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GERMAN EXPERIENCES IN ESTIMATING HOUSEHOLDS' NON-FINANCIAL ASSETS
- PRELIMINARY VERSION (SEPTEMBER 2007) -

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English - Or. English

GERMAN EXPERIENCES IN ESTIMATING HOUSEHOLDS' NON-FINANCIAL ASSETS*

- PRELIMINARY VERSION (SEPTEMBER 2007) -

Abstract

Germany has a long tradition of estimating balance sheets of households as consumers within the frame of the activities of the Federal Statistical Office (Destatis) and the Deutsche Bundesbank. Initially, integrated non-financial and financial balance sheets of the household sector were compiled by the Federal Statistical Office (Destatis) and by the Bundesbank on the basis of ESA 79. After the introduction of ESA 95, having implied an enlargement of the household sector by the inclusion of households as producers, balance sheets of the "new" household sector were compiled by the Bundesbank by combining financial accounts data and estimates of fixed assets and land. Regarding the compilation of households' stock of fixed assets and land, the Bundesbank applied a simplified estimation method which was based on the one hand on an updating procedure of former estimates by the Federal Statistical Office (Destatis) on the basis of ESA 79 by using sectoral investment time series and land price indices, and, on the other hand, on adjustments taking into account the change in the sector definitions under ESA 95.

In recent times, increased efforts were made by the Federal Statistical Office (Destatis) and by the Bundesbank both to enlarge the scope and to improve the quality of data on households' non-financial assets. This paper outlines the latest results of the work that has been done recently. The Federal Statistical Office (Destatis) presents the compilation of fixed assets for the household sector, including households as producers, based on the perpetual inventory method which is used as a standard method for fixed assets. It describes the advantages and weaknesses of using this method for the calculation of sector accounts. The Bundesbank outlines an advanced compilation method regarding the stock of land underlying buildings and structures for the household sector (including non-profit institutions serving households), being based on an own estimation approach which uses different sources of information from statistics on land and land prices published by the Federal Statistical Office (Destatis). Furthermore, both the compilation and a short analysis of households' (including NPISH) balance sheets for the period 1992 to 2006 are presented by combining Destatis' latest results of the compilation of fixed assets, the Bundesbank's data on land underlying buildings and structures, and the Bundesbank's data on financial accounts.

* *This article represents the authors' personal opinions and does not necessarily reflect the views of the Statistisches Bundesamt (Destatis) and the Deutsche Bundesbank.*

1. Introduction

Germany has a long tradition of estimating balance sheets of households as consumers which were published in the past on the basis of ESA 79 at irregular intervals.[1] As regards the data sources of the balance sheet items, dwellings and consumer durables in the former territory of Germany were produced by the Federal Statistical Office (Destatis) whereas financial assets and liabilities were compiled by the Bundesbank. Land underlying dwellings was estimated by the Bundesbank in an updating process on the basis of a study by the German Institute for Economic Research (DIW) Berlin.

After the introduction of ESA 95 the compilation method of households sector balance sheets had to be adjusted due to the definitional enlargement of the household sector by the inclusion of households as producers. Integrated financial and non-financial balance sheets of the "new" household sector were published by the Bundesbank for the first time in June 2000.[2] Furthermore, annual household sector balance sheet data have been transmitted regularly up to the present to international organisations (e.g. OECD, ECB, IMF) on an annual basis.[3] Regarding the determination of fixed assets and land, the Bundesbank applied a simplified estimation method which was based on the one hand on an updating procedure of former estimates by the Federal Statistical Office (Destatis) on the basis of ESA 79 by using sectoral investment time series and land price indices, and, on the other hand, on adjustments taking into account the new sector definition under ESA 95. Furthermore, stocks of valuables and inventories, land other than underlying buildings and structures and other non-produced assets have been unavailable for all sectors up to the present.

In recent times, increased efforts by the Federal Statistical Office (Destatis) and by the Bundesbank were made both to enlarge the scope and to improve the quality of the compilation of households' non-financial assets (see table 1). This paper presents the latest results of the work that has been done recently, most notably regarding the compilation of households' fixed assets by the Federal Statistical Office (Destatis) and respecting the estimation of households' stock of land underlying buildings and structures by the Bundesbank.

The paper is organised as follows. In section 2, the Federal Statistical Office (Destatis) presents the compilation of fixed assets for the household sector, including households as producers based on the perpetual inventory method which is used as a standard method for fixed assets. It describes the advantages and weaknesses of using this method for the calculation of sector accounts. Given the fact that on the one hand small and medium sized family owned firms and self employed persons play an important role in the German economy, and that on the other hand households (S.14) and non-financial corporations (S.11) were formerly treated together in the traditional German enterprise sector, the main task of the compilation procedure outlined in the following comprised the identification of fixed assets of those constituting the household sector in order to improve the data base for fixed assets of both households (S.14) and non-financial corporations (S.11). In section 3, the Bundesbank outlines an advancement regarding the compilation of the stock of land underlying buildings and structures for the household sector (including non-profit institutions serving households), being based on an own estimation approach which uses different sources of information from statistics on land and land prices published by the Federal Statistical Office (Destatis). In section 4, both the compilation and a short analysis of integrated non-financial and

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1 See, for example, Deutsche Bundesbank (1999), Changes in households' asset situation since the beginning of the nineties, Monthly Report, January 1999, pp. 33-50, and Deutsche Bundesbank (1999), Overall financial flows in 1998, Monthly Report, June 1999, pp.15-40.

2 See Deutsche Bundesbank (2000), Overall financial flows in 1999, Monthly Report, June 2000, pp. 15-42.

3 Moreover, German household sector (including non-profit institutions serving households) balance sheet data have been published regularly by the OECD in the statistical annex of the OECD's Economic Outlook.

financial household sector (including NPISH) balance sheets are presented for the period from 1992 to 2006 on the basis of ESA 95 as one possible example of use of the "new" data on households' non-financial assets. These integrated balance sheets were compiled by combining Destatis' latest results of the compilation of the net stock of households' fixed assets valued at replacement costs (see section 2), the Bundesbank's latest estimates of households' stock of land underlying buildings and structures valued at market prices (see section 3), and data on households' financial assets and liabilities originating from the Bundesbank's financial accounts. Section 5 concludes.

Table 1: Overview on the availability of data on non-financial assets of households.

