An exception are dwellings¹²: since the production of housing services by owner-occupiers is considered in the system as own account production (ESA95, 1.13), all dwellings acquired for residential purposes are treated as gross fixed capital formation of Consumer households, while those acquired for rent purposes are attributed to Producer households.

Thus, in our scheme, GFCF in residential buildings are to be divided between:

- a) GFCF in dwellings occupied by the owners, allocated to the Consumer households;
- b) GFCF in dwellings for investment purposes allocated to the Financial corporations, Non-financial corporations, Producer households (including households who rent their dwellings), General government, NPISHs.

By owner industry, all the dwellings are assigned to the branch "Letting of own property" (Nace Rev.1, section 70.20) under the hypothesis that every owner of a dwelling has kind-of-activity unit (KAU)¹³ engaged in this economic activity.

GFCF in dwellings, once the share of S.12, S.13 and S.15 is excluded, is divided among S.11, S.14 HP (as to the let dwellings) and S.14 HC (as to the own occupied dwellings) using a distribution function estimated basing on data derived from 14th General Population and Housing Census¹⁴, that registered the Italian housing stock on the 21st of October 2001. By matching the information on the "home tenure" (home owner, tenant) and the "nature of dwelling owner" (individual, other private owner¹⁵) it is possible to identify the percentage of owner occupied houses (assigned to Consumer households), the percentage of let houses whose owner is an individual (assigned to Producer households), the percentage of let houses whose owner is an enterprise or corporation (assigned to Non-financial corporations)¹⁶.

Using the estimated distribution function, the following shares have been estimated (table 2).

Table 1: Attribution of GFCF in dwelling, by resident status and by owner of the dwelling.

Home tenure	Nature of dwelling owner	
	Individual	Other private owner
Tenant	S.14 HP	S.11
Home owner	S.14 HC	S.11

¹² Also Costs of ownership transfer of buildings are given to HC S.14: this category is strongly linked with GFCF in dwellings.

¹³ The KAU groups all the parts of an institutional unit in its capacity as producer contributing to the performance of an activity at class level (four digits) of the NACE rev. 1 and corresponds to one or more operational subdivisions of the institutional unit. The institutional unit's information system must be capable of indicating or calculating for each local KAU at least the value of production, intermediate consumption, compensation of employees, the operating surplus and employment and gross fixed capital formation (ESA95 2.106).

¹⁴ Istat - 14° Censimento della popolazione e delle abitazioni, www.istat.it.

¹⁵ All public owners are excluded.

¹⁶ Enterprises and corporations could be HP too but in Italian National Accounts only very small size enterprises are included in S.14 : insofar we can hypothesize that their gross fixed capital formation in dwellings is rather negligible. More, the value of housing services for the market producers classified in S.14 is rather low (they only receive 1% of the total): so, we assumed that the gross fixed capital formation in dwellings of small enterprises classified in S.14 equals zero.

Table 2: Share (%) of GFCF in dwellings. Italy.

Sub-sector	%
S.14 HC	87.5
S.14 HP	8.0
S.11	4.5

Source: Our elaborations on Istat –14° General Population and Housing Census.

The annual Households Expenditure Survey¹⁷ provides, then, information allowing to update the Census data and to estimate GFCF as the increase in dwelling stocks.

2.3.2 Other assets

All assets, other than dwellings, have to be divided between Non-financial corporations and Producer households. Partition coefficients are used to this purpose; they are estimated from information provided by business surveys (SCI, PMI and the sample survey on economic and financial accounts of agricultural enterprises, REA¹⁸), that are the main sources to calculate GFCF by owner industry, too.

