7

Sectorisation and cross-classification

Introduction

7.1. Previous chapters have examined general principles and approaches to estimate the value of land. As discussed in Chapter 1, the coverage of national balance sheets by institutional sectors is of particular interest for economic policy analysis. There may also be a need to provide a further breakdown of the total value (e.g. by types of land, industries). This chapter looks at producing estimates for different sectors of the economy as well as for different types of land and industry.

7.2. It is not currently straight-forward to obtain estimates by institutional sector and cross-classification of land. This chapter discusses their relevance as well as the challenges faced in obtaining these estimates. It also provides suggested approaches to producing such estimates. These estimates can be produced either by starting at the top and breaking down the data into more detail or by producing data at the bottom level and aggregating up to the total.

7.3. This chapter starts by considering the definitions of sectorisation and cross-classification and why such estimates are needed. It then considers how to extend each of the previously considered methods for estimating the value of land to provide estimates by sector and cross-classification. The chapter continues by discussing challenges faced by estimating at this level of detail before ending with a case study from the Netherlands.

Definitions

7.4. Sectorisation refers to the production of estimates for institutional sectors of the economy as shown in Table 7.1 below.

Table 7.1: Sectors of the economy

Code	Sector
S.1	Total economy
S.11	Non-financial corporations
S.12	Financial corporations
S.13	General government
S.14	Households
S.15	Non-profit institutions serving households (NPISH)

Source: ESA 2010

7.5. Cross-classification refers to a breakdown of land by sector that is further subdivided into land by type and/or by industry. It is the way that either the classification of land (as discussed in Chapter 3) or the classification of industries is divided up across the institutional sectors mentioned above.

7.6. Table 7.2 below shows the cross-classification of land by sector and type of land. It shows an imaginary country with a value of 100 billion for land in the economy, which is broken down into the institutional sectors and by type of land.

Table 7.2: The cross-classification of land by sector

	S.1	S.11	S.12	S.13	S.14	S.15
Total land (AN.211)	100	40	3	15	37	5
Land underlying buildings and structures (AN.2111)	80	30	3	11	32	4
Land under cultivation (AN.2112)	15	10	0	0	5	0
Recreational land and associated surface water (AN.2113)	4	0	0	3	0	1
Other land and associated surface water (AN.2119)	1	0	0	1	0	0

Source: TF on Land and other non-financial assets, fictitious data

7.7. Table 7.3 shows the cross-classification of land by industry and by institutional sector. It uses the same imaginary country as in Table 7.2 above, although this time the rows have been changed from land types to industries.

Table 7.3: Cross-classification of land by industry and by sector

	S.1	S.11	S.12	S.13	S.14	S.15
Total industry	100	40	3	15	37	5
Other production	20	12	0	0	8	0
Manufacturing	10	10	0	0	0	0
Construction	5	5	0	0	0	0
Services	65	13	3	15	29	5

Source: TF on Land and other non-financial assets, fictitious data

Why are sectorisation and cross-classification important?

7.8. At the centre of the national accounting framework is the production concept and the way in which labour, capital and natural resources, including land, define economic activity. This involves both benefits to economic agents and the risk associated with the link between the three main economic activities within the national accounting scope: production, consumption and accumulation.

7.9. The behaviour of economic agents is driven, to a large extent, by the actual and potential benefits arising from ownership of assets and liabilities as well as the associated risk dynamics. The national accounting framework recognises this by showing the various types of accounts — production, consumption and accumulation at institutional sector and/or industry level. Therefore, ensuring a complete coverage of assets and liabilities at sector level is essential for a representative picture of economic activity and risk allocation within a country's boundaries.

7.10. Among non-financial assets, land stands as an important factor of production and a store of wealth; it is therefore an integral part of a complete sectoral balance sheet. For many institutional sectors, real estate, and thus land, represents a significant proportion of their non-financial assets, an additional argument for a sectoral distribution of the value of land within an economy. A true measure of wealth and net worth at sector level cannot be obtained by excluding the value of land.

7.11. In addition to the productive potential derived from its legal and/or economic ownership rights, land as an asset presents a unique set of risks for its owner(s). This is because a significant number of real estate transactions are intermediated by debt in the form of mortgage loans. This argument carries particular weight for the households sector, given that, in most countries, households own a large amount of real estate, and therefore land, some of which is financed through debt.