Code	Non-financial assets (AN)	Availability by institution
AN.1	Produced assets	Partly available
AN.11	Fixed assets	Now available, Destatis, see section 2
AN.111	Tangible fixed assets	Now available, Destatis, see section 2
AN.1111	Dwellings	Now available, Destatis, see section 2
AN.1112	Other buildings and structures	Now available, Destatis, see section 2
AN.1113	Machinery and equipment	Now available, Destatis, see section 2
AN.1114	Cultivated assets	Now available, Destatis, see section 2
AN.112	Intangible fixed assets	Now available, Destatis, see section 2
AN.12	Inventories	Not available
AN.13	Valuables	Not available
AN.2	Non-produced assets	Partly available
AN.21	Tangible non-produced assets	Partly available
AN.211	Land	Partly available
AN.2111	Land underlying buildings and structures	Available, Bundesbank, see section 3
AN.2112	Land under cultivation	Not available
AN.2113	Recreational land and associated surface water	Not available
AN.2119	Other land and associated surface water	Not available
AN.212	Subsoil assets	Not available
AN.213	Non-cultivated biological resources	Not available
AN.214	Water resources	Not available
AN.22	Intangible non-produced assets	Not available

2. Compilation of households' fixed assets by the Federal Statistical Office

The calculation of fixed assets within national accounts at Destatis goes back to the early 1970s. Until 1999 a cross classification by industry and by sector did not exist in German national accounts. What we call now the general government sector (S.13) and the non-profit institutions serving households sector (S.15) were industries in the 1979 German classification by industry (WZ 79) – of course with some slight differences in definition. Financial corporations were industries within that classification with some minor differences regarding the definition of sector S.12, too. One can say that the 1979 German classification by industry also integrated institutional aspects and, unlike the later classifications that were based on ISIC/NACE, was not only concentrated on activities. Housing including services of owner occupied dwellings was treated as an industry in a 'functional' way on the basis of the stratification method in national accounts. It was therefore available separately, which it has been until now.

But households as market producers – employers including own account workers or sole proprietorships and partnerships without independent legal status (other than those treated as quasi-corporations), as we call them now within the household sector (S.14) – were not separately treated in the

former national accounts in Germany. They were part of all enterprises, most of them belonging to non-financial enterprises. Basic statistics for national accounts were also organised in this way and only a few of them contained information on the civil status of enterprises as a basis for a breakdown into the two sectors.

That is why the sectors S.11 and S.14 were treated together in the first phase of the process of reorganising the calculation of fixed assets and consumption of fixed capital to fulfil ESA 95 requirements in the late 1990s. The breakdown into the two sectors for consumption of fixed capital, where differentiated figures were necessary for S. 11 and S. 14 to fulfil the ESA transmission programme, was done with simplified methods (mainly for assets other than dwellings). The data base has improved in the meantime so that we have decided to improve our methods, too.

The main method of calculating fixed assets and consumption of fixed capital in Germany is the Perpetual Inventory Method (PIM). Long-term series of gross fixed capital formation and service life approaches provide the main information needed to run the PIM when the basic features of the model are fixed.[4] Separate information was available for dwellings by all sectors including the sub-sectors of general government and financial corporations from the reorganisation of these long-term series of gross fixed capital formation in the process of the introduction of ESA 95. The breakdown by goods for the service life approach was included in this reorganisation process. The time series on gross fixed capital formation in dwellings by sector were coordinated with the Bundesbank. Destatis and the Bundesbank decided to treat all investments in dwellings by real estate developers as if the dwellings had already been sold to households independently of whether this was really the case. This approach was chosen as information was not available on the time of the change of ownership.

Information on the main part of households' fixed assets - namely dwellings – was only internally available on this basis, but was not published. And another very small part of households' fixed assets was available from the very beginning of ESA 95 calculations, namely fixed assets of private insurance brokers, financial consultants etc. belonging to the industry "Services auxiliary to financial intermediation". Other buildings and structures, machinery and equipment, cultivated assets as well as intangible assets of the former non-financial enterprises for all the other industries were not divided into those of non-financial corporations (S.11) and households (S.14). There were two exceptions: As for entertainment, literary and artistic originals, there are two different types, providing the basis for the breakdown into the two sectors. Publishing, printing and reproduction of recorded media as well as motion-picture and television activities belong to S.11 whereas artistic and literary creation and interpretation belong to S.14. Mineral exploration completely belongs to S.11.

To summarise: Dwellings were available for all sectors. Cultivated assets were calculated based on direct information on stocks from agricultural statistics rather than by PIM. Because of their minor importance, they were divided into S.11 and S.14 on the basis of the general breakdown of agriculture into these two sectors without any special information.

PIM information in a cross classification of

- other buildings and structures (including major improvements on land and costs of ownership transfer on land)
- machinery and equipment

[4] For more information see Schmalwasser, O. and Schidlowski, M.: Measuring Capital Stock in Germany. http://www.destatis.de/jetspeed/portal/cms/Sites/destatis/Internet/EN/Navigation/Publications/Specializedpublications/Nationalaccounts,templateId=renderPrint.psml__nnn=true

- intangible assets

for S.1 – S.12 – S.13 – S.15 = (S.11 + S.14)

by 60 industries (A60 of ESA 95)

was therefore the basis for generating the complete breakdown into all institutional sectors for the other fixed assets and consumption of fixed capital.

The method used is based on the idea to generate different long-term series of gross fixed capital formation for non-financial corporations and households by industry and by asset and to use the same service life approach for each industry for both sectors to run the PIM. As a result, one can get information on part of S.11 / (S.11 + S.14) and S.14 / (S.11 + S.14) for all flows – consumption of fixed capital and retirements – and stocks – gross and net stocks at the beginning of the year – of fixed assets by industry and asset.

The breakdown of gross fixed capital formation into these two sectors was available from the work that was done within the development of non-financial sector accounts. Direct information on the civil status of enterprises as a basis for the breakdown of gross fixed capital formation into the two sectors is for some service industries available from the service statistics. This statistics includes information on both turnover and investments. The survey on investments in manufacturing and some other industries does not provide information on the civil status of enterprises. For these industries an investment-turnover ratio was used together with information on the civil status of enterprises from the business register and the value added tax statistics (containing information on turnover).

The time series of gross fixed capital formation for households and non-financial corporations started in 1980. We had a look at the time series and realised that, for some industries, the shares of each sector were quite stable over time whereas for other industries there was a clear trend towards smaller shares of S.14 enterprises. How to deal with this? Aggregated information from value added tax statistics starting in 1972 gave the impression that this trend continued also backwards over that period. But would it have been a good idea to continue this trend in the process of splitting the time series of gross fixed capital formation for PIM? If we had done so, the shares of S.14 especially for assets with very long service lives such as buildings, but also for machinery, would have remained very high until now. We had no information on how far S.14 enterprises change their civil status and become non-financial corporations (including quasi corporations) over time. And therefore we did not know how many assets that were created by employers including own account workers or sole proprietorships and partnerships without independent legal status became assets of non-financial corporations. That is why we decided to take shares that were near to those for the period between 1990 and 2000 for the time before 1980 whereas for the period between 1980 and 1990, we took the reported shares of the non-financial sector accounts.