Since the difference between S.11 and S.14 HP mainly attains to the size class and legal form, to estimate GFCF by sector:

- a) average values of gross fixed capital formation based on total employment, by size class and legal form, are calculated in every branch and for each asset as follows (a):

$$(a) \quad a_{jik} = \frac{A_{jik}}{e_{ik}}$$

where

a_{jik} = average value of GFCF for the asset j , in industry i , size class+legal form k

A_{jik} = acquisitions of asset j , in industry i , size class+legal form k

e_{ik} = employment in industry i , size class+legal form k

i (1,...,101) = industry

j (1,...,5) = asset (buildings; machinery; furniture; transport equipment; software)

k (1,2) = size class+ legal form (where $k= 1$ identifies enterprises with size class 1-5 and legal form sole proprietorships, società semplici and società di fatto; $k= 2$ identifies enterprises with size class 6+ people employed and other legal form)

therefore:

$aji1$ is a proxy of the average value of the GFCF of Producer households in asset j in industry i ;

$aji2$ is a proxy of the average value of the GFCF of Non-financial corporations in asset j in industry i .

- b) these average values are multiplied by the labour input of each sector, by industry, expressed in FTEUs, used to totalize average values (b).

$$(b) \quad A_{sij} = a_{jik} \times FTEUs_{si}$$

where

A_{sij} = first estimate of GFCF of sector s in asset j in industry i

$FTEUs_{si}$ = full time equivalent units of sector s in industry i

s =sector (S.11 or S.14 HP).

¹⁷Istat - Households Expenditure Survey (*Indagine sui consumi delle famiglie*), www.istat.it.

¹⁸ Istat- Survey on economic and financial accounts of agricultural enterprises (Rilevazione economica sulle aziende agricole, REA), www.istat.it

The ratio between GFCF of each sector and the sum of GFCF of the two sectors calculated in this way represents the partition coefficient used to divide the amount of GFCF by industry net of S.12, S.13, S.15 (c).

$$(c) \quad GFCF_{sij} = [GFCF_{s1ij} - (GFCF_{s12ij} + GFCF_{s13ij} + GFCF_{s15ij})] \times \frac{A_{sij}}{A_{.ij}}$$

where

$GFCF_{sij}$ = GFCF of sector s in industry i and asset j

$GFCF_{s1ij}$ = Total GFCF in industry i and asset j

$GFCF_{s12ij}$ = GFCF of S.12 in industry i and asset j

$GFCF_{s13ij}$ = GFCF of S.13 in industry i and asset j

$GFCF_{s15ij}$ = GFCF of S.15 in industry i and asset j

$A_{.ij} = A_{s11ij} + A_{s14HPij}$.

Survey data are available for the following categories of goods: buildings, machinery, furniture, transport equipment, software. So this method allows to estimate the followings types of GFCF:

- cultivated assets (machinery and equipment acquired by Agriculture industry)
- machinery and equipment, office machinery and computer, communication equipment and apparatus, furniture;
- transport equipment¹⁹;
- non-residential buildings and structures;
- software.

As to those assets for which no information is available in enterprises surveys, the estimation is based on specific hypothesis; for example, the distribution of major improvements to transport equipment and costs of buildings ownership transfer are proportionally shared on the bases of the relevant GFCF.

3 Analysis of the results

The analysis of GFCF by institutional sector provides very interesting information, but to correctly interpret these results it is necessary to control for the sector of economic activity. In fact capital intensity (and therefore GFCF) crucially depends on the category of economic activity the enterprises are involved in: it is typically higher in manufacturing and lower in services activities. Different institutional sectors do not perform their activities in all economic sectors. Producer households, for example, are mainly concentrated in services activities: table 3 shows that only 10% of the total labour input of manufacture, in terms of FTEUs, is employed in small enterprises classified as Producer households, while in Nace F to K the share of HP rises to more than 30 per cent.

In this section we want to analyse the structure of GFCF by institutional sector without being affected by economic cycle or other factor that can influence investment decision in the short run, such as fiscal incentives that can induce to anticipate or postpone investment decisions and therefore emphasize the variation rate of GFCF.

