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Urban Growth and Circular Flow in a SAM-framework: The Case of The Netherlands

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Abstract—This paper follows an approach different from those commonly taken in assessing trends and impact of the economy on urbanization. A social accounting matrix (SAM) for The Netherlands, which distinguishes between six levels of urbanization, is inverted to give multiplier effects of institutional transfers and sectoral injections on urbanization levels. Multipliers of the SAM are analyzed for two different periods. Changes in urban performance are decomposed into changes in multipliers and in exogenous effects which are often controlled by policy makers. Copyright © 1996 Elsevier Science Ltd.

INTRODUCTION

In seeking a simplified way of looking at trends and changes in urban development we usually describe urban dynamics to consist of a four stage cyclus: (1) industrialization occurs with major growth for the manufacturing sector; (2) the service sector and transport facilities grow; (3) increased appreciation for quality of life and the rise of what can be called an environmental sector; and (4) rise of the information sector. The cyclus is marked by spatial concentration at first, followed by a deconcentration later. The predictions of this urban dynamics model are accordingly described as structurally determined. The actual urban configuration at any one time is considered to be the result of an interaction between internally structuring forces and externally intervening forces.

Analysts isolate and study the underlying interactions and changes in different analytical frameworks ranging from the partial and more specific to the more general. Furthermore, while many frameworks emphasize the spatial dimension, others emphasize the sectoral. Our objectives are to present an analytical framework that focuses on the economy-wide circular flow and sectoral interactions, and demonstrate its usefulness for understanding recent changes in the urban development of the small and developed economy of The Netherlands.

Urbanization studies for The Netherlands [3] suggest that the Dutch urban system is in stage (3) of the cyclus. This stage is marked by spatial deconcentration, which means a shift of people and jobs from cores (central towns) to rings (surrounding suburban municipalities). Some features of this stage include a rapid rise in energy prices and a contraction of average family size, while public transport, town renovation and spatial planning are given more weight in government policy. The Dutch urban system saw a deconcentration of population which peaked in the early 1970s and has since then declined, as well as a movement towards stage (4), in which we see a more balanced development of central towns and suburban areas (revitalization or reurbanization policy), a widespread computerization of society, increased attention to small-scale industry and a structural increase of leisure time.

More specifically, during the 1960s and early 1970s, a period with considerable economic growth, there was a strong emphasis in The Netherlands on suburbanization, which led to the decline of cores and even of entire agglomerations. The introduction of growth towns in ring areas was important for the increasing population in the suburban municipalities. A change in the downward trend was observed at the end of the 1970s which coincided with the gloomy economic prospects of towering unemployment figures and weak (negative) economic growth. In the course of the 1980s, which were years of cautious recovery of the Dutch economy, there were once again tendencies towards a slight increase in deconcentration.

Policy studies [2] show that in these years there was a change in the growth towns in the sense of a different market-oriented policy aimed at consolidating the foundations of the competitive

position of the agglomeration for which one would try to attract high-grade companies, high-income groups and tourists. The town is looked upon as an enterprise to be managed efficiently and whose continuity must be safeguarded. Evidence on the success of growth towns' policy is mixed. In some instances, cities are not deconcentrating, while in other instances city deconcentration is occurring.

The studies mentioned above approach the problem of urban dynamics and reach their conclusions using primarily frameworks that lay emphasis on the spatial settlement of households and business in different urbanization levels. However, these studies are disadvantaged by paying less attention to the economy-wide linkages which couple activities and households at different levels of urbanization. The objective of this paper is to attack this disadvantage by modelling the economy-wide circular flow as a general equilibrium framework. This will allow treating economy-wide linkage effects and explore growth and distributionary tendencies of changing urbanization patterns over an intermediate period of time.

The questions addressed are: How can internally structuring forces and externally intervening forces working together in the economy-wide circular flow, explain urban dynamics during the 1980s in the Netherlands? And when and where were the externally intervening forces more significant than the internally structuring forces? The hypothesis which we pose is that while the external forces are statistically more significant than the internal forces in shaping urban dynamics, the combination of the two forces is different for different urbanization levels.

To that purpose, we construct and analyze a social accounting matrix (SAM) of The Netherlands for two-periods. This SAM will distinguish between household groups classified by six urbanization levels. In general, the SAM is a circular flow register of incomings and outgoings of households, firms, sectors, government and the rest of the world. The origins of the idea go back to Quesnay's Tableau Economique in 1758. The idea was revived only 200 years later by R. Stone, among others. Today, there are such matrices for most countries and sometimes with regional disaggregations. For applications of SAM to comparative statistics, regional and interregional analysis see Refs [1,6,7,10].

The SAM is seen as a helpful tool in: (1) the setting up of national and regional statistical accounts, and discovering and correcting for inconsistencies; (2) conducting diagnostic analysis on the interrelations between components of the circular flow; (3) initialization of applied general equilibrium models; and (4) being a square matrix. The SAM can be converted into a static general equilibrium model of the economy, which can help explain on the internal and external mechanisms of the economy.

The current paper focuses on the conversion of the SAM into a circular flow model. After introducing the construction and structure of the SAM, multipliers of the SAM circular flow model are analyzed to show the impact of various injections on the growth of the six urbanization levels in two different years, namely 1981 and 1985. Finally, a decomposition of urban growth performance in terms of internal and external forces is done over the 4 years.

STRUCTURE AND CONSTRUCTION OF A SAM FOR THE NETHERLANDS

A SAM is basically a transformation of the circular flow in an exchange economy into a matrix of transactions amongst various agents, as in Table 1. In the rows of such a matrix, we find several types of accounts: (1) the products account; (2) the factors account, consisting of labour income and other income from profits, interest etc.; (3) the institutions' current account for, respectively, households, firms, government and social insurance, as well as one aggregrate institutional capital account; (4) the production activities account; and (5) the rest of the world account (ROW). The columns are ordered similarly. Transactions between these factors are represented by the filled cells in correspondence with the circular flow. A particular row lists receipts of a given group of actors—or incomings, while a particular column lists corresponding expenditures—or outgoings. For example, in Table 1, row 4 is equivalent to the total receipts of the households, giving, from left to right, receipts from wages (155,080), profits (57,818), transfers from government (21,520), from social security (75,100) and from abroad (−1078). Column 4 gives the expenditure of the households.