Because of the uncertainties of this method we decided to publish results only for the sectors as a whole rather than by industries although we run the PIM by industry and added the results for the sectors. We felt that the results were sufficient for the breakdown of fixed assets into the sectors S.11 and S.14, but not for each industry.

Table 2: Net stock of fixed assets of households (S.14) in Germany*, valued at current replacement costs, EUR bn.

Code	Fixed assets by category	1991	2000	2005
AN.11	Fixed assets	1976	2983	3244
AN.111	Tangible fixed assets	1970	2972	3233
AN.1111	Dwellings	1651	2626	2948
AN.1112	Other buildings and structures	208	225	181
AN.1113	Machinery and equipment	106	117	100
AN.1114	Cultivated assets	5	4	4
AN.112	Intangible fixed assets	6	11	12

* at the beginning of the year

About 47% of fixed assets in Germany belong to the household sector. Dwellings are the biggest part. They account for about 50% of all fixed assets, and 86% of dwellings belong to households which either use them for their own purposes or rent them to other households. The data sources for the breakdown of dwellings into sectors are quite good. Information from the 1987 census in the former territory and the 1993 census in the new Länder and from the 1995 sample survey on dwellings in Germany could be used in addition to the information on construction work completed by owner to breakdown gross fixed capital formation in dwellings into the sectors. But nevertheless the same problems remain as with the change of ownership between sectors over time.

The great weakness of the method used is to run the PIM with time series of gross fixed capital formation by sector knowing that there could be and in some cases really is a trend over time of diminishing or increasing shares of sectors. A change of the civil status of an enterprise may cause a change in the sector the enterprise belongs to during the service life of assets. The results can be overestimated or underestimated for different sectors because, due to the PIM, assets belong to the stock of the sector of their first investment over their service life. The influence of this time series problem depends on the service life of the assets. It is the bigger the longer the service life is because the assets remain for quite a long time in the sector where they were invested. And the influence is also greater on gross stocks than on net stocks. This is because they remain with their initial value in the gross stock whereas their net worth diminishes over time.

But of course the method used also has an advantage: All results generated by the PIM, that means not only stocks for the balance sheet but also gross and net stock at constant replacement costs as well as consumption of fixed capital are available by sector. The method used is consistent with the PIM, the main method used to estimate fixed assets in Germany.

3. Estimation of households' stock of land underlying buildings and structures by the Deutsche Bundesbank

3.1 Background information

This section outlines an advancement of the Bundesbank's estimation approach to the determination of the market value of the household sector's (including non-profit institutions serving households) stock of land underlying buildings and structures. Before the introduction of the revised system in 2007, the compilation of fixed assets and land underlying buildings and structures was based on the one hand on an updating procedure of former estimates by the Federal Statistical Office (Destatis) on the basis of ESA 79 by using sectoral investment time series and land price indices, and, on the other hand, on adjustments taking into account the changes in the sector definitions under ESA 95. One consequence of this compilation approach was the fact that the estimation of land underlying buildings and structures was

inextricably linked with the estimation of households' fixed assets, implying that there was no possibility to determine the land values distinctly from the building values and to breakdown the results by ESA 95 asset categories. However, despite the existing limitations, from a computational perspective, the data on households' non-financial assets provided unique and important insights in households' non-financial wealth position which were used for many economic analyses at the national and international level.

The main reason for reworking the former estimation approach was due to the introduction of Destatis' sectoral approach to the compilation of fixed assets in Germany. Owing to the fact that data quality regarding fixed assets had improved considerably by Destatis' compilations, there was no longer a need for the Bundesbank to estimate households' stock of fixed assets. However, as there was no possibility to separate the estimation of land from the compilation of fixed assets according to the "old" approach, a new way for the estimation of land underlying buildings and structures had to be found which was able firstly, to determine the stock of land underlying buildings and structures in real terms, and secondly, to value this stock at current market prices. Furthermore, as land prices regarding land underlying dwellings differ substantially from land prices respecting land underlying other buildings and structures in Germany, an estimation method had to be found which was able to distinguish between land underlying dwellings and land underlying buildings and structures both in real and in nominal terms.

A further reason for the advancement of the Bundesbank's estimation approach was the fact that the existing compilation method was limited to the household sector. As the introduction of Destatis' approach to the compilation of fixed assets, however, allowed for a sectoral breakdown, the need to determine the land values for all institutional sectors arose.

The following subsections provide a brief outline of the Bundesbank's revised compilation method. Moreover, latest compilation results are presented for the household sector in combination with Destatis' results on households' net stock of fixed assets valued at replacement costs for the period from 1991 to 2006.

3.2 Definitions and data requirements

The aim of the estimation procedure was to compile the market value of the stock of land underlying buildings and structures (AN.2111) for the German household sector (including non-profit institutions serving households) (S.14+S.15)[5] for the period from 1991 to 2006. As market prices for land underlying dwellings differ substantially from market prices for land underlying other buildings and structures in Germany, the market value of the total stock of land underlying buildings and structures is crucially influenced by the distribution of land among land underlying dwellings and land underlying other buildings and structures. Accordingly, the estimation of the market value of land underlying buildings and structures called for a compilation of the market value both of land underlying dwellings (part of AN.2111 underlying AN.1111) and land underlying other buildings and structures (part of AN.2111 underlying AN.1112).

3.3 Data sources

The estimation procedure is based on two statistics which are compiled and published by Destatis. The first data source, the *statistics on purchase values of building land*[6], provides annual and quarterly data

[5] The composite sector households including non-profit institutions serving households (S.14+S.15) will be labelled as "households" in the following.

[6] See Destatis (annual issues from 1990 until 2005), Preise: Kaufwerte für Bauland, Fachserie 17 / Reihe 5, available at http://www.destatis.de. This publication is only available in German language. However, an extract of current data is available in English language at http://www.destatis.de.

for the whole economy for the period 1964 up to today on real sales volumes (in sqm) of building land, data on the corresponding average nominal purchase values (in €/sqm), data on the number of purchase events, as well as data on the total nominal purchase value (in €) of all purchase events in the respective period. Regarding the data on average nominal purchase values, results are presented in various breakdowns, as for example breakdowns by federal states, by categories of building land and by building areas for different kinds of building land.[7] The statistics provides no breakdowns according to ESA 95 by institutional sectors as well as no breakdowns into land underlying dwellings and land underlying other buildings and structures. In order to overcome these incompatibilities and to transform the existing information into an ESA 95 classification scheme, the statistics' breakdown by building areas, namely the breakdown into business area, mixed business and residential area, residential area, industrial area, and village area was used for the estimation procedure as this breakdown scheme allowed for an allocation of building land transactions into building land transactions associated with dwellings and transactions associated with other buildings and structures at the total economy level by using plausible assumptions. Information on quantities was derived from the statistics' data on real sales volumes of total building land (in sqm) and information on prices from data on average nominal purchase values (in €/sqm) for each type of building area.