As a consequence, in tables 3 to 7 only average values over the period 2000-2008 are presented. Data are shown for the total economy and detailed by institutional sector: Non-financial corporations, Financial corporations, total Households (including NPISHs, Consumer households and Producer households) and Producer households alone, General government. More, they are displayed for the following industries:

- Agriculture, hunting, forestry, Fishing (Nace A,B)
- Mining, Manufacturing, Electricity, gas and water supply (Nace C, D, E)
- Construction (Nace F)
- Wholesale, retail trade, repair, Hotels and restaurants, Transport, storage and communications (Nace G, H, I)

¹⁹ Road transport equipment are divided between S.11 and S.14 HP while air sea and rail transport equipment are totally assigned to S.11.

- Financial intermediation, Real estate, renting and business activities (Nace J, K)
- Public administration, defence, compulsory social security, Education, Health, Other service activities (Nace L, M, N, O, P).

The capital goods are grouped into three main categories:

1. buildings: it includes dwellings, mostly bought by Consumer households, non residential buildings and other structures. This category includes as well major maintenance, installation costs and costs connected with transfer of ownership;
2. transport equipment: it includes road transport equipment and other transport equipments (air sea and rail transport equipment: planes, boats etc.);
3. other assets: it includes products of agriculture, machinery and other equipments, office machinery and computer; communication equipment and apparatus; furniture, software and other intangible assets.

Table 3 weights the total composition of GFCF against value added and labour input. All values are compared by institutional sector and by industry. Non-financial corporations produce most of value added (52%), perform most of GFCF (55%) and employ most of labour input (54%). Financial corporations, which produce 4% of total value added, perform only 2% of GFCF. The Households sector is the second one in terms of GFCF (31%), value added (29%) and FTEUs (29%). Most of this GFCF is actually operated by Consumer households and it is made of dwellings. Producer households share of GFCF is 12%, low if compared to 20% of value added and 24% of FTEUs. The remaining GFCF is operated by General Government (11%), which produces 14% of value added and employs 14% of FTEUs. Table 3 shows that the incidence of GFCF of Non-financial corporations is the highest in most industries.

More in deep, the incidence of GFCF of Non-financial corporations in Mining, Manufacturing, Electricity, gas and water supply is the highest (96%, table 3). This is mainly due to the high incidence of machinery and other equipment (97%) and buildings (94%) (table 4). For Non-financial corporations the per-capita value of GFCF in this industries is the highest (see table 6), due to the value recorded in machinery and other equipment (which is the highest with respect to all industry and all institutional sectors). In these industries Producer households do not perform a relevant activity, nevertheless it may be interesting to notice a different composition of GFCF with respect to S11 (see table 5): while share in building is quite similar (21% for Producer households and 25% for S.11), Producer households count a much higher weight of investment in transport equipment (22% against 4% of Non-financial corporations), for which, moreover, they show much higher per-capita value of GFCF (table 6). This can be due to the failure of small enterprises to exploit the economy of scale involved: Producer households are in fact characterized by a small size.

Agriculture, hunting, forestry, fishing is the only industry where Producer households show the highest quote of investment (84%). This sector keeps more or less the same quote in terms of the three category of goods (see table 4). It is the branch where Producer households and Non-financial corporations differ less in terms of composition of investment goods, which are mostly made of machinery and equipment (62% for Non-financial corporations and 58% for Producer households) and of buildings (34% for Non-financial corporations and 37% for Producer households), only marginally of transport equipment (table 5). Producer households show in this industry the highest per-capita values, higher than the ones displayed by Non-financial corporations in all types of goods and the highest incidence on value added (see table 7).

Non-financial corporations employ 65% of FTEUs and produce 65% of value added of the construction industry, but perform 75% of GFCF (table 3). Most of it is made of machinery and equipment (table 4). Also for this branch Producer households have an higher quote of investment in transport equipment (table 3 and 4). For transport equipment the per-capita values of S.11 and HP are quite similar (27% with respect to the industry per-capita GFCF for Producer households against 25% for Non-financial corporations), while the per-capita values of building and especially of machinery and equipment of Producer households (respectively 17% and 28%) are much lower than those recorded by Non-financial corporations (respectively 35% and 54%, see table 6).