Such an aggregate SAM of The Netherlands for 1981 is constructed entirely from published

Table 1. The social accounting matrix of The Netherlands, 1981, in millions of guilders[a]

Expenditures/receipts	Products 1	Wages 2	Profits 3	Household 4	Firm 5	Govt 6	Social Security 7	Capital 8	Activities 9	ROW	Total
1				213,230		60,100	2650				275,980
2									20,1530	110	201,640
3									82,798	−1070	81,728
4		155,080	57,818			21,520	75,100			−1078	308,440
5			17,960								17,960
6	15,424		5010	44,150	11,100			5811	11,053	−1378	91,170
7		46,560	940	19,580		9850				−590	76,340
8				31,480	6860	−300	−1410		35,617	−7756	64,491
9	223,764							46,246	194,260	189,075	653,348
10	36,792							12,431	128,090	14,928	192,241
Total	275,980	201,640	81,728	30,8440	17,960	91,170	76,430	64,491	653,348	192,241	1,963,338

[a]In 1981, the exchange rate was U.S.$1.00 to 2.67 Dutch guilders. In 1995, U.S.$1.00 = 1.60 Dutch guilders.

estimates of the national accounts for that year. There are several options for the disaggregation of the SAM depending on available data and the purpose of the analysis, cf. Ref. [8]. The SAM in this paper has been disaggregated further into seven products, two factors of production and six household groups who receive and spend incomes. They are classified by their residence in various degrees of urbanization. The available statistics make the following classification feasible:

1. Rural municipalities (r.m.); with more than 20% of the labour force active in agriculture.
2. Urbanized rural municipalities (u.r.m.); with less than 20% of the labour force active in agriculture.
3. Dormitory towns (d.t.); with at least 30% non-residents.
4. Small towns (s.t.); with 10,000–30,000 inhabitants.
5. Medium-sized towns (m.s.t.); with 50,000–100,000 inhabitants.
6. Large towns (l.t.); with more than 100,000 inhabitants, i.e. cities.

In addition to these, there are accounts for firms, government, social insurance, an aggregate capital account, 10 sectors of production activities, and the rest of the world. The result is a matrix of 30 rows × 30 columns, as seen in Table 2.

The data required for disaggregation include: (a) the household budget survey produced by the Central Bureau of Statistics [4], used to break up the household account into the six urbanization groups, specifying their incomes by source and expenditures by type of product (the entries in the SAM reflect the fact that the household budget surveys do not consider income transfer between household groups, which is a limitation); (b) the input–output table, in order to disaggregate the production activities; and (c) an initial converter table, to transform a classification by products into a classification by sector. The same SAM has been constructed for 1985 at 1985 prices. (See Appendix Table A1 and Table A2).

In the following, we seek to sketch but a few characteristics of the changes the household groups underwent during the period 1981–85. One interesting phenomenon involves the variance and change in the average household size over the different urbanization levels. In 1981, the size varied from 3.5 for households in the rural municipalities to 2.3 for households in the large towns. During the period 1981–85 we see, for each urbanization level, a slight decrease of the average household size. This decrease in size is a general trend in The Netherlands and is predicted to continue partly due to aging and partly to a preference by the young for a one-person household.

ANALYSIS OF SAM MULTIPLIERS

The use of a SAM as a model that generates multipliers can be demonstrated from a very simple example. Take the simplest Keynesian model, which contains a consumption equation relating consumption C to income Y, and an equation defining income as consumption C plus investment

Table 2. The social accounting matrix of The Netherlands (disaggregated), 1981, in millions of guilders

SAM Netherlands 1981 organization	1	2	3	4	5	6	7		8	9	10	11	12	13	14	15	
1. Food											2453	8373	4613	3314	7578	11,539	37,870
2. Rent											3421	12,309	6785	5032	10,533	14,840	52,920
3. Clothing/footwear											1004	3421	1998	1751	3132	4464	15,770
4. Health											2080	6192	3674	2645	6112	9527	30,230
5. Education/transportation											3739	12,161	8116	5333	12,490	19,061	60,900
6. Other											1344	3916	1572	1649	3344	3715	15,540
7. Public utilities																	
											14,041	46,372	26,758	19,724	43,189	63,146	213,230
8. Labour earnings																	
9. Profits																	
10. Rural municipalities									11,646	4220							
11. Urbanized rural municipalities									35,584	12,672							
12. Dormitory towns									23,129	8502							
13. Small towns									14,307	5159							
14. Medium-sized towns									29,696	11,496							
15. Large towns									40,718	15,770							
									155,080	57,819							
16. Firms										17,960							
17. Government	1481	3347	1842	303	6636	1815	0	15,424		5010	2631	9272	6685	3891	9473	12,198	44,150
18. Social insurance									46,560	940	1423	4438	2609	1859	3696	5555	19,580
19. Capital											1962	4170	3502	2167	6950	12,730	31,480
	1481	3347	1842	303	6636	1815	0	15,424	46,560	23,910	6016	17,880	12,796	7917	20,119	30,483	95,211
20. Agriculture	1972	12	0	0	832	0	0	2636									
21. Mining	4	0	0	0	7	0	0	11									
22. Light industry	14,942	4309	6234	1486	4845	507	0	32,323									
23. Heavy industry/electricity	0	820	25	104	1779	227	0	2955									
24. Public utilities	0	10,117	0	0	0	0	0	10,117									
25. Construction	0	1217	0	0	0	0	0	1217									
26. Trade etc.	9659	5614	3757	2428	21,842	1275	0	44,575									
27. Transport etc.	0	0	0	0	5307	0	0	5307									
28. Banking etc.	0	21,184	67	0	5123	1230	0	27,604									
29. Service	0	2272	0	21,254	5424	5321	62,750	97,021									
	26,396	45,544	10,082	25,272	45,159	8560	62,750	223,764									
30. Rest of the world	9993	4029	3846	4655	9105	5165	0	36,792									
	37,870	52,920	15,770	30,230	60,900	15,540	62,750	275,980	201,640	81,728	20,057	64,252	39,554	27,641	63,308	93,629	308,440