The second data source, the *statistics on the area of land classified by actual uses*[8], provides quadrennial data[9] on the breakdown of the whole economy's stock of land by kinds-of-use (in sq.km) which are classified into areas and open spaces underlying buildings[10], recreation areas, transport areas, areas underlying agriculture, forest areas, surface of water, and other areas. The statistics' definition of item areas and open spaces underlying buildings corresponds approximately to the definition of land underlying buildings and structures (AN.2111) according to ESA 95. Therefore, item areas and open spaces underlying buildings was used in the estimation procedure to measure the stock of land underlying buildings and structures of the whole economy in sq.km. Though the statistics on the area of land classified by actual utilisation provides a further disaggregation of item areas and open spaces underlying buildings, there is no possibility to derive any information on sectoral breakdowns as well as on the distribution of land among land underlying dwellings and land underlying other buildings and structures.

3.4 Estimation procedure

A comparison between the data requirements outlined in section 3.2 with the information provided by the primary statistics outlined in section 3.3 reveals that there was no possibility at the outset to derive any direct sector information on households' (S.14+S.15) real stock of land underlying buildings and structures (AN.2111), as well as on its market value for the period from 1991 to 2006. Primary statistics only provided data on the real stock of land underlying buildings (AN.2111) for selected years (1992, 1994,

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7 A comparison of average nominal purchase values over time can be carried out only with some reservations as the underlying statistical masses (sales of building land) are not constant over time due to the fact that the statistics is solely based on transactions. Consequently, the statistics on purchase values of building land exhibits more the characteristics of a statistics on changes of property than the characteristics of a general price statistics whose statistical masses do not change over time. For that reason, there is no publication of price indices of building land.

8 See Destatis (2005), Land- und Forstwirtschaft, Fischerei: Bodenfläche nach Art der tatsächlichen Nutzung, Fachserie 3 / Reihe 5.1, Stand: 31.12.2004, available at http://www.destatis.de. This publication is only available in German language.

9 Data are available for the following years: 1992, 1996, 2000, and 2004.

10 There is no differentiation by dwellings and other buildings and structures.

2000, 2004) for the total economy (S.1) measured in sq.km, data on real transaction volumes for building land sales for the total economy (S.1) measured in sqm and broken down by building areas, as well as data on the corresponding nominal market values of these transactions at the total economy level (S.1) also broken down by building areas. In order to overcome these existing incompatibilities, a three step estimation procedure - being outlined in the following - was developed according to which data provided by primary statistics were ultimately transformed into the market value of households' stock of land underlying buildings and structures for the period from 1991 to 2006.

Step 1: Stock-flow calculation of land underlying buildings and structures at the total economy level and breakdown by building areas

During the first stage of the compilation, a complete stock-flow calculation both in real and nominal terms was carried out for the stock of land underlying buildings and structures (AN.2111) at the total economy level (S.1) for the period 1991 to 2006. Moreover, stocks and flows were broken down into building areas, that is, into business area, mixed business and residential area, residential area, industrial area, and village area.

This stock-flow approach was developed in three steps. Firstly, a breakdown of the total stock of land at the total economy level into building areas in real terms was calculated for the reference year 2004 by use of the share of cumulated land sales transactions of each building area in total cumulated land sales transactions of all building areas during the period from 1964 to 2004; data on real sales volumes broken down into building areas were taken from the statistics on purchase values of building land and the stock of land in real terms for the reference year 2004 was taken from the statistics on the area of land classified by actual uses. This calculation is based on the theoretical consideration that the share of one specific building area in the total stock of land today can be approximated by its share of cumulated land sales transactions in total land sales transactions during the past, provided that sufficiently long time series are available which provide a representative picture of the accumulation process for the period for which no data are available. To put it differently, this approximation rule is based on the fact firstly, that the total stock of land underlying buildings and structures today corresponds to the cumulated land sales during the past to build new dwellings and other buildings and structures, and secondly, that the stock of land of a specific building area today, say the stock of land underlying residential area, corresponds to the cumulated land sales during the past to erect new dwellings. Consequently, if exhaustive information on the past is available, the share of cumulated land sales in residential areas in total land sales during the past corresponds exactly to the share of land underlying residential areas in the total stock of land today. As a consequence, if information on the total stock of land is available today, a breakdown by building areas can be carried out by determining their shares by past cumulated transactions. If full information is not available, as it is the case in the present estimation process, the approximation rule assumes that the accumulation process during the period for which no information is available displays the same characteristics as the accumulation process for which data are available. Thus, the reliability of the approximation rule increases with the length of the time series which are available. As regards the present case, it was assumed that the accumulation process before 1964 can be approximated by the accumulation process from 1964 to 2004.[11]

[11] In mathematical terms, the approximation rule reads as

$$\hat{\lambda}^{i}_{2004} = \frac{\sum_{t=1964}^{2004} \Delta l_t^i}{\sum_{t=1964}^{2004} \Delta l_t^{all}} \quad \approx \quad \lambda^{i}_{2004} = \frac{l^{i}_{2004}}{l^{all}_{2004}},$$

Secondly, the breakdown of the stock of land underlying buildings and structures for the reference year 2004 was written back to 1991 and written forward to 2006 for each building area in real terms (in sq.km) on the basis of transaction volumes according to the statistics on purchase values of building land. Moreover, the stock-flow approach was additionally adjusted by information on the stock of land for selected years owing to the statistics on the area of land classified by actual uses.

Thirdly, stocks and flows broken down by building areas for the period 1991 to 2006 were valued by average nominal purchase values (in €/sqm) for each building area according to the statistics on purchase values of building land. Due to the fact that the statistics on purchase values of building land does not exhibit the character of a "real" price statistics as statistical masses differ over time, land prices exhibited a very high volatility.[12] For that reason, 5-year centred moving averages were used to value stocks and flows. In the end, a complete stock-flow calculation regarding the total stock of land underlying buildings and structures at the total economy level broken down into building areas both in real terms and valued at market prices was available.

Step 2: Breakdown of the stock-flow calculation into land underlying dwellings and land underlying other buildings and structures at the total economy level

In stage 2 of the compilation process, the stock-flow calculation broken down by building areas was transformed into a stock-flow calculation broken down by land underlying dwellings (part of AN.2111 underlying AN.1111) and land underlying other buildings and structures (part of AN.2111 underlying AN.1112) at the total economy level (S.1). This breakdown was carried out by using plausible assumptions regarding the shares of land underlying dwellings and land underlying other buildings and structures of each building area which are summarised in table 3. Referring to table 3, it was assumed, for example, that 50 % of the stock of land of building area type mixed business and residential area can be classified as land underlying dwellings, and that the remaining 50 % can be classified as land underlying other buildings and structures in the period from 1991 to 2006. After having applied all assumptions, a complete stock-flow calculation regarding the total stock of land underlying buildings and structures broken down into land underlying dwellings and land underlying other buildings and structures at the total economy level both in real terms and valued at market prices was available.