In Wholesale, retail trade, repair, Hotels and restaurants, Transport, storage and communications, Non-financial corporations absorb most of GFCF of the total economy (87%), and performs most of the investment in machinery and equipment (89%) operated in this industry (tables 3 and 4). The composition of GFCF deeply differs between Non-financial corporations and Producers households. While Non-financial corporations sector invests around 40% in machinery and equipment and building, the Households sector invests more than 50% in transport equipment (see table 5). This is due to the fact that while the per-capita value of transport equipment is just slightly lower for Producer

households with respect to the industry average, for the other assets Producer households display much lower per-capita value (table 6).

The Household sector performs most of the investment in Financial intermediation, Real estate, renting and business activities (71%). This is mainly due to the Consumer household buying dwellings. If we consider the Producer households alone, the GFCF account to only 10%, much lower than the FTEUs employed (33%) and the value added produced (25%) (table 3). A low capital intensity of Producer households activities in these industries is confirmed by the low per-capita values recorded, compared to the other sectors. The per-capita value of machinery and equipment is the lowest, and in fact the Households sector displays the lowest quote on machinery and equipment computed on total investment of this sector in this industry (18%), compared to the other sectors: it is 32% for Non-financial corporations, 63% for Financial corporations and 19% for the General government.

General government activities are performed mainly in public administration, defence, compulsory social security, education, health and other service industries. In these industries S13 absorbs more than 75% of total investment, the main asset being buildings (97% of total capital formation in building of this branch, table 4). Building represents 73% of General government GFCF in this industry (table 5). The Non-financial corporations, perform most of the remaining GFCF of this branch (17%), even though they employ the same remaining share of FTEUs and produce almost the same value added than Households.

It is worth remembering that this branch includes a variety of different activities and the market and non market producers are specialized in different activities. The General government mainly performs proper public administration activities, defence, compulsory social security, education and the largest part of health, while Producer households and Non-financial corporations are involved in the other services. Also NPISHs, included in the Household sector, operate in this industry, but their quote of GFCF, that a total national level, hardly rises above 0.1%, does not reach 1% here.

The Households sector includes as well activity of households as employer of domestic staff. This activity produces value added only employing labour input and does not need capital stock, therefore there is not capital formation. Non-financial corporations and Producer households both perform negligible amount of investment in building, with comparable per-capita values, but, in this activity as well, Producer households tend to invest more in transport equipment (24% of total investment in this branch, against 8% performed by Non-financial corporations) and less in machinery (68% compared to 88%) compared to Non-financial corporations.

Table 3: Gross fixed capital formation, value added and labour input (FTEUs) distributions by institutional sector and by industry, average percentages of current values, (years 2000-2008)

	Total economy			Non financial-corporations			Financial corporations			Households			of which: Producer households			General Government		
	% GFCF	%Value added	%Fteus	% GFCF	%Value added	%Fteus	% GFCF	%Value added	%Fteus	% GFCF	%Value added	%Fteus	% GFCF	%Value added	%Fteus	% GFCF	%Value added	%Fteus
Total industries	100	100	100	55.5	52.4	54.5	2.3	4.5	2.1	31.2	28.6	28.9	12.1	19.7	24.4	11.0	14.5	14.5
Agriculture, hunting, forestry, Fishing (Nace A,B)	100	100	100	15.5	22.0	21.3	-	-	-	84.5	78.0	78.7	84.4	71.9	65.3	-	-	-
Mining,Manufacturing,Electricity, gas and water supply (Nace C, D, E)	100	100	100	96.5	94.2	89.9	-	-	-	3.5	5.8	10.1	3.5	5.8	10.1	-	-	-
Construction (Nace F)	100	100	100	75.2	65.2	64.8	-	-	-	24.8	34.8	35.2	24.8	34.4	34.4	-	-	-
Wholesale, retail trade; repair, Hotels and restaurants,Transport, storage and communic. (Nace G, H, I)	100	100	100	86.7	74.2	68.3	-	-	-	13.3	25.8	31.7	13.3	25.8	31.7	-	-	-
Financial intermediation, Real estate, renting and business activities (Nace J, K)	100	100	100	18.9	27.7	48.8	7.3	17.0	15.2	70.7	53.2	33.1	10.0	24.8	33.1	3.1	2.1	2.9
Public adm, defence, compulsory social security,Education, Health, Other service activities (Nace L, M, N, O, P)	100	100	100	17.2	16.1	18.7	-	-	-	7.7	16.9	26.4	6.8	11.3	11.7	75.1	67.0	54.9