7.12. The financial situation of the households sector is a major consideration for financial stability, monetary, and fiscal policies as mentioned in Chapter 9 on real estate wealth. The value and price dynamics associated with households' holdings of real estate, particularly as they relate to the associated mortgage debt contain important analytical information. This has been highlighted by the post-2008 events in the United States, as well as other countries, where sudden downturns in real estate markets have set off chain reactions with significant economic and financial costs that, in many cases, have lingered for many years. Therefore, the significance of having a value of land allocated to the households sector cannot be overstated, as it is generally accepted that real estate market fluctuations are closely associated with the land component of residential properties; the value of dwellings being mostly driven by input (construction costs) inflation.

7.13. The value of land in the households sector is also important because for some countries it may be used to impute values to the production of households that are owner-occupiers. If the user cost approach is used it is best to compute user costs for dwellings and user costs for the land underlying the dwellings ([77]).

7.14. As discussed in Chapter 1, the sectoral breakdown of land is included, among other balance sheet items, in Table 26 of the ESA 2010 data transmission programme. The allocation of land to households and non-profit institutions serving households will be a mandatory item from 2017, whilst the other sectors will remain voluntary.

7.15. Another argument for sectoral allocation of land relates to the government sector's holdings and a more accurate measure of government net worth.

7.16. The sectoral allocation of land is important not only for providing a more accurate economic and financial picture of each sector in the economy, but may also be relevant for valuation purposes, depending on the methodology being used. For example, residential land that is owned by the government, which often is used for providing subsidised housing, will generally tend to be of lower value compared to residential land owned by households.

7.17. Whilst cross-classification of land is not required for mandatory data returns, it is still useful for more detailed analysis. For example an additional breakdown for industries is helpful when looking at productivity analysis.

Methods of estimating the value of land by sector or cross-classification

7.18. This section looks at the different methods which are covered earlier in this compilation guide and shows how to extend them to sectorise and cross-classify.

7.19. One of the most important factors in determining a method and the sectorisation/cross-classification method is the availability of data sources for both sectors and by

([77]) Organisation for Economic Co-operation and Development, *Measuring Capital: OECD Manual*, Second edition, 2009, Chapter 18, p. 159. Available at http://www.oecd.org/std/productivity-stats/43734711.pdf

type of land and/or industry. In practice, due to limited data or resources, it may not be possible to use only one of these methods. In this case, combining different methods may be applicable.

7.20. For example, when sectorising land, a country may be able to use the direct method for government land as there are detailed administrative records. For the rest of the sectors in the economy they may use the residual approach if data on total real estate value (the combined value of the structure and the land) are available at the sector level.

7.21. The availability of data sources will also dictate whether a top-down or a bottom-up approach is possible for producing estimates. A top down approach may start with a high level figure for the total economy by asset and then break that down into sectors, land types or industries using a proxy indicator.

7.22. The bottom-up approach would instead estimate data at the bottom level, for instance producing estimates for all combinations of land by asset, sector and industry, and then aggregating up these values to the total economy level.

7.23. The bottom-up approach is preferred as it uses detailed data from existing data sources which as a result gives a higher level of accuracy in the resulting estimates. Another benefit of the bottom-up approach is that it may provide better links between national accounts land estimates and outputs from other areas, particularly environmental and social statistics. These areas might require the partitioning of land that cuts across the institutional sectors or land use classification.

7.24. If detailed data are not available or its quality is not sufficient then a top down approach can be considered. The accuracy of resulting estimates in this case will depend on the validity of assumptions underlying the choice of proxy indicators to distribute the total value to the required level of detail.

7.25. There is further discussion of the use of the bottom-up and top-down methods in the country case study at the end of this chapter.

7.26. When preparing a cross-classification, a combination of these approaches is even possible. For example when the type of land is available at bottom level, this can be aggregated up to the total value of land. Next, the total value of land could be allocated to industry based on a proxy to produce bottom level data by industry or even to produce data by type of industry further subdivided by type of land.

Direct method

Introduction

7.27. This section extends the description of the direct method covered in Chapter 5 to include sectorisation and cross-classification.

7.28. The direct method either takes the land area and multiplies it by the price (bottom-up approach) or it uses a proxy (e.g. land area) to break down the value of land at the total economy level (top-down approach). This method depends on a source of data for the value of land excluding any buildings or other structures built upon it.