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where Δl_t^i, Δl_t^{all}, l_{2004}^i, l_{2004}^{all}, $\hat{\lambda}_{2004}^i$, λ_{2004}^i stand for real land sales of building area *i* in period *t*, real land sales of all building areas in period *t*, the real stock of land of building area *i* in year 2004, the real total stock of land underlying buildings and structures in 2004 (AN.2111) corresponding to the sum of the real stocks of land of all building areas in 2004, the estimated share of building area *i* in the total stock of land underlying buildings and structures in 2004, the actual share of building area *i* in the total stock of land underlying buildings and structures which is unknown.

[12] See also footnote 7.

Table 3: Assumptions regarding the distribution of land among land underlying dwellings and land underlying other buildings and structures of different types of building areas.

Type of building area	Share of land underlying dwellings (assumptions in percentages)	Share of land underlying other buildings and structures (assumptions in percentages)
Business area	0 %	100 %
Mixed business and residential area	50 %	50 %
Residential area	90 %	10 %
Industrial area	0 %	100 %
Village area	80 %	20 %

Step 3: Breakdown of land underlying dwellings and land underlying other buildings and structures by institutional sector

During the last stage of the compilation process a sectoral breakdown of the stock-flow calculation was developed in two steps by use of Destatis' sectoral breakdown of the compilation of fixed assets. Firstly, the ratio building value including land value to land value was compiled at the total economy level both for dwellings and other buildings and structures for each year within the period form 1991 to 2006.

Secondly, these annual ratios for dwellings and other buildings and structures at the total economy level were applied to Destatis' breakdown of dwellings and other buildings and structures by institutional sectors which allowed for a distribution of the market values of land underlying dwellings and land underlying other buildings and structures among all institutional sectors (S.11 to S.14+S.15). Finally, a full set of time series for land underlying dwellings and land underlying other buildings and structures broken down by institutional sectors was available for the period from 1991 to 2006. It has to be noted, however, that this top-down approach is based on the assumption that the ratio of building value including land value to land value both for dwellings and other buildings and structures at the total economy level is also valid at the sector level, and furthermore, that this ratio is identical for all institutional sectors.

3.5 Results of the estimation procedure regarding households' stock of land underlying buildings and structures

One obvious possibility regarding the presentation of the estimation results was to combine the Bundesbank's estimates respecting the stock of land valued at market prices with Destatis' data on the net stock of fixed assets valued at replacements costs being illustrated in figure 1 and table 4. This data set is very useful for economic analyses as it represents the present value of households' non-financial wealth broken down by different asset categories, and is used as an ingredient for the compilation of integrated non-financial and financial balance sheets for the household sector (see section 4). Moreover, this data set represents the maximum of information being currently available on the present value of households' stock of non-financial assets in Germany according to the definitions of ESA 95.[13]

The data set was broken down into dwellings (AN.1111), land underlying dwellings (part of AN.2111 underlying AN.1111), other buildings and structures (AN.1112), land underlying other buildings and

[13] It has to be noted that the stock of consumer durables, being compiled by the Bundesbank, is additionally available for the period from 1991 to 2006. However, owing to its feature of being defined as a memorandum item according to ESA 95, consumer durables were neglected in the present context.

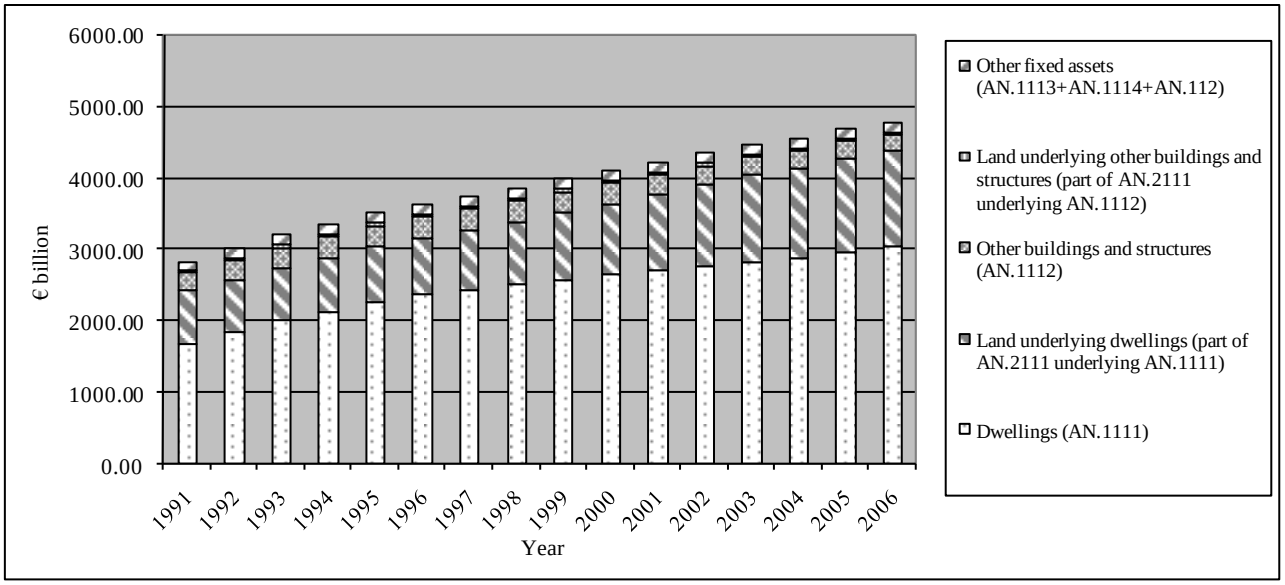
structures (part of AN.2111 underlying AN.1112), and other fixed assets including machinery and equipment (AN.1113), cultivated assets (AN.1114), and intangible fixed assets (AN.112).[14] Households' housing wealth can be derived from the present breakdown as the sum of dwellings (AN.1112) and land underlying dwellings and structures (part of AN.2111 underlying AN.1111) whereas households' non-housing wealth is represented by the sum of the remaining components. Moreover, the results are presented in nominal values (in bn €)[15] and as shares of the respective asset category in the total stock of fixed assets including land underlying buildings and structures.