Table 4: Gross fixed capital formation composition by institutional sector, by type of good and industry, average percentages of current values, (years 2000-2008).

	Total economy				Non-financial corporations				Financial corporations				Households				of which: Producer households				General Government			
	Machinery and equipm.	Transport equipm.	Building	Total GFCF	Machinery and equipm.	Transport equipm.	Building	Total GFCF	Machinery and equipm.	Transport equipm.	Building	Total GFCF	Machinery and equipm.	Transport equipm.	Building	Total GFCF	Machinery and equipm.	Transport equipm.	Building	Total GFCF	Machinery and equipm.	Transport equipm.	Building	Total GFCF
Total industries	100	100	100	100	78.3	65.7	35.5	55.5	3.4	1.4	1.6	2.3	12.3	28.9	46.3	31.2	12.2	28.8	8.5	12.1	5.9	4.0	16.5	11.0
Agriculture, hunting, forestry, Fishing (Nace A,B)	100	100	100	100	16.4	12.3	14.4	15.5	-	-	-	-	83.4	87.7	84.2	84.5	83.3	87.7	84.1	84.4	-	-	-	-
Mining,Manufacturing,Electricity, gas and water supply (Nace C, D, E)	100	100	100	100	96.9	82.8	94.0	96.5	-	-	-	-	2.8	17.1	2.9	3.5	2.8	17.1	2.9	3.5	-	-	-	-
Construction (Nace F)	100	100	100	100	78.1	63.6	77.3	75.2	-	-	-	-	21.3	36.4	19.2	24.8	21.3	36.4	19.2	24.8	-	-	-	-
Wholesale, retail trade; repair, Hotels and restaurants,Transport, storage and communic. (Nace G, H, I)	100	100	100	100	88.8	70.8	87.8	86.7	-	-	-	-	9.7	29.1	5.8	13.3	9.7	29.1	5.8	13.3	-	-	-	-
Financial intermediation, Real estate, renting and business activities (Nace J, K)	100	100	100	100	47.2	65.5	11.0	18.9	33.8	7.8	3.1	7.3	14.3	25.8	82.9	70.7	14.2	25.8	8.1	10.0	4.7	0.9	3.0	3.1
Public adm, defence, compulsory social security,Education, Health, Other service activities (Nace L, M, N, O, P)	100	100	100	100	41.4	20.2	1.4	17.2	-	-	-	-	14.2	27.4	1.4	7.7	12.7	26.2	1.0	6.8	44.4	52.4	97.2	75.1

Table 5: Gross fixed capital formation composition by investment goods, by institutional sector and industry, average percentages (years 2000-2008)