Description of method and data requirements

7.29. This method can include additional variables, for example sectors or cross-classifications, by sub-dividing the source or proxy data. Once the source or proxy data has been allocated to the extra variable, for example by sector, the usual method, as described in Chapter 5, can be used to produce the value of land by sector.

7.30. Some countries already collect data on land by type of land. Where this is the case, the existing categories can be matched to the list in Chapter 3 on the classification of land.

7.31. The model requires the following variables:

— land area;
— land price;
— land type.

7.32. To extend the model, the following variables could be added:

— institutional sector;
— industry.

7.33. If land price data are not available, the total land value for the economy could be broken down using land area as a proxy. This top-down approach assumes that there are no large price variations across the categories. It is likely, however, that this assumption will not hold in all cases and this would result in an over- or underestimation of some sectors or land types.

Example

7.34. For countries with an existing land classification, Table 7.4 shows how this can be aggregated to make the classifications used in Chapter 3. In the case of orchards and pasture, they can be added up to make a value for agricultural land. In some cases, where an existing category fits

into two or more land classification category, a proportion of the value of that land should be used for each of the categories. This is shown for building site land which has been split between land underlying dwellings and land underlying other buildings and structures.

7.35. Table 7.5 shows an example of how to sectorise using the direct method. For the bottom-up approach, once the land area and price for each sector has been collected, the land area is multiplied by the price to produce the value. For example, public corporations in the table below have a land area of 10 000 and a price of 9, making a land value of 90 000.

7.36. For the top-down approach, only the total value and the land area is known. The land area could then be used as a proxy to distribute the value of land across the institutional sectors. In this approach, public corporations have a land area of 10 000 which is 10 % of the total land area. Therefore, the value is estimated at 10 % of the total, which gives a land value of 100 000.

Table 7.4: Aggregating existing land types
(billion KRW)

Country land type	Value	Land classification type	Value
Orchard	1 400	Agricultural land	24 200
Pasture	22 800		
Warehouses	119 900	Land underlying other buildings and structures	1 160 400
Roads	588 400		
Schools	364 100		
Building site	220 000	Split 60 % dwellings and 40 % other buildings and structures	-
Dwellings	2 670 000	Land underlying dwellings	2 802 000

Source: Bank of Korea and TF on Land and other non-financial assets

Table 7.5: Sectorising land value using the direct method

Institutional sector	Bottom-up approach			Top-down approach		
	Land area (hectares)	Price (EUR)	Value (billion EUR)	Land area (hectares)	Price (EUR)	Value (billion EUR)
Total economy	100 000	10	1 000 000	100 000	:	1 000 000
Public corporations	10 000	9	90 000	10 000	:	100 000
Private non-financial corporations	6 000	12	72 000	6 000	:	60 000
Financial corporations	1 000	11	11 000	1 000	:	10 000
Central government	35 000	5	175 000	35 000	:	350 000
Local government	25 000	9	225 000	25 000	:	250 000
Households	20 000	20	400 000	20 000	:	200 000
Non-profit institutions serving households	3 000	9	27 000	3 000	:	30 000

Source: TF on Land and other non-financial assets

Other factors to consider

7.37. The value of the sectors may not add up to the value for the total economy if the source of the land and/or price data for sectors is different to the source for the whole economy. If this happens and no consistent source is available, the data should be constrained to make the data consistent.

7.38. In order to estimate the value of land by sector as well as possible, disaggregated data on type of land is vital. For instance, central government may own both land underlying non-residential buildings and agricultural land which will differ in price. If data about land type by owner is available, taking into account price differences will provide an improvement of land estimation.

Indirect methods — the residual approach

Introduction

7.39. The residual approach was described in Chapter 6.2. This section discusses aspects relevant to the sector allocation and cross-classification of land values under this approach.

Description of method and data requirements

7.40. To briefly summarise, the two main variables used in the residual approach are the total value of real estate (e.g. structures and underlying land) and the corresponding value of structures, where the last variable is usually

derived using a perpetual inventory method (PIM) model. As discussed in Chapter 6.5, a few countries rely on administrative records or surveys of stocks rather than a PIM to estimate the stock of fixed assets. Therefore, the ability to derive satisfactory estimates of land value by sector and type of land depends largely on the sources of data available on which the estimation of the two main variables relies.