continued

Table 2. *Continued*

SAM Netherlands 1981 organization	16	17	18	19		20	21	22	23	24	25	26	27	28	29		30	
1. Food																		37,870
2. Rent																		52,920
3. Clothing/footwear																		15,7770
4. Health																		30,230
5. Education/transportation																		60,900
6. Other																		15,540
7. Public utilities		60,100	2650		62,750													62,750
		60,100	2650		62,750													275,980
8. Labour earnings						2577	576	21,456	23,026	2612	16,300	28,591	15,792	18,899	71,701	201,530	110	201,640
9. Profits						9583	24,014	899	2441	2223	5487	15,086	3655	10,794	8816	82,798	−1070	81,728
10. Rural municipalities		948	3308		4256												−65	20,057
11. Urbanized rural municipalities		3611	12,601		16,212												−216	64,252
12. Dormitory towns		1791	6250		8041												−118	39,554
13. Small towns		1842	6430		8272												−97	27,641
14. Medium-sized towns		4976	17,366		22,342												−226	63,308
15. Large towns		8352	29,145		37,497												−356	93,629
		21,520	75,100		96,620												−1078	308,441
16. Firms																		17,960
17. Government	11,100			5811	16,911	427	43	3234	−496	51	79	4596	−2132	2427	2824	11,053	−1378	91,170
18. Social insurance		9850			9850												−590	76,340
19. Capital	6860	−300	−1410		5150	1970	930	5870	3350	2720	1190	3570	5090	6350	4577	35,617	−7756	64,491
	17,960	9550	−1410	5811	31,911	2397	973	9104	2854	2771	1269	8166	2958	8777	7401	46,670	9724	249,961
20. Agriculture				130	130	921	0	19,133	0	0	0	189	7	0	238	20,488	8188	31,442
21. Mining				87	87	20	134	3639	710	9315	129	0	0	0	54	14,001	14,665	28,764
22. Light industry				−1062	−1062	10,047	53	22,130	2241	1103	2533	4169	1388	965	4005	48,634	79,777	159,671
23. Heavy industry/electricity				6256	6256	287	243	2517	9413	527	5659	806	864	407	2403	23,126	43,766	76,105
24. Public utilities				810	810	1016	101	2638	1650	448	375	1533	544	439	2459	11,203	89	22,219
25. Construction				31,849	31,849	349	105	835	1094	150	9581	364	327	2038	2818	17,661	1742	52,469
26. Trade etc.				3544	3544	1300	96	4953	2416	274	2169	2352	1291	444	1638	16,933	14,079	79,131
27. Transport etc.				467	467	176	253	1095	679	49	583	8288	1360	1377	1804	15,664	15,353	36,791
28. Banking etc.				4452	4452	532	124	2950	2509	113	781	2457	996	3823	1965	16,250	2436	50,741
29. Service				−287	287	319	17	1247	723	135	198	487	463	831	5880	10,300	8978	116,011
				46,246	46,246	14,967	1126	61,137	31,435	12,114	22,008	20,645	7240	10,324	23,264	194,260	189,073	653,348
30. Rest of the world				12,431	12,431	1918	2075	67,076	26,349	2499	7405	6644	7146	1948	5030	128,090	14,928	192,241
	17,960	91,170	76,340	64,488	249,958	31,442	28,764	159,672	76,105	22,219	52,469	79,132	36,791	50,743	116,012	653,348	192,241	1,963,338

I. That is:

$$C = cY \tag{1}$$

$$Y = C + I \tag{2}$$

This is a model of two equations in two endogenous (unknown) variables of C and Y, where I is an exogenous (given) variable. The model can be written as a square matrix which is then inverted to give the Keynesian multipliers, i.e. the effect of an increase in I on Y [i.e. in this case $1/(1 - c)$].

In this way, many models have been developed with their own characteristic multipliers. In one of the most frequently used models, the input–output model, an endogenous vector of sectoral production (y) can be predicted from a matrix of input–output coefficients A and a vector of exogenous final demand x as in eqn (3).

$$y = Ay + x = (I - A)^{-1}x = M_a x, \tag{3}$$

where M_a is the Leontief multiplier matrix.

Now, the interesting case arises when the SAM is also a square matrix, and, as such, it represents a model of the economy. By appropriate partition and inversion of this square matrix, it is also possible to derive SAM-multipliers, which are more comprehensive than those of Keynes and Leontief together; this, because the SAM contains the whole circular flow.

Several steps are required in converting the SAM into a model. First, a sub-division of the 30 × 30 SAM between endogenous y and exogenous x variables is required. We shall assume for a country like The Netherlands that the columns of government expenditure, social insurance and rest of the world are exogenous. Why these three columns? Because government behaviour cannot apparently be explained in terms of demand and supply or utilities and availabilities in the same sense as earnings and expenditure of households are explained economically, even though it is not denied that there have been analytical advances in endogenizing government behaviour.

Transfers under the social security system in the Netherlands are legally determined. They were considered in the 1970s to be a given constant. The level and coverage of social security payments have since then become controversial. Social security payments are generally viewed as more the result of political pressures than of economic motivations.

Finally, for a small open-economy country like The Netherlands, it is most realistic to consider the demand pattern of the rest of the world as exogenous.