	Total economy				Non-financial corporations				Financial corporations				Households				of which: Producer households				General Government			
	Machinery and equipm.	Transport equipm.	Building	Total GFCF	Machinery and equipm.	Transport equipm.	Building	Total GFCF	Machinery and equipm.	Transport equipm.	Building	Total GFCF	Machinery and equipm.	Transport equipm.	Building	Total GFCF	Machinery and equipm.	Transport equipm.	Building	Total GFCF	Machinery and equipm.	Transport equipm.	Building	Total GFCF
Total industries	39.2	10.7	50.1	100	55.3	12.7	32.0	100	63.5	7.0	29.5	100	15.6	9.9	74.5	100	39.4	25.4	35.2	100	21.4	3.9	74.7	100
Agriculture, hunting, forestry, Fishing (Nace A,B)	58.3	5.3	36.5	100	61.8	4.2	34.0	100	-	-	-	-	57.9	5.5	36.6	100	57.9	5.5	36.6	100	-	-	-	-
Mining,Manufacturing,Electricity, gas and water supply (Nace C, D, E)	70.0	4.5	25.6	100	71.0	3.9	25.1	100	-	-	-	-	57.4	22.0	20.6	100	57.4	22.0	20.6	100	-	-	-	-
Construction (Nace F)	45.3	25.4	29.3	100	47.7	21.8	30.5	100	-	-	-	-	39.9	37.5	22.5	100	39.9	37.5	22.5	100	-	-	-	-
Wholesale, retail trade; repair, Hotels and restaurants,Transport, storage and communic. (Nace G, H, I)	37.9	24.6	37.5	100	40.1	20.8	39.1	100	-	-	-	-	28.3	54.6	17.1	100	28.3	54.6	17.1	100	-	-	-	-
Financial intermediation, Real estate, renting and business activities (Nace J, K)	12.8	6.1	81.1	100	31.8	21.2	47.0	100	63.5	7.0	29.5	100	2.6	2.2	95.2	100	18.1	15.8	66.1	100	19.5	1.8	78.7	100
Public adm, defence, compulsory social security,Education, Health, Other service activities (Nace L, M, N, O, P)	36.8	6.5	56.7	100	87.8	7.7	4.6	100	-	-	-	-	67.0	22.7	10.3	100	67.8	24.4	7.7	100	22.0	4.5	73.5	100

Table 6: Per-capita Gross fixed capital formation by institutional sector and industry, percentage value with respect to average industry per-capita value (years 2000-2008)

	Total economy				Non-financial corporations				Financial corporations				Households				of which: Producer households				General Government			
	Machinery and equipm.	Transport equipm.	Building	Total GFCF	Machinery and equipm.	Transport equipm.	Building	Total GFCF	Machinery and equipm.	Transport equipm.	Building	Total GFCF	Machinery and equipm.	Transport equipm.	Building	Total GFCF	Machinery and equipm.	Transport equipm.	Building	Total GFCF	Machinery and equipm.	Transport equipm.	Building	Total GFCF
Total industries	39.1	10.6	50.2	100	56.3	12.8	32.7	101.8	63.0	6.9	36.8	106.7	17.0	10.8	80.6	107.9	19.5	12.6	17.5	49.6	16.0	2.9	57.2	76.2
Agriculture, hunting, forestry, Fishing (Nace A,B)	58.2	5.3	36.6	100	44.8	3.0	24.7	72.5	-	-	-	-	62.0	5.9	39.3	107.1	74.4	7.1	47.2	128.7	-	-	-	-
Mining,Manufacturing,Electricity, gas and water supply (Nace C, D, E)	70.0	4.4	25.5	100	75.6	4.1	26.7	106.4	-	-	-	-	19.8	7.5	7.2	34.6	19.8	7.5	7.2	34.5	-	-	-	-
Construction (Nace F)	45.2	25.4	29.4	100	54.4	24.9	34.9	114.2	-	-	-	-	27.5	26.5	16.4	70.4	28.1	27.1	16.8	71.9	-	-	-	-
Wholesale, retail trade; repair, Hotels and restaurants,Transport, storage and communic. (Nace G, H, I)	37.8	24.4	37.9	100	49.2	25.4	48.7	123.2	-	-	-	-	11.6	22.4	7.0	41.0	11.6	22.4	7.0	41.0	-	-	-	-
Financial intermediation, Real estate, renting and business activities (Nace J, K)	12.7	6.1	81.2	100	12.3	8.2	18.3	38.8	28.4	3.1	16.6	48.1	5.5	4.8	203.3	213.6	5.5	4.8	20.0	30.2	21.0	1.9	85.4	108.3
Public adm, defence, compulsory social security,Education, Health, Other service activities (Nace L, M, N, O, P)	36.4	6.4	57.2	100	80.4	7.0	4.4	91.8	-	-	-	-	21.1	7.2	3.3	31.6	39.7	14.3	4.7	58.7	29.4	6.1	101.7	137.2