7.41. In most countries, the PIM-based value of structures is generally estimated with a high level of granularity — by sector and industry as well as by type of structure, namely for dwellings, and other buildings and structures. The use of the PIM, in spite of its shortcomings, is well established within the international national accounting community, and this provides for a consistent methodology where coherence among investment flows, consumption of fixed capital, and stock of assets is ensured. In countries where the regional dimension is relevant, the PIM has sufficient flexibility to accommodate this additional dimension. For countries that rely on administrative records or surveys of stocks the more granular data may also be available.

7.42. The second variable, the total value of real estate is more problematic, as it is often derived by a combination of methods and assumptions where ensuring consistency is challenging. Furthermore, the level of sectoral breakdown and type of property for which the total value is available, based on a given methodology, depends on source data available. Only by introducing a full mapping between the levels of detail in the derivation of the structure value on the one hand and the total real estate value on the other hand, can a complete sector allocation of land be achieved. This, in turn, requires additional derivations for the total real estate to complete the full mapping to structures detail.

Other factors to consider

7.43. Several observations can be made here, which although more visible at lower level of aggregation, are valid for the residual approach generally. A recognised challenge of this approach is the somewhat constrained ability to impose full consistency in the derivation of the two main variables. While the PIM-derived structures are built within the national accounts framework following national accounting relationships, the total value of real estate is often sourced from different data sources, often potentially subject to specific biases (e.g. taxation incentives), thus coherence with the national accounts framework is difficult in practice.

7.44. Finally, the residual approach, by extension, inherits all the weaknesses of the PIM approach, through the many simplifications and assumptions used. As noted, these issues are inherent to the residual approach; however, they become potentially more acute at lower levels of aggregations, where the scope for inter-sector and inter-property type offsets is more limited. In extreme cases, the resulting value of land is negative, a result which is economically impossible. In such cases, further analysis is warranted to investigate potential sources as well as to identify viable solutions that would ensure a reasonable residual value for land. For example, supplementing the analysis with information on land-to-structure ratios (LSRs), or using an alternative method to derive the total real estate value may yield useful analytical insights into whether adjustments may be needed in the PIM assumptions or the total real estate value in order to derive economically meaningful land values.

Indirect methods — the land-to-structure ratio approach

Introduction

7.45. The LSR approach was detailed in Chapter 6.3. This section discusses aspects relevant to the sector allocation and cross-classification of land values under this approach.

Description of method and data requirements

7.46. Similar to the residual approach discussed above, the LSR approach relies on the estimation of the value of structures as a starting point in the indirect derivation of land value. However, the second variable used is the LSR which in turn permits the calculation of land in the absence of a control total for the real estate value.

7.47. The derivation of the LSR is ideally done at sector level and by type of land/industry and structure, provided satisfactory sources of data exist. Assuming the LSR can be calculated with the same level of detail as the structures derived through the PIM approach, a complete sector allocation and cross-classification for the value of land can be achieved by simply mapping the two variables at any given level of aggregation. This is the bottom-up approach.

Other factors to consider

7.48. In practice, however, the derivation of the LSR has its share of limitations, as it is often based on samples. In such circumstances, the composition of the sample may not necessarily align fully with the full coverage assumed in the PIM — with respect to type of property and location, both very significant dimensions of the derivation of the value of land. Moreover, if a full mapping between the LSR and the structures detail cannot be obtained, an average LSR could be used, although any compositional differences will introduce a bias in the calculation of land at sector level and/or by type of land/industry. For sectors and/or property types where direct information to derive the LSR is not available, proxies could be built using data on existing LSRs and various qualitative and quantitative assumptions. This is the top-down approach.

7.49. As is the case with the residual approach, the LSR approach extrapolates the PIM shortcomings to the derivation of land, however, it does avoid the issue of negative land values since both the LSR ratio and the structure value are both positive. In essence the LSR approach does not control to a total real estate value whereas the residual approach constrains to the total.

Hedonic approach

Introduction

7.50. The hedonic approach was explained in Chapter 6.4. This section extends the description to include sectorisation and cross-classification.

7.51. The hedonic approach involves the use of regression models to estimate the price of land and buildings. This approach depends on a detailed data source of real estate properties and their characteristics (such as the number of square metres of land).