By separating the influence of these three externally intervening forces from the rest of the economy—government expenditure, social security and exports—it becomes feasible to study the rest of the economy consisting of factors, households, firms and sectors, as an internally functioning economic structure. In a sense, the externally intervening forces are the impulses that drive the economy, while the internally functioning economic structure—via factor earnings, consumption and investment of households, and intersectoral relations of firms—give shape to the outcome.

As a result of the above exogenous assignments, variables belonging to the remaining 27 accounts are endogenous, y. These consist of variables of the seven product accounts, as well as those of the two factor accounts, the current institutions account pertaining to six household types distinguished by urbanization level, those of the firms, the capital institution account and, finally, the 10 sectoral activities.

This particular sub-division into endogenous and exogenous variables will allow the study of multiplier effects of exogenous actions in the forms: (1) institutional transfers to households by urbanization level; and of (2) sectoral injections. We shall be interested in tracing the income effects on households located by urbanization level h and the output effects on sectoral activities i.

Secondly, the flows in the endogenous matrix are divided by their respective totals, columnwise, to give the matrix of average propensities S.

Thirdly, the vector of endogenous variables y can now be solved from matrix S and exogenous variables x in eqn (4), to give the SAM multiplier matrix M_s:

$$y = Sy + x = (I - S)^{-1}x = M_s x. \tag{4}$$

The portions of M_s in which we are primarily interested are denoted by $M_{s,hh}$ and $M_{s,ih}$, which stand for the effects of income transfers to households h on income of households h, and output by sector

Table 3. Average multiplier effects of institutional transfers, $\bar{M}_{s,hh}$ and $\bar{M}_{s,ih}$, and sectoral injections, $\bar{M}_{s,hi}$ and $\bar{M}_{s,ih}$ The Netherlands 1981

	Actual shares in total (1)	Average of all institutional transfers: Multiplier share in total (2)	RDM (3) = (2)/(1)	Average of all sectoral injections: Multiplier share in total (4)	RDM ((5) = (4)/(1)
Income by urbanized level					
Rural municipalities	6.50	7.45	1.15	7.43	1.14
Urban rural municipalities	20.83	22.65	1.09	22.57	1.08
Dormitory towns	12.82	14.85	1.16	14.84	1.16
Small towns	8.96	9.14	1.02	9.12	1.02
Medium towns	20.53	19.36	0.94	19.41	0.95
Large towns	30.36	26.54	0.87	26.62	0.88
Total	100.00	100.00		100.00	
Average income multiplier		$\bar{M}_{s,hh} = 1.457$		$\bar{M}_{s,hi} = 0.771$	
Output of sectors					
1. Agriculture	4.81	3.25	0.68	4.16	0.86
2. Mining	4.40	2.82	0.64	6.36	1.44
3. Light industry	24.44	17.68	0.72	18.51	0.76
4. Heavy industry	11.65	6.08	0.52	9.22	0.79
5. Public utilities	3.40	5.43	1.60	5.08	1.49
6. Construction	8.03	12.84	1.60	16.44	2.05
7. Trade	12.11	19.30	1.59	14.46	1.19
8. Transport	5.63	5.17	0.92	5.63	1.00
9. Banking	7.77	13.90	1.79	11.34	1.46
10. Services	17.76	13.52	0.76	8.79	0.50
Total	100.00	100.00		100.00	
Average output multiplier		$\bar{M}_{s,ih} = 1.333$		$\bar{M}_{s,ii} = 2.271$	

i; while $M_{s,hi}$ and $M_{s,ii}$ represent the effects of demand injections in sector i on incomes of households h and output by sector i, respectively.

Besides the size of the multipliers, it is interesting to know: (1) how the *predicted* income multiplier effect will be distributed on the households by residence, and how the *predicted* output multiplier effect will be distributed on the sectors of production; and (2) how they compare to the *actual* distribution of income on households and *actual* distribution of output on sectors, respectively. We use for such a measure the Relative Distributive Measure (RDM), as defined in Ref. [5]. It is the quotient of the percentage distribution of the predicted individual multiplier effects on households (sectors) to the actual share of income of households (output of sectors) in the total household income (total sectoral output), and thus reflects the long-term income (output) growth bias of the economy. For values of RDM < 1, > 1 and $= 1$, there are positive, negative and neutral redistributive effects, respectively. For example, a predicted multiplier share of 27% and an actual share of 30% as far as household income of large towns is concerned gives an RDM of 0.87, which is an indication of a negative growth bias, as shown in Table 3. In the next section, we shall discuss to which direction the income and output growth patterns of institutional transfers and sectoral injections are biased in The Netherlands.

Table 3 gives average values of SAM multipliers for 1981 of institutional transfers and their relative distribution on households and sectors, $M_{s,hh}$ and $M_{s,hi}$, and, similarly, those of sectoral injections under $M_{s,hi}$ and $M_{s,ii}$.

It is interesting to note from the second column of Table 3 that irrespective of the urbanization level to which institutional transfers take place, the generated income multiplier effect of one unit of transfer is about 1.45 units. Results, not taken in the table, cf. Ref. [9] show very little variance; namely, between a low value of 1.44 in the case of an injection to dormitory towns and a high value of 1.47 in the case of an injection to large towns, i.e. cities.

The percentage distribution of the generated income multiplier effect shows cities to benefit most, 26%, and rural municipalities least, 7%. Results, not taken in the table, show also that almost the same pattern of distribution of benefits on the six urbanizations is repeated irrespective of the urbanization level to which the initial transfer is directed.

In the fourth column, Table 3 shows a sectoral injection of 1.0 to generate an average income multiplier of 0.77, which is distributed on the urbanization levels along the same pattern mentioned previously.

In the first column, the table lists the actual distributions of household income by urbanization level and output by sector. It is then possible to compute RDM, which is the division of the

predicted share by the actual share. The results show that rural municipalities and dormitory towns are experiencing the highest growth bias with RDM values of 1.15 and 1.16, respectively. Large towns are mostly disfavoured (RDM = 0.87). The results support the hypothesis of a built-in decline bias for large towns in favour of outskirts. More or less, the same tendencies are obtained for multipliers and RDM relating to sectoral injections.