Table 7: Investment rate: incidence of Gross fixed capital formation on value added. Average percentages (years 2000-2008)

	Total economy				Non-financial corporations				Financial corporations				Households*	of which: Producer households				General Government			
	Machinery and equipm.	Transport equipm.	Building	Total GFCF	Machinery and equipm.	Transport equipm.	Building	Total GFCF	Machinery and equipm.	Transport equipm.	Building	Total GFCF	Total GFCF over disposable income	Machinery and equipm.	Transport equipm.	Building	Total GFCF	Machinery and equipm.	Transport equipm.	Building	Total GFCF
Total industries	9.0	2.5	11.6	23.1	13.5	3.1	7.8	24.4	7.0	0.8	4.2	12.0	9.3	5.6	3.6	5.0	14.1	3.7	0.7	13.1	17.5
Agriculture, hunting, forestry, Fishing (Nace A,B)	22.4	2.0	14.1	38.6	16.8	1.1	9.3	27.2	-	-	-	-		26.3	2.5	16.6	45.4	-	-	-	-
Mining,Manufacturing,Electricity, gas and water supply (Nace C, D, E)	19.2	1.2	7.0	27.4	19.8	1.1	7.0	27.8	-	-	-	-		9.5	3.6	3.4	16.5	-	-	-	-
Construction (Nace F)	7.0	4.0	4.6	15.6	8.4	3.9	5.4	17.7	-	-	-	-		4.4	4.3	2.7	11.4	-	-	-	-
Wholesale, retail trade; repair, Hotels and restaurants,Transport, storage and communic. (Nace G, H, I)	8.7	5.6	8.7	23.0	10.5	5.4	10.3	26.2	-	-	-	-		3.3	6.4	2.0	11.6	-	-	-	-
Financial intermediation, Real estate, renting and business activities (Nace J, K)	3.5	1.7	22.1	27.3	5.9	3.9	8.8	18.7	7.0	0.8	4.2	12.0		2.0	1.7	7.2	11.0	8.0	0.7	32.4	41.1
Public adm, defence, compulsory social security,Education, Health, Other service activities (Nace L, M, N, O, P)	4.9	0.9	7.7	13.5	12.6	1.1	0.7	14.4	-	-	-	-		5.6	2.0	0.7	8.2	3.3	0.7	11.2	15.1

* The Households sector investment rate has been computer over gross disposable income

The decision on how enterprises employ income from their activity deeply influences future earnings. Investing in fixed capital can enhance production, but the time lag between the investment and the increase in production is strongly related to the type of investment good, the general capital intensity and therefore how the investment good interacts with the rest of capital goods and with the labour input. It is therefore meaningless to compute the impact of GFCF on the increase of production and value added: this analysis should be performed using capital stock. Disposing, at the moment, only of GFCF only allows to compute the investment rate, measured as the incidence of GFCF on value added (table 7): it can be an indicator of how enterprises decide to invest on their future productive activities. For total households the ratio has been computed with respect to gross disposable income. Financial corporations show the lowest investment rate (12%, table 7), well below the average national value (23.1%). As a matter of fact financial intermediation typically involves a very low use of capital stock. The small enterprises classified in the sector, mostly concentrated in services activities (characterized by a lower investment rate), on the contrary show an incidence of GFCF on value added limited to 14.1%.