Description of method and data requirements

7.52. The existing method can include data by sector and for cross-classifications as required. As previously described in Chapter 6.4, additional models can be used for each subsample, namely for each sector, for each industry or for each land type. The introduction of sectors and cross-classifications will mean that further models and lower level data are required. This will increase the amount of time and effort needed to successfully use this method.

7.53. As described in Chapter 6.4, the expanded model requires the following variables:

— property price;
— square metres of land;
— square metres of buildings;
— building year of construction;
— average service life of buildings.

7.54. To extend the model, the following variables could be added:

— institutional sector;
— industry;
— land type.

Example

7.55. Table 7.6 expands the example of the seven real estate properties provided in Chapter 6.4 by adding an additional variable of 'sector' to break down the dataset into subsamples so that the regression model can be run separately. In this example the sectors are limited to S.11 non-financial corporations, and S.14 households. The principle can be applied in the same way for cross-classification by industry or land type.

Table 7.6: Source data required for sectorising using the hedonic approach

Property transaction	Sector	Property price (DKK)	Land (m^2)	Buildings (m^2)	Quality adjusted (m^2)	Year of construction
1	S.14	2 700 000	886	136	58	1969
2	S.11	3 200 000	843	143	74	1976
3	S.11	2 115 000	729	110	34	1960
4	S.14	3 600 000	761	162	73	1971
5	S.14	2 800 000	749	143	72	1975
6	S.11	3 050 000	791	143	72	1975
7	S.14	3 850 000	814	171	121	1990
	Total S.11	8 365 000	2 363	396	180	
	Total S.14	12 950 000	3 210	612	324	

Source: TF on Land and other non-financial assets

Other factors to consider

7.56. In adding extra detail about sector or industry, it is necessary to assume that the sector/industry of both the land and the building is the same. This may be true for most cases, although this assumption should be checked against industry or country-specific circumstances.

7.57. The average service life of buildings may differ between sectors/industries/land types. For example, the average life length of buildings in the households sector which is mainly dwellings may be different to that in the private non-financial corporations' sector, which would include a range of buildings such as factories, office blocks and warehouses.

Summary of approaches

7.58. On a final note, although the discussion above focused on one approach at a time, in practice, a combination of methods could be used to complete the allocation of land to institutional sectors. For example, based on data availability one method may be applicable to certain type(s) of land, while for others different data sources may facilitate the use of a different approach. In such cases, although ensuring consistency across sectors and types of land/industry may represent an additional challenge, the ability to fully show the breakdown of land values within the national accounts will provide data users valuable analytical information on an important driver of economic behaviour.

Challenges

Data sources

7.59. As it has been emphasised in Chapter 4, identifying and utilising data sources for assessing land values represents a major challenge. In most cases, direct information on land holdings is sparse; therefore there is a need to rely on partial information, proxies and an estimation methodology. These data challenges will differ from country to country and they will largely determine the choice of approach for deriving land values by sector and type of land.

7.60. Data sources with partial coverage and information exist in any given country; however, the challenge is to ensure comparability, conceptual coherence and to develop a unifying framework under which the missing information can be derived reliably. This condition holds for the derivation both at the aggregate level and at the recommended level of granularity with respect to sector and type of land and/or industry.

Shared land

7.61. Shared land describes a case when two or more economic agents use the same piece of land for economic purposes. This presents a problem for sectorisation as the two economic agents may be in different sectors and this makes it difficult to allocate the land to just one sector.

7.62. There are many examples of different economic agents using the same piece of land, however in these cases there is usually a single owner. For example, a rented out office building housing multiple businesses, shopping malls, or apartment buildings in which also stores are established.

7.63. Many airplanes use the same runway at an airport. The runway is owned by the airport and the airplane companies are paying to use the facility. Two or more sports teams may use the same stadium. One of the teams may own the stadium and lease it out to the other. In both cases the land is not shared.

7.64. More than one farm uses common land to graze their animals. In this case, the common land is shared at no charge to the farmer; however, the land is owned by the government and would be allocated to the government sector.

7.65. If it is not possible to find a single owner for a piece of land, the data should be shared between the owners in proportion to the amount of land that they own. For example, if a piece of land is valued at 100 and 2 companies own it equally, then the value of 50 should be given to each company.

7.66. Chapter 3 provides further guidance on how to classify shared land by type. Further details are also available in SNA 2008 paragraphs 17.344 to 17.348.