The lower part of the table gives results on output multipliers and their distribution on sectors. Results show a sectoral growth bias favourable to construction, public utilities, banking, mining and trade, all with RDM > 1.0 and an unfavourable bias for services, light and heavy industry. This would indicate a confirmation of the hypothesis that urban development in The Netherlands, which has already passed cyclus stages 1 and 2, was, during the 1980s, in stage 3 and approaching stage 4, which is consistent with Ref. [3].

The availability of the SAMs for 1981 and 1985 permits an investigation of how the above multiplier effects have changed, admittedly though, over a relatively short period of time. The analysis may be limited by the fact that both SAMs are in current prices. The extent of this limitation cannot yet be fully determined. In this respect, it is comforting to know that between 1981 and 1985 the annual increases of the Paasche price indices for the categories of consumption, investment and the GDP were 3.9, 2.8 and 3.6%, respectively, which are low and reasonably close to each other.

Table 4 gives the SAM multipliers for 1985. It can be restated that in 1981 an institutional transfer of 1 million guilders (m.g.) has lead to an average income multiplier amounting to 1.457 m.g. and an output multiplier of 1.333 m.g. In contrast, in 1985 an institutional transfer of 1 m.g. would generate, on average, an income multiplier of 1.445 m.g., which is 0.8% less than in 1981, and an output multiplier of 1.282, which is 3.8% less than in 1981.

Over the 4 years there has been, in fact, only a slight deterioration of both multipliers. But this begs the question: did the relative distribution of the income effects on the households and of the output effects on the sectors remain the same? For this purpose, we shall compare the RDM indicators for 1985 with those of 1981.

Taking first the relative distribution of the income multiplier, we note an increase of the values of RDM for households in small towns (from 1.02 to 1.09) and in middle-sized towns (from 0.95 to 0.99). This was accompanied by a reduction of RDM for households in the other urbanizations, particularly in the rural municipalities, dormitory towns and large towns, experiencing reductions of about 4, 8 and 4%, respectively. The obtained results show that the period of 1981–1985 was

Table 4. Average multiplier effects of institutional transfers, $\bar{M}_{s,hh}$ and $\bar{M}_{s,ih}$, and sectoral injections, $\bar{M}_{s,hi}$ and $\bar{M}_{s,ii}$ The Netherlands, 1985

		Average of all institutional transfers		Average of all sectoral injections	
	Actual shares in total (1)	Multiplier share in total (2)	RDM (3) = (2)/(1)	Multiplier share in total (4)	RDM ((5) = (4)/(1)
Income by urbanized level					
Rural municipalities	10.12	11.10	1.10	11.07	1.09
Urban rural municipalities	20.04	21.43	1.07	21.24	1.06
Dormitory towns	15.84	16.91	1.07	16.77	1.06
Small towns	10.77	11.73	1.09	11.75	1.09
Medium towns	17.42	17.15	0.98	17.27	0.99
Large towns	25.83	21.69	0.84	21.89	0.85
Total	100.00	100.00		100.00	
Average income multiplier		$\bar{M}_{s,hh} = 1.445$		$\bar{M}_{s,hi} = 0.780$	
Output of sectors					
1. Agriculture	4.73	2.95	0.62	3.66	0.78
2. Mining	5.09	3.83	0.75	8.25	1.62
3. Light industry	24.71	16.85	0.68	16.85	0.68
4. Heavy industry	12.16	6.65	0.55	10.07	0.83
5. Public utilities	3.53	5.86	1.66	5.27	1.49
6. Construction	6.77	11.55	1.71	15.29	2.26
7. Trade	12.32	18.54	1.50	14.21	1.15
8. Transport	5.51	5.06	0.92	5.43	0.98
9. Banking	8.38	15.42	1.84	12.35	1.47
10. Services	16.79	13.30	0.79	8.63	0.51
Total	100.00	100.00		100.00	
Average output multiplier		$\bar{M}_{s,ih} = 1.282$		$\bar{M}_{s,ii} = 2.269$	

characterized by convergence tendencies in income growth bias of the various urbanization levels. In this regard, note especially that the decline bias for large towns appears to have been intensified, with RDM declining from 0.88 to 0.84.

Taking next the relative distribution of the output multiplier on sectors of production, we see here that there is much similarity between 1985 and 1981. In The Netherlands there is a growth bias towards four sectors: banking, construction, public utilities and trade, with values of RDM in 1985 above 1.50. Except for trade, the other three sectors show higher rates of their RDM in 1985 than in 1981. The increases vary between 2.8% for banking and 6.9% for construction. The other sectors have a decline basis. Thus, in 1985, the urbanization sectors of heavy industry and agriculture were mostly disfavoured, with values of RDM of 0.55 and 0.62 (in 1981, these were 0.52 and 0.68, respectively). In 1985, light industry and mining were also experiencing low RDM values of 0.68 and 0.75 (where, in 1981 these values were 0.72 and 0.64, respectively).

The noted growth and decline bias in the contexts of household incomes at urbanization levels and sectoral output feed each other. Large towns with an income decline bias (RDM = 0.85) have relatively more of such sectors as light industry and services with RDM's of 0.68 and 0.51, respectively. The demands for these sectors is likewise more dependent on the prosperity of the large towns than on other urbanization levels.

It requires noting that the Keynesian, Leontief and SAM models share together the common feature that they are basically demand representations of the economy. The multiplier effects from these models do not consider the supply side. It is assumed that supply adjusts to demand, i.e. that there are no capacity restrictions that will obstruct the realization of the potential multiplier effect. Accordingly, the role of investment in these models is confined to that of enhancing the purchase of capital goods, and not of adding to the productive capacity. Whether the potential multiplier effects of impulses will be realized in increased quantities in full or in part depends on the elasticity of supply. If the size of the impulse is relatively small, which is usually the case, these multipliers can still be seen to represent realizable quantity effects with little leakage into price inflationary effects.