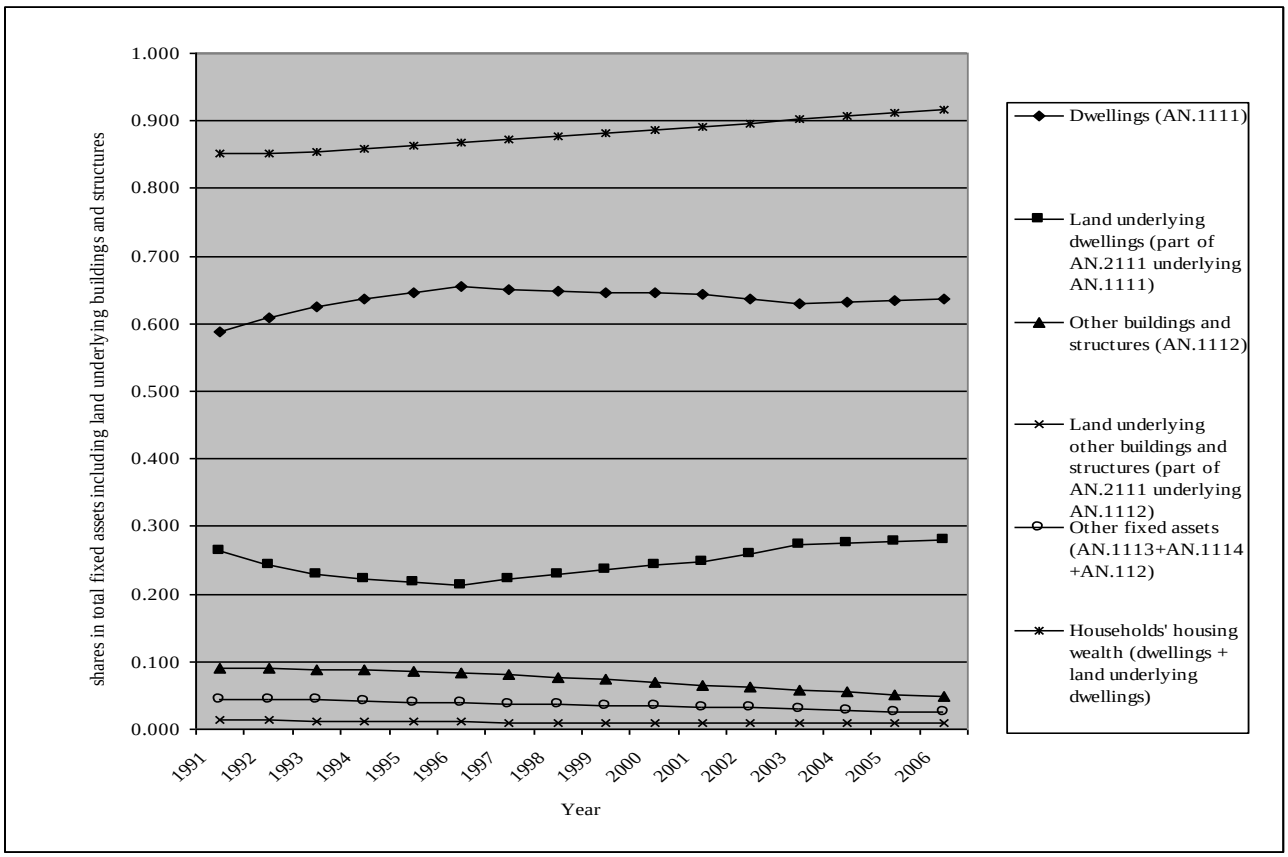
Figure 1 indicates that households' stock of fixed assets including land underlying buildings and structures recorded a steady increase from originally around € 2.8 trillion in 1991 to slightly more than € 4.7 trillion, corresponding to an average annual nominal growth rate of about 3.54 %. Regarding the shares of the different asset categories, dwellings were the most important non-financial asset over the entire review period whose share started to increase steadily from 59 % in 1991 to 65 % in 1996. In the following period, the share levelled off at around 63 %. The share of land underlying dwellings initially decreased from almost 27 % in 1991 to its minimum of 21 % during the review period in 1996. From 1997 onwards, the share increased steadily and reached 28 % in 2006. The share of households' housing wealth, that is the sum of dwellings and land underlying dwellings, rose steadily from 85 % in 1991 to almost 92 % in 2006. Other buildings and structures recorded an initial share of 9 % which fell steadily during the review period to 5 % in 2006. The value of land underlying other buildings and structures decreased also steadily from 1.5 % in 1991 to 0.9 % in 2006. Likewise, the share of other fixed assets fell continuously from 4.3 % in 1991 to 2.5 % in 2006.

[14] Note that the results for households' net stock of fixed assets in table 4 do not correspond to the results regarding fixed assets in table 2, as the results in table 2 refer to the household sector (S.14) whereas the results in table 4 refer to the household sector including non-profit institutions serving households (S.14+S.15).

[15] The net stock of fixed assets is valued at replacement costs whereas land underlying buildings and structures is valued at market prices.

Figure 1: German households' (including NPISH) (S.14+S.15) stock of fixed assets including land underlying buildings and structures broken down into different asset categories valued at replacement costs and market prices (€ billion) and as shares in total non-financial assets.





Sources: Destatis and Deutsche Bundesbank.

Notes:

1. Stocks and shares at the beginning of the year. All asset categories are defined according to ESA 95.
2. Fixed assets are valued at replacements costs; land underlying buildings and structures is valued at market prices.

Table 4: Net stock of fixed assets at current replacement costs including land underlying buildings and structures valued at market prices of the household sector including non-profit institutions serving households (S.14 + S.15).

€ billion

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Fixed assets including land underlying buildings and structures	2835.12	3022.34	3204.76	3358.51	3519.83	3642.40	3757.87	3865.70	3990.58	4109.90	4232.15	4350.55	4479.25	4555.20	4687.67	4774.85
Dwellings including land	2418.32	2575.91	2740.14	2885.24	3039.66	3159.81	3281.10	3391.71	3521.35	3647.64	3772.97	3901.90	4046.37	4135.27	4277.56	4378.55
Dwellings	1666.92	1839.86	2003.92	2136.17	2275.96	2382.03	2445.41	2508.01	2576.33	2650.54	2722.66	2773.08	2825.36	2876.57	2974.58	3035.71
Land underlying dwellings	751.40	736.05	736.22	749.07	763.70	777.78	835.69	883.70	945.02	997.10	1050.31	1128.82	1221.01	1258.70	1302.98	1342.84
Other buildings and structures including land	294.80	314.53	325.79	332.81	339.20	342.35	337.60	334.70	330.73	323.74	320.06	311.99	301.97	293.90	287.29	277.46
Other buildings and structures	252.88	271.30	285.24	293.96	300.97	304.20	302.16	298.17	292.64	285.42	276.49	267.73	257.60	249.37	242.65	236.64
Land underlyingother buildings and structures	41.92	43.23	40.55	38.85	38.23	38.15	35.44	36.53	38.09	38.32	43.57	44.26	44.37	44.53	44.64	40.82
Other fixed assets	122.00	131.90	138.84	140.45	140.98	140.24	139.17	139.29	138.51	138.53	139.12	136.66	130.91	126.03	122.82	118.84

Sources: Destatis and Deutsche Bundesbank.