Shared ownership

7.67. Shared ownership describes the situation where two or more economic agents own one piece of land. It is also known as equity sharing, for example when both a household and a house building company own parts of a house and the land underlying it. In this case, if there is not a clear single owner, the data should be shared between the owners in proportion to the amount of land that they own, as described above.

Households as producers/unincorporated enterprises

7.68. One particular difficulty, along the lines of the shared ownership challenge discussed above, relates to land owned by households as producers. This becomes an issue only for countries where a finer granularity of sectoral allocation is desired, more specifically, where a non-corporate business sector is shown separately from the households sector. This distinction may be particularly relevant in emerging economies where the share of self-employment in the total employment is large.

7.69. Unincorporated enterprises should be separated from the incorporated enterprises. The unincorporated enterprises should be allocated in S.14 households, with the exception of quasi-corporations.

7.70. In countries where the unincorporated enterprises are shown as a separate sector, the associated structures (dwellings) and investment flows are presented separately from those allocated purely to households. This relative breakdown then can serve as a proxy for the allocation of land.

Changes in classification or sector allocation

7.71. A major challenge in the sector allocation of land is the capturing of data on reclassifications from one type of land to another (e.g. agricultural land reclassified to non-residential or residential) with or without a change in sector ownership. In theory, if the value of land by type and by sector is accurate at any given point in time, and the transactions among sectors are properly captured, such reclassifications would be properly captured. In practice, given the limited data availability, capturing these flows as they happen may be difficult. Furthermore, decoupling transactions and other changes in volume may not be possible (see the Netherlands case study on agricultural land at the end of this chapter). However, over a number of reporting periods, that information should filter into the estimates through the various economic signals and assumptions used in the overall methodology, such that medium- and long-term trends in land sector allocation and cross-classification reflect economic reality.

Case study sectorisation and cross-classification of land: The Netherlands

Introduction

Statistics Netherlands publishes yearly estimates of three types of land: land underlying dwellings, land underlying non-residential buildings and land under cultivation. To attain a division into industries and sectors, a top down approach is used. This implies that the total value of each type of land is estimated first after which land is allocated to different industries and sectors. The argument for using the top down approach is that the only available source data are on the national level. Data on land prices or surface areas by industry or sector are not available.

This case study discusses the division of land into industries and sectors for land underlying dwellings and land under cultivation in the Netherlands. Land underlying dwellings serves as an example for land that is estimated indirectly, while land under cultivation is an example of directly estimated land.

Land underlying dwellings (estimated using indirect method)

In the Netherlands, the total value of land underlying dwellings is estimated indirectly, using the residual approach. First, the total value of dwellings, including the underlying land, is estimated using tax register data. Subsequently, the value of dwellings is subtracted to derive the value of land underlying dwellings.

To attain a division of land underlying dwellings into industry and sector, the value of dwellings by industry and sector from the capital stock can be used. This assumes a relationship between the value of the dwellings and the underlying land. This relationship depends on whether a bottom up or top down approach is employed. In a bottom up approach, land-to-structure ratios are suitable to estimate the value of land underlying dwellings by industry or sector. Subsequently, the total value of land is derived by aggregating the values by industry or sector. In contrast, in the top-down approach the total value of land is estimated first. Then, the distribution of the value of the dwellings from the capital stock is used to distribute land underlying dwellings across industries and sectors. In the Netherlands, the top-down approach is used.

The following numerical example illustrates how capital stock data can be applied to compile a complete balance sheet of land underlying dwellings at the sector level for the year 2005. Effectively, the distribution of the capital stock of dwellings across sectors is used for the sector allocation of land. The capital stock data required at a sector level are the opening and closing balance sheet, and purchases less sales. The opening and closing balance sheet of the total value of land underlying dwellings as well as the revaluation percentage are also required. Tables 7.7 and 7.8 show the required input data and Table 7.9 the computation for sectorisation.