DECOMPOSITION OF PAST PERFORMANCE

SAM multipliers of The Netherlands for the periods 1978 and 1981, as reported in Ref. [5], showed diminishing effects over time for all the sectors (except for public utilities and banking). We see once again in a later period between 1981 and 1985 diminishing multiplier effects over time for most of the sectors. Exceptions are mining, heavy industry, public utilities and banking. The situation for households is less clear because only three out of six urbanizations show negative multiplier effects, namely household groups in the urbanized rural municipalities, middle sized towns and large towns.

The diminishing income and output multiplier effects between 1981 and 1985 can be interpreted as a weakening of the endogenous circular flow mechanisms in the economy.

Since The Netherlands had experienced some economic growth between 1978 and 1981, and still a greater economic growth between 1981 and 1985, there must have been during these years a strengthening of the positive exogenous effects so as to overcompensate for the weakened endogenous effects, producing the realized economic growth. This implies that there has been an increased dependence on the exogenous variables in influencing the course of the economy. The exogenous variables, it should be recalled, are those of the government sector, social security, and the rest of the world. The hypothesis of a weakening of the internally structuring forces—the endogenous multiplier effects—and an increased dependence of the economy on externally intervening forces—the exogenous effects—are those treated here.

The availability of the two SAMs for 1981 and 1985 allows a decomposition of the performance of the economy in the medium term into that part which is due to changes in SAM multipliers and that part due to changes in the exogenous variables.

Recall that we have solved the vector of endogenous variables y from eqn (4):

$$y = Sy + x = (I - S)^{-1}x = M_s x$$

where M_s is the aggregate multiplier matrix and x is the vector of exogenous variables. Rewriting

Table 5. An explanation of changes in urbanization income and sectoral output between 1981 and 1985 in terms of changes in exogenous variables and SAM multipliers, The Netherlands

	Changes in millions of current Dutch guilders						Percentages		
	Overall (1)	Due to multiplier (2)	Due to exogenous (3)	Of which government (4)	Social security (5)	ROW (6)	Overall (7)	Multiplier (8)	Exogenous (9)
Urbanization income									
Rural municipality	16,695	7493	9202	2289	3857	3056	83.24	37.36	45.88
Urban rural municipality	8550	−3065	11,615	3148	2525	5942	13.31	−4.77	18.08
Dormitory towns	18,011	4009	14,002	3571	5763	4667	45.54	10.14	35.40
Small towns	11,477	5196	6281	1655	1345	3281	41.52	18.80	22.72
Medium towns	−22	−5189	5167	1849	−1554	4873	−0.03	−8.20	8.17
Large towns	213	−10,964	11,178	4157	885	6135	0.23	−11.71	11.94
Total	54,924	−2521	57,444	16,688	12,821	27955	17.81	−0.82	18.62
Sectoral output									
Agriculture	5233	−2265	7498	451	367	6680	16.64	−7.20	23.85
Mining	10,769	3962	6806	571	539	5696	37.44	13.77	23.66
Light industry	32,075	−6556	38,631	2459	2250	33922	20.09	−4.11	24.19
Heavy industry	18,270	2208	16,062	154	1833	14,075	24.01	2.90	21.10
Public utilities	5191	859	4331	901	798	2632	23.36	3.86	19.49
Construction	54	−5122	5178	−416	3788	1805	0.10	−9.76	9.87
Trade	16,480	−2503	18,984	2389	2624	13,970	20.83	−3.16	23.99
Transport	6007	−753	6760	730	714	5317	16.33	−2.05	18.37
Banking	14,315	4540	9773	2009	2225	5539	28.21	8.95	19.26
Services	14,292	−774	15,065	6714	1950	6401	12.32	−0.67	12.99
Total	122,685	−6404	129,088	15,962	17,088	96,038	18.78	−0.98	19.76

Note: (7) = (1)/value of variable in 1981.(8) = (2)/(1) × (7).(9) = (3)/(1) × (7).

this equation for two periods of 1981 and 1985 and subtracting 1981 from 1985 to give the change in the endogenous variables Δy, yields eqn (5):

$$\Delta y = y_{85} - y_{81} = M_{s,85}x_{85} - M_{s,81}x_{81} \tag{5}$$

Changes in the endogenous sector can be explained in terms of two effects: a change in the multiplier matrix ($M_{s,85} - M_{s,81}$) and a change in the exogenous vector ($x_{85} - x_{81}$). The assumption of a zero value for one effect allows for measurement of the other. This is done by adding, subtracting and simplifying terms to give eqn (6):

$$\Delta y = M_{s,85}x_{85} - M_{s,81}x_{81} = M_{s,85}x_{85} - M_{s,85}x_{81} + M_{s,85}x_{81} - M_{s,81}x_{81} = M_{s,85}\Delta x + \Delta M_s x_{81} \tag{6}$$

As a result, the change in an endogenous variable is decomposed into a change in exogenous variables (at constant SAM multipliers), and a change in SAM multipliers (at constant exogenous variables).

Table 5 applies the above factorization to the SAMs of 1981 and 1985 in an effort to explain the changes in overall and sectoral output and in overall income and its distribution across the different household groups distributed by urbanization level. Results show that total income and total output increased by 17.8 and 18.8%, respectively. This is basically due to the exogenous change of 18.7% for total income and of 19.8% for total output, together with a minor decrease in the percentage change of the multiplier 0.8% resp. 1.0%.

We can see from Table 5 that during 1981–1985 the income performance of household groups living in the rural municipalities of The Netherlands were the best in spite of the previously observed unfavourable relative income distribution bias. Income growth of this urbanization level amounted to 83.2% as compared to a national average of 17.8%. This is the result of a positive change in the multiplier effect over time of 37.4% and an even higher positive change in the exogenous effect of 45.9% as compared to the national averages of −0.8 and 18.6%, respectively. It can be asserted that both the endogenous and exogenous forces have worked in favour of the households in rural municipalities during the period considered.