Notes:

1. Stocks at the beginning of the year. Figures may not add up due to rounding.
2. All categories of fixed assets represent net stocks valued at replacement costs. Land underlying dwellings is valued at market prices.
3. All asset categories are defined according to ESA 95 as follows: Dwellings (AN.1111), other buildings and structures (AN.1112), land underlying dwellings (part of AN.2111 underlying AN.1111), land underlying other buildings and structures (part of AN.2111 underlying AN.1112); the sum of land underlying dwellings and other buildings and structures represents households' entire stock of land underlying buildings and structures (AN.2111); fixed assets including land underlying other buildings and structures (AN.11+AN.2111); other fixed assets represent the sum of machinery and equipment (AN.1113), cultivated assets (AN.1114), and intangible fixed assets (AN.112).

3.6 Assessment

Though the estimation approach outlined above led to considerable improvements in the estimation of households' stock of land underlying buildings and structures compared to the former approach, it has to be emphasized that the estimation results have to be interpreted with due care because of two reasons. Firstly, the results of the estimation approach broken down by institutional sectors are based solely on assumptions since official data broken down by institutional sectors are not yet available. Secondly, the valuation of the real stock of land underlying buildings and structures is based on a statistics on market or transaction prices whose statistical masses change over time as only new building land is considered. This implies that there is no information on market prices, respectively on the changes of market prices, of building land on which buildings are already built. For example, the market value of land underlying buildings and structures of large city centres, as for example Munich, Frankfurt or Hamburg, is not available by current statistics. In terms of the present estimation approach, this kind of missing information implies that these centres were valued at market prices of new land. Accordingly, the estimation approach presented above can be considered only as a lower limit of actual market values of land underlying buildings and structures.

4. Example of use: Compilation of integrated financial and non-financial household sector balance sheets

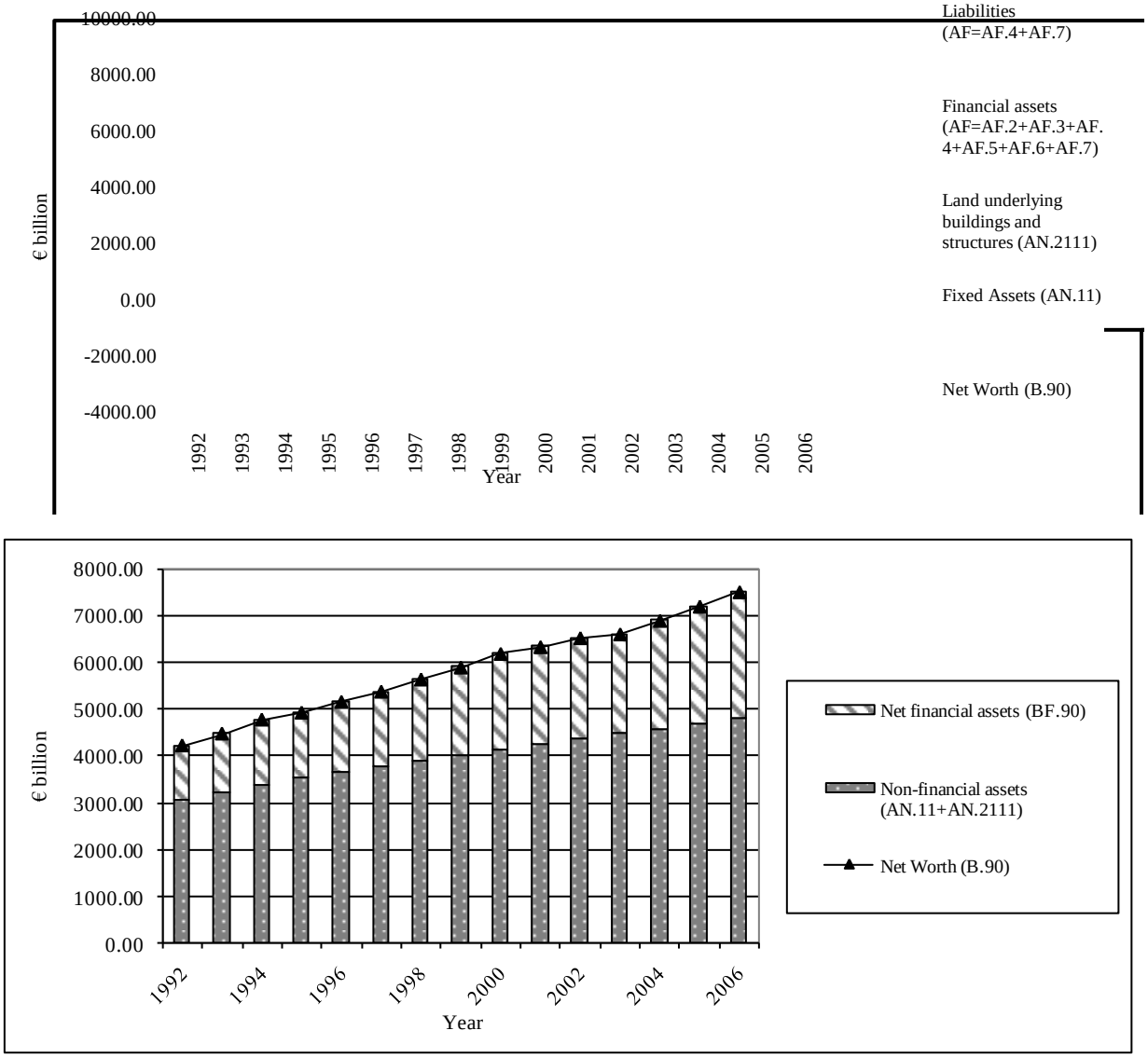
One important field of application regarding data on households' non-financial assets is the compilation of integrated financial and non-financial balance sheets of the household sector. These integrated balance sheets provide important information for economic analyses as they allow for an exhaustive representation of both households' financial and non-financial wealth broken down by different asset categories and households' net worth position over time.

Before the introduction of Destatis' compilation of households' fixed assets outlined in section 2, household sector (including NPISH) balance sheets were compiled on an annual basis by the Bundesbank on the basis of ESA 95, and formerly on the basis of ESA 79. As outlined in the introductory section, these integrated balance sheet data were calculated by combining financial accounts data and estimates of fixed assets and land which were based on the one hand on an updating procedure of former estimates under ESA 79 by using sectoral investment time series and land price indices, and, on the other hand, on adjustments taking into account the alteration of the sector definitions under ESA 95. In the past, household sector balance sheet data were officially published at irregular intervals in the form of articles on households' financial and non-financial wealth in the Bundesbank's Monthly Report.[16] Moreover, households' balance sheet data have been transmitted regularly to international organisations (ECB, IMF, OECD), where the OECD also has officially published the data in the statistical annex of the OECD's Economic Outlook[17] on an annual basis.