In this example, the opening and closing balance sheet of the total value of land underlying dwellings in 2005 are respectively EUR 900 billion and EUR 1 000 billion (Table 7.8). To allocate land underlying dwellings to sectors, first the opening and closing balance sheet of land underlying dwellings are proportionally related to the opening and closing balance sheets of the dwellings capital stock (Table 7.9). For example, the share of dwellings for the non-financial corporations' sector on the opening balance sheet is 20 % (200/1 000) so the total value of land underlying dwellings on the opening balance sheet (900) is multiplied by this proportion in order to derive the value of land for the non-financial corporations' sector (180). To obtain the revaluation, the percent change in the price index of land underlying dwellings is multiplied with the opening balance sheets of the respective sectors to compute the amount of

revaluation at a sector level. The revaluation percentage by sector is assumed to be similar and set equal to the revaluation percentage of the national estimation (in this example 5 %). The next column of Table 7.9, purchases less sales (transactions) of land are based on the purchases less sales of dwellings. Purchases less sales of dwellings per sector are computed as a percentage of the opening balance sheets of dwellings after which, in each sector, the resulting percentage is multiplied with the opening balance sheets of land underlying dwellings. For instance, when five per cent of the dwellings are sold, relative to the opening balance sheet, it is also assumed that five per cent of the underlying land is sold. Finally, given the opening balance sheet, the revaluation, transactions of land, and the closing balance sheet, the other changes in volume of land in each sector are computed as a residual.

Table 7.7: Input data: value of dwellings in the capital stock, 2005

Sector Code	Sector	Opening balance sheet (billion EUR)	Purchases less sales (billion EUR)	Closing balance sheet (billion EUR)	Purchases less sales (share of opening BS)
S.1	Total economy	1 000	0.0	1 200	
S.11	Non-financial corporations	200	1.0	240	0.005
S.12	Financial corporations	40	-3.0	45	-0.075
S.13	General government	10	0.0	15	0.000
S.14	Households	750	2.0	900	0.003

Source: Statistics Netherlands

Table 7.8: Input data: total value and price index land underlying dwellings

Total value land underlying dwellings 2004 (billion EUR)	900
Total value land underlying dwellings 2005 (billion EUR)	1 000
Price index land underlying dwellings (%)	5

Source: Statistics Netherlands

Table 7.9: Distribution of land underlying dwellings based on capital stock, 2005
(billion EUR)

Sector code	Sector	Opening balance sheet	Revaluation	Purchases less sales	Other volume changes	Closing balance sheet
S.1	Total economy	180+36+9+675=900	9+2+1+34=46	1-3+0+2=0	10+3+2+39=54	200+38+12+750=1 000
S.11	Non-financial corporations	200/1 000*900=180	0.05*180=9	0.005*180=1	200-180-9-1=10	240/1 200*1 000=200
S.12	Financial corporations	40/1 000*900=36	0.05*36=2	-0.075*36=-3	38-36-2+3=3	45/1 200*1 000=38
S.13	General government	10/1 000*900=9	0.05*9=1	0*9=0	12-9-1-0=2	15/1 200*1 000=12
S.14	Households	750/ 1 000*900=675	0.05*675=34	0.003*675=2	750-675-34-2=39	900/1 200*1 000=750

Source: Statistics Netherlands

Land under cultivation (estimated using direct method)

The total value of land under cultivation in the Netherlands is estimated directly using price information and data on surface areas. Land under cultivation consists of open farmland and land underlying greenhouses. These types of land are estimated separately due to the availability of detailed price and surface area information. Since no relation exists with the capital stock, the division of land under cultivation into industries and sectors relies on a different method than the division of land underlying dwellings.

The following example illustrates how open farmland is allocated to industries and sectors. Table 7.10 shows the total surface area of open farmland at the beginning of the year and its division into leased and non-leased open farmland. The share of each type of open farmland is assessed yearly and based on data from the Economic Institute for Agriculture. Leased and non-leased farmland are valued separately since prices for non-leased farmland are higher (Table 7.11). Table 7.12 shows the computation of the balance sheets. Since input data for the quantities and prices are respectively beginning and end of the year data, estimating open farmland in a particular year requires data from different years. For instance the closing balance sheet of 2011 requires 2012 quantity data and 2011 price data.