Only Non-financial corporations and the General government have high investment rate in services activities. For the General government this is especially due to high incidence of investment in buildings in both financial intermediation, real estate, renting and business activities and public administration, education, health and other service activities. Non-financial corporations instead show higher incidence over value added in machinery and transport equipment for Financial intermediation, real estate and business activities, while they display the highest incidence for machinery and equipment in the other services activities. Agriculture is characterized by the highest incidence of investment is, especially in the Producer households sector (45%, table 7). After agriculture, manufacturing employ the most part of value added to substitute or increase the capital stock (27% at a national level, 28% for S11 and 16% for S14 HP, table 7) .

From the analysis performed so far it appears as gross fixed capital formation is not just a linear function of value added nor enterprises class size: both the investment rate and per-capita values, in fact, deeply differ among institutional sector, even in the same industry, it is to say keeping constant the technology available for the same productive process. Namely, the investment rate and the per-capita values are both much lower for Producer households than for Corporations.

Producer households show a different behaviour only when buying transport equipment: this is the only asset for which this sector displays a relevant share of the total GFCF and higher per-capita values than Corporations for each industry (but for Financial intermediation, real estate and business activities). It appears therefore that this is the asset for which Producer households draw less benefit from economies of scale.

Consumer households should be analysed in a different way with respect to the other sectors. The only type of production of this sector is related to own final use. The only investment good is dwellings, the other goods from which Households can derive their utility for a longer period are considered as consumption durables. Consumer households perform about 40% of the investment in buildings operated in the total economy, investing in dwellings 9.3% of their disposable income. For Households it is possible to evaluate the flows of returns of this investment: Households gross operating surplus is mostly composed by the flow of imputed rents of owner occupied dwellings. In the last years, this accounted on average for about 10% of disposable income, with an increase rate that, in the examined period, has been more than double than the increase rate of disposable income (6.2% the growth rate of Household gross operating surplus, 3.5% the increase rate of gross disposable income). Also Households expenditure has been sustained by accumulated fixed capital: imputed rents showed an average growth rate of 5.8%, against 3.2% increase rate of total expenditure of resident Households.

4 Conclusions and future developments

Estimating capital formation according to the new methodology is a burdensome process, that needs the integration of different data sources (business surveys and administrative data) in a coherent framework with a high detail of analysis. The procedure is demanding, but, on the other hand, the results obtained are more reliable.

Starting from these estimates, it is possible to analyse the relationship between capital formation and value added, keeping separately in each industry corporations and unincorporated enterprises. This kind of analysis allows to evaluate the existence of economies of scale and of different models of

capital formation for different goods on enterprises organised differently, namely small enterprises versus corporations.

It is important to perform the analysis differentiating by industry: producer households (unincorporated enterprises employing up to five employees) are not uniformly distributed by industry, but their incidence is higher in services. The enterprises in these economic sectors behave strongly differently than the one in manufacturing in terms of structure of fixed assets and capital intensity.

The analysis performed is based on asset flows: gross fixed capital formation replaces and increases the existing capital. It should be integrated with the analysis of stocks. Disposing of Balance sheets would allow to investigate the relationship among capital formation, capital stock and value added growth. In fact productivity depends on how enterprises mix production factors: the way capital stock, with the technology it embodies, interacts with labour input can explain the pattern of production and value added growth. Moreover Balance sheets can allow to study how the capital intensity differs among sectors in the same industry and the way it affects the different pattern in GFCF decision.

In 2007, thanks to an Eurostat grant, Istat Directorate of National Accounts started a project aimed at producing a first draft estimate of Balance sheets by institutional sector for the main non-financial assets, in particular dwellings, non residential buildings and other structures, machinery and equipment and land for the year 2006. The transmission of Balance sheets by institutional sectors, is scheduled in ESA95 transmission programme and is going to be compulsory for Italy by 2010²⁰.

The compilation of Balance sheets performed by all the member countries will enrich the statistical knowledge and will advantage productivity research studies.

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²⁰ Santoro (2008)