Households in urbanized rural municipalities, middle sized towns and large towns experienced least favourable performance. Total income of middle sized towns decreased in 1981–1985 by 0.03%, which was due to a deterioration of the multiplier component of −8.2% and to an increase of the exogenous stimulus of 8.2%. Total income of households in large towns changed little in 1981–1985—a nominal growth of 0.23%—which was due to a deterioration of the multiplier component of −11.7% and an increase in the exogenous stimulus of 11.9%. Total income of

households in urbanized rural municipalities increased by 13%, consisting of a decline in the multiplier effect of −5% and a rise in the exogenous effect of 18%.

Summarizing, we see that the endogenous multiplier effects work against the urbanized rural municipalities, middle-sized towns, and large towns, in that they show negative multiplier effects of −4.8, −8.2 and −11.7%, respectively. Furthermore, the contributions of the exogenous effects to overall growth at 18.1, 8.2 and 11.9%, respectively, are also less than that for a national growth at 18.6%.

Table 5 also allows for a decomposition of the exogenous stimulus by source: namely, the government, social security and the rest of the world. What, then, are the consequences of the exogenous stimuli by source on urbanizational growth in the period 1981/1985? In the first place, in absolute amounts, the exogenous stimuli of the *government* are particularly beneficial for households in large towns, dormitory towns and urbanized rural municipalities, who are clearly associated with public employment and related jobs. The exogenous stimuli of *social security* are found to favour dormitory towns, rural municipalities and urbanized rural municipalities, where, presumably, old-age pensioners live, while the exogenous stimuli of the *rest of the world* favour large towns, urbanized rural municipalities and middle-sized towns.

Realized growth of mining (37%) and banking (28%) are remarkably high as compared to low figures of services (12%) and construction (almost zero growth). The endogenous multiplier effects have favoured mining and banking as reflected in positive multiplier changes for mining (13.77%) and banking (8.95%). Further, public utilities (3.86%) and heavy industry (2.90%) have benefited. For agriculture and construction we note the highest negative multiplier changes of −7.20 and −9.76%, respectively. The exogenous changes are positive for all sectors and have varied between 9.87% for construction and 24.19% for light industry. Table 5 shows once again that the stimulus to growth differs across sectors, with growth generally more dependent on exogenous than endogenous mechanisms.

With respect to exogenous stimulus by source the results indicate the relative importance of government stimulus for services and light industry, of social security for construction and trade, and the external world for light and heavy industry and trade.

It must be kept in mind, however, that eqn (5) and (6) can alternatively be reformulated to give a decomposition of performance starting from a different base (year), as in eqn (7):

$$\Delta y = \Delta M_s x_{85} + M_{s,81} \Delta x \tag{7}$$

A more general formula would be:

$$\Delta y = \Delta M_s x_{81} + M_{s,81} \Delta x + \Delta M_s \Delta x \tag{8}$$

However, the results obtained from application of eqn (7) do not vary much from those of eq (6) and, hence, to save space, are not reported here. The similarity of results in using eq (6) and (7) offers some evidence that selection of a base year, 1981 or 1985, for decomposition of past performance does not significantly influence the obtained results. Consequently, one can speculate that the results in this section may not have been much different if the SAMs were expressed in constant prices.

CONCLUDING REMARKS

From our work we suggest that insight can be gained by analyzing growth patterns of urbanized levels within an economy-wide framework that gives justice to circular flow. In this paper, results on urban performance were obtained from two social accounting matrices (SAMs) for The Netherlands, one for 1981 and one for 1985.

Admittedly, this short period cannot succeed in distinguishing long trends, but when our results are taken together with similar results obtained for the period 1978–81 in a comparable context [5], they do indicate some very likely trends in the medium term.

In our SAMs, we introduced households classified by degree of urbanization (rural municipalities, urbanized rural municipalities dormitary towns, small towns, medium-sized towns and large towns). The SAM is demonstrated to form an appropriate framework for integrating various statistical sources on regional development, and for studying the structural properties of

the economy and intervening external forces in determining growth and distribution. It was shown empirically for the country and period concerned that the externally intervening forces gain in strength as compared to the internally structuring forces in determining the income growth of urbanization levels and the output growth of production sectors. It was shown further that large towns and the services sector are experiencing negative growth bias in terms of both internal and external influencing forces. Taking into account the working of the circular flow, the economic model employed here suggests that a deconcentration of cities towards towns, rural municipalities, dormitory towns and small towns goes simultaneously with enhanced growth for the sectors of mining, banking and public utilities at the cost of light industry, construction and services.

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APPPENDIX

Table A1. The social accounting matrix of The Netherlands 1985 in millions of guilders

Expenditures/receipts	Products 1	Wages 2	Profits 3	Household 4	Firms 5	Government 6	Social security 7	Capital 8	Activities 9	ROW	Total
1				247,720		64,550	3120				315,390
2									216,762	80	216,842
3									121,352	600	121,952
4		166,092	84,722			31,810	82,230			−1487	363,367
5			33,610								33,610
6	19,124		2870	42,420	13,060			6288	11,027	−959	93,830
7		50,750	750	35,240		2720				−730	88,730
8				37,987	20,550	−5250	3380		42,867	−16,790	82,744
9	254,700							52,778	228,286	240,272	776,033
10	41,568							23,678	155,740	24,522	245,508
Total	315,390	216,842	121,952	363,367	33,610	93,830	88,730	82,744	776,034	245,508	2,338,007

Table A2. The social accounting matrix of The Netherlands (disaggregated), 1985, in millions of guilders