Table 7.10: Partition of total open farmland into non-leased and leased land

Year	Total area open farmland (1 000 hectares)	Share non-leased land (share of total area)	Share leased land (share of total area)	Area non-leased land (1 000 hectares)	Area leased land (1 000 hectares)
2010	2 400	0.58	0.42	1 392	1 008
2011	2 300	0.57	0.43	1 311	989
2012	2 100	0.56	0.44	1 176	924

Source: Statistics Netherlands

Table 7.11: Input data prices for open farmland
(million EUR, rounded)

Year	Non-leased land (1 000 EUR/hectare)	Leased land (1 000 EUR/ hectare)	Price index % change
2009	46.0	23.0	2
2010	47.0	23.5	6
2011	50.0	25.0	5

Source: Statistics Netherlands

Table 7.12: Balance sheets open farmland (1)
(million EUR, rounded)

Year	Opening balance sheet	Revaluation	Purchases less sales and other volume changes	Closing balance sheet
Non-leased open farmland				
2010	1 392*46=64 032	64 032*0.02=1 281	61 617-64 032-1 281=-3 696	1 311*47=61 617
2011	1 311*47=61 617	61 617*0.06=3 698	58 800-61 617-3 698=-6 515	1 176*50=58 800
Leased open farmland				
2010	1 008*23=23 184	23 184*0.02=464	23 242-23 184-464=-406	989*23.5=23 242
2011	989*23.5=23 242	23 242*0.06=1 395	23 100-23 242-1 395=-1 537	924*25=23 100

(1) Calculation: surface area (thousands of hectares) * price (thousands EUR/hectare) = balance sheet value

Source: Statistics Netherlands

Table 7.13 shows how open farmland is allocated to industries for 2011. First, all non-leased open farmland is assigned to the industry agriculture, forestry and fishing. Leased open farmland is allocated to several industries, using information from government reports.

Table 7.13: Balance sheets open farmland by industry, 2011
(million EUR, rounded)

Industry	Percentage	Opening balance sheet	Revaluation	Purchases less sales and other volume changes	Closing balance sheet
Non-leased land					
Agriculture	100	61 617	3 698	- 6 515	58 800
Leased land					
Government	26	0.26*23 242=6 041	0.26*1 395=363	6 006-6 041-363=-398	0.26*23 100=6 006
Financial corporations	11	0.11*23 242=2 557	0.11*1 395=153	2 541-2 557-153=-169	0.11*23 100=2 541
Insurance companies	12	0.12*23 242=2 789	0.12*1 395=167	2 772-2 789-167=-184	0.12*23 100=2 772
Households	41	0.41*23 242=9 529	0.41*1 395=572	9 471-9 529-572=-630	0.41*23 100=9 471
Agriculture	10	0.10*23 242=2 324	0.10*1 395=140	2 310-2 324-140=-154	0.10*23 100=2 310

Source: Statistics Netherlands

Subsequently, given the industry classification, industries are assigned to a sector, see Table 7.14. For open farmland (both non-leased and leased land) in the agricultural industry the sector allocation is based on annual production data and assigned to S.11 non-financial corporations and S.14 households. For other industries, farmland is directly linked to a specific sector. For instance, open farmland owned by insurance companies is assigned to the sector S.12 financial corporations.

Table 7.14: Allocation of open farmland by industry to sectors, 2011
(million EUR)

Industry	Percentage of industry to sector	Sector	Opening balance sheet	Revaluation	Purchases less sales and other volume changes	Closing balance sheet
Agriculture (non-leased and leased land)			63 941	3 838	-6 669	61 110
Agriculture	25	S.11	15 985	959	-1 667	15 277
Agriculture	75	S.14	47 956	2 879	-5 002	45 833
Government	100	S.13	6 041	363	-398	6 006
Financial corporations	100	S.12	2 557	153	-169	2 541
Insurance companies	100	S.12	2 789	167	-184	2 772
Households	100	S.14	9 529	572	-630	9 471

Source: Statistics Netherlands

As previously discussed, to obtain the total value of land under cultivation in the Netherlands land underlying greenhouses must be estimated. While not shown in the example above, the allocation of land underlying greenhouses follows a similar procedure. To allocate land underlying greenhouses to industries and sectors, all land used for agricultural production is assigned to the industry agriculture, forestry and fishing. A separate estimation is made for land underlying greenhouses that is used by garden centres. It is based on the number of garden centres and their average size. The value is assigned to the industry retail trade and repair. It is assumed that all other land underlying greenhouses are part of agricultural companies. Therefore, its value is assigned to the industry agriculture, forestry and fishing. Given the allocation of land underlying greenhouses to either retail trade and repair, or agriculture, forestry and fishing, each industry is subsequently subdivided into sectors. As with open farmland, the allocation to sector is based on annual production data.