[16] See footnote 1 and 2 for references.

[17] See, for example, OECD (2007), OECD Economic Outlook, Volume 2007/1, No. 81, June, p. 298, table 58, household wealth and indebtedness.

Figure 2: Integrated non-financial and financial balance sheets of German households (including NPISH) (S.14+S.15) and structure of net worth for the period from 1992 to 2006.



Sources: Destatis and Deutsche Bundesbank.

Notes:

1. Stocks at the beginning of the year. All asset categories are defined according to ESA 95.
2. Non-financial assets are defined as the sum of fixed assets (AN.11) valued at replacement costs and land underlying buildings and structures (AN.2111) valued at market prices.
3. Financial assets (AF) are defined as the sum of currency and deposits (AF.2) valued at nominal values, securities other than shares (AF.3) valued at market prices, loans (AF.4) valued at nominal values, shares and other equity (AF.5) valued at market prices, book values and fair value, insurance technical reserves (AF.6) valued at present value, and other accounts receivable (AF.7) valued at nominal and book values.
4. Liabilities (AF) are defined as the sum of loans (AF.4) valued at nominal values and other accounts payable (AF.7) valued at nominal and book values.
5. Net worth (B.90) is calculated as residual, that is as the sum of non-financial assets and financial assets less liabilities.
6. Net financial assets (BF.90) are calculated as financial assets less liabilities.

Table 5: Balance sheet of households and non-profit institutions serving households (S.14+S.15) for the period from 1992 to 2006.

€ billion

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Assets	**5036.54**	**5359.66**	**5748.91**	**5994.33**	**6300.50**	**6599.77**	**6924.20**	**7257.78**	**7648.90**	**7840.15**	**8056.65**	**8155.15**	**8462.70**	**8774.27**	**9079.95**
Non-financial assets	3022.34	3204.76	3358.51	3519.83	3642.40	3757.87	3865.70	3990.58	4109.90	4232.15	4350.55	4479.25	4555.20	4687.67	4774.85
Fixed assets	2243.06	2428.00	2570.58	2717.91	2826.47	2886.74	2945.47	3007.48	3074.49	3138.27	3177.47	3213.87	3251.97	3340.05	3391.19
Land underlying buildings and structures	779.28	776.76	787.93	801.92	815.93	871.13	920.23	983.10	1035.41	1093.88	1173.08	1265.38	1303.23	1347.62	1383.66
Financial assets	2014.20	2154.90	2390.40	2474.50	2658.10	2841.90	3058.50	3267.20	3539.00	3608.00	3706.10	3675.90	3907.50	4086.60	4305.10
Liabilities and net worth	**5036.54**	**5359.66**	**5748.91**	**5994.33**	**6300.50**	**6599.77**	**6924.20**	**7257.78**	**7648.90**	**7840.15**	**8056.65**	**8155.15**	**8462.70**	**8774.27**	**9079.95**
Liabilities	828.40	895.90	984.20	1079.70	1154.50	1232.70	1295.30	1370.50	1467.40	1513.70	1535.40	1552.10	1568.40	1573.70	1568.70
Net Worth	4208.14	4463.76	4764.71	4914.63	5146.00	5367.07	5628.90	5887.28	6181.50	6326.45	6521.25	6603.05	6894.30	7200.57	7511.25
Net financial assets	**1185.80**	**1259.00**	**1406.20**	**1394.80**	**1503.60**	**1609.20**	**1763.20**	**1896.70**	**2071.60**	**2094.30**	**2170.70**	**2123.80**	**2339.10**	**2512.90**	**2736.40**

Sources: Destatis and Deutsche Bundesbank.

Notes:

1. Stocks at the beginning of the year. Figures may not add up due to rounding. All asset categories are defined according to ESA 95.
2. Non-financial assets are defined as the sum of fixed assets (AN.11) valued at replacement costs and land underlying buildings and structures (AN.2111) valued at market prices.
3. Financial assets (AF) are defined as the sum of currency and deposits (AF.2) valued at nominal values, securities other than shares (AF.3) valued at market prices, loans (AF.4) valued at nominal values, shares and other equity (AF.5) valued at market prices, book values and fair value, insurance technical reserves (AF.6) valued at present value, and other accounts receivable (AF.7) valued at nominal and book values.
4. Liabilities (AF) are defined as the sum of loans (AF.4) valued at nominal values and other accounts payable (AF.7) valued at nominal and book values.
5. Net worth (B.90) is calculated as residual, that is as the sum of non-financial assets and financial assets less liabilities.
6. Net financial assets (BF.90) are calculated as financial assets less liabilities.

Despite the fact that this "old" compilation procedure by the Bundesbank provided unique and important insights in households' wealth position in the past, it has become obsolete since both the implementation of Destatis' compilation of households' fixed assets and the Bundesbank's revised estimates of land underlying buildings and structure implied an enormous advancement respecting data availability and data quality of households' fixed assets. In order to take advantage of improved data quality regarding non-financial assets, the "new" compilation procedure of household sector balance sheets combines firstly, Destatis' data on households' net stock fixed assets valued at replacement costs, secondly, the Bundesbank's estimates on households' stock of land underlying buildings and structures valued at market prices, and finally, the Bundesbank's financial accounts data on financial assets and liabilities. This compilation procedure implies that households' net worth position (B.90) is calculated as the residual of the other components.

This "new" compilation procedure is presented for the first time in this paper and summarised in figure 2 and table 5. Balance sheets were compiled by combining data on non-financial assets according to table 4 with latest German financial accounts data provided by the Bundesbank. Figure 2 illustrates that households' net worth followed a steady positive trend and reached a peak level of about € 7.5 trillion in 2006. All in all, net worth recorded a cumulated increase of around € 3.3 trillion during the review period from 1992 to 2006, corresponding to an average nominal annual growth rate of about 4.23 %. The increase in net worth, representing past accumulated savings, capital transfers and nominal holding gains, was due to both an increase in non-financial assets of around € 1.75 trillion and an increase in net financial assets of approximately € 1.55 trillion.

5. Conclusion

This paper presents a brief summary of the work that has been done recently by the Federal Statistical Office (Destatis) and the Bundesbank both to enlarge the scope and to improve the quality of the compilation of households' fixed assets and households' stock of land underlying buildings and structures. The results presented above clarify that considerable improvements in data availability and data quality have been achieved. Moreover, the paper also demonstrated the enhancements regarding the compilation of household sector balance sheets which were due to the improved data set on households' non-financial assets.

However, despite the far reaching enhancements that have been achieved, the data set on households' non-financial assets can be further improved in a number of ways. Regarding data availability, one future challenge will be the collection of data on non-financial assets which have not been covered yet by the present compilation approach. Concerning data quality, the present approach can be improved by the development of reliable valuation methods for land which take into account especially regional differences in Germany.