SAM Netherlands 1985 organization	1	2	3	4	5	6	7		8	9	10	11	12	13	14	15	
1. Food											4596	9513	6124	4263	7317	10,957	42,770
2. Rent											6208	13,805	10,332	6388	11,209	16,838	64,780
3. Clothing/foortwear											1695	4132	2500	1813	2776	4094	17,010
4. Health											3599	7148	5280	3719	6126	9108	34,980
5. Education/transportation											6537	14,327	10,501	7858	12,202	19,005	70,430
6. Other											1564	3379	2756	1880	4338	3833	17,750
7. Public utilities																	
											24,199	52,304	37,493	25,921	43,968	63,835	247,720
8. Labour earnings																	
9. Profits																	
10. Rural municipalities									18,650	9193							
11. Urbanized rural municipalities									37,193	16,624							
12. Dormitory towns									29,186	13,265							
13. Small towns									19,293	10,117							
14. Medium sized towns									27,423	15,537							
15. Large towns									34,347	19,985							
									166,092	84,722							
16. Firms										33,610							
17. Government	1979	4109	2141	403	8258	2234	0	19,124		2670	3695	7529	8296	4671	7111	11,118	42,420
18. Social insurance									50,750	750	3989	7978	5361	3750	5832	8330	35,240
19. Capital											4872	4990	6417	4777	6374	10,557	37,987
	1979	4109	2141	403	8258	2234	0	19,124	507,50	37,230	12,556	20,497	20,074	13,198	19,317	30,005	115,647
20. Agriculture	2053	11	0	0	955	0	0	3019									
21. Mining	4	0	0	0	9	0	0	13									
22. Light industry	17,144	4383	6818	1860	5366	603	0	36,174									
23. Heavy industry/electricity	0	699	24	98	1835	182	0	2838									
24. Public utilities	0	13,455	0	0	0	0	0	13,455									
25. Construction	0	1232	0	0	0	0	0	1232									
26. Trade etc.	9542	5441	3589	3342	24,374	1762	0	48,050									
27. Transport etc.	0	0	0	0	6445	0	0	6445									
28. Banking etc.	0	28,711	86	0	6295	1492	0	36,584									
29. Service	0	2263	0	22,064	5837	9052	67,670	106,886									
	28,744	56,196	10,517	27,365	51,116	13,092		254,698									
30. Rest of the world	12,047	4475	4352	7212	11,056	2424	0	41,568									
	42,770	64,780	17,101	34,980	70,430	17,750	67,670	315,390	216,842	121,952	36,755	72,801	57,567	29,119	63,285	93,840	363,367

Continued overleaf

Table A2. *Continued*

SAM Netherlands 1985 organization	16	17	18	19		20	21	22	23	24	25	26	27	28	29		30	
1. Food																		42,770
2. Rent																		64,780
3. Clothing/footwear																		17,101
4. Health																		34,980
5. Education/transport																		704,300
6. Other																		17,750
7. Public utilities		64,550	3120		67,670													67,670
		64,550	3120		67,670													315,390
8. Labour earnings						3081	814	23,300	24,350	2662	14,808	31,231	17,526	22,350	76,640	216,762	80	216,842
9. Profits						10,911	33,157	7457	7007	2687	4997	20,899	5184	19,092	9961	121,352	600	121,952
10. Rural municipalities		2527	6533		9060												−149	36,755
11. Urbanized rural municipalities		5378	13,903		19,281												−297	72,801
12. Dormitory towns		4274	11,049		15,323												−208	57,567
13. Small towns		2750	7108		9658												−149	39,119
14. Medium-sized towns		5740	14,838		20,578												−253	63,285
15. Large towns		11,140	28,799		39,939												−431	93,840
		31,180	82,230		114,040												−1487	363,367
16. Firms																		33,610
17. Government	13,060			6288	19,348	679	51	2346	269	62	49	698	-2917	1254	3574	11,027	−959	93,830
18. Social insurance		2720			2720												−730	88,730
19. Capital	20,550	−5250	3380		18,680	2470	1350	6980	4060	3140	1410	4190	6490	7490	5287	42,867	−16,790	82,744
	33,610	2530	3380	6288	40,748	3149	1401	9326	3791	3202	1459	10,388	3573	8744	8861	53,894	−18,479	298,914
20. Agriculture				−136	−136	974	0	21,779	0	0	0	203	12	0	259	23,227	10,565	36,675
21. Mining				134	134	22	285	5280	740	15,040	84	0	0	0	121	21,572	17,814	39,533
22. Light industry				1445	1445	10,786	46	23,952	2503	364	2185	4817	901	1044	4465	51,063	103,065	191,747
23. Heavy industry/electricity				10,053	10,053	351	276	3156	11,968	704	5800	805	784	426	2931	27,199	54,283	94,375
24. Public utilities				827	827	1503	120	2748	1781	435	381	1885	646	560	3052	13,111	17	27,410
25. Construction				30,706	30,706	459	97	1026	1135	147	10,131	326	278	2208	3273	19,080	1505	52,523
26. Trade etc.				5342	5342	1632	126	6598	2803	129	2448	2792	1672	564	1981	20,745	21,474	95,611
27. Transport etc.				461	461	202	256	1289	776	52	538	9552	1576	1669	2095	18,005	17,887	42,796
28. Banking etc.				4890	4890	670	143	4039	3369	136	943	3432	1201	4731	2447	21,111	2471	65,056
29. Service				−944	−944	369	26	1801	1001	172	227	672	700	1169	7034	13,173	11,189	130,30
				52,778	52,778	16,968	1375	71,668	26,076	17,179	22,737	24,484	7770	12,371	27,658	228,286	240,270	776,033
30. Rest of the world				23,678	23,678	2567	2786	79,996	33,151	1680	8522	8610	8745	2499	7184	155,740	24,522	245,508
	33,610	93,830	88,730	82,744	29,8914	36,676	39,533	191,747	94,375	27,410	52,523	95,612	42,798	65,056	130,304	776,034	245,508	233,087