

# A Social Accounting Matrix for Prato: Interrelating the Chinese Migrant Community and the Provincial Economy

Paola Biasi and Stefano Rosignoli

**Abstract** A social accounting matrix (SAM) is a descriptive and analytical tool that records the flows occurring between all of the actors of an economic system. SAMs represent the economic process, stressing its circularity in a flexible way. The disaggregation of the individual accounting blocks in a SAM make it possible to highlight particular interdependencies. Such interdependencies would remain hidden in traditional statements (two section accounts). We analyze the 2010 SAM estimated for Prato Province, distinguishing between the Chinese migrant community and the local community (that includes other migrant communities). This distinction allows us to quantify the contribution of the Chinese community to the entire provincial economy. We consider contributions such as the production of goods and services, the income generation, and the aggregate demand addressed to the system by the community itself. Using the estimated SAM as an impact modeling tool allows us to evaluate the economic effect of the integration policies of the Chinese community (additionally, in terms of overcoming local liabilities).

**Keywords** Social accounting matrix (SAM) · Input output · Multiplier analysis · Structural analysis · Social integration · Impact models

## 1 Introduction

We estimate a social accounting matrix (SAM) for the province of Prato for 2010, to analyze Prato's economic system, the contribution provided by the Chinese community, and the network of local and transnational relations of this community. Given the particular socio-economic connotation of the province and the flexibility

---

P. Biasi (✉)  
University of Florence, Florence, Italy  
e-mail: paola.biasi@unifi.it

S. Rosignoli  
IRPET, Florence, Italy  
e-mail: stefano.rosignoli@irpet.it

of the SAM structure, we distinguish two groups in the system: the Chinese migrant community, and the local community (including other migrant communities). The SAM helps to describe the provincial economic system as a whole, and can isolate the flows of goods and services, and of income and capital between all of the actors in the economic system. This matrix can quantify the contribution of the Chinese community to the entire provincial economy in terms of both the production of goods and services and income generation, and the aggregate demand addressed to the system by the community itself.

There is an extensive literature on the particularity of Prato's economic system. Extant studies examine the relationship between the international dimension of corporate activity and the local development in the years of maximum development (Colombi 2002); the history, the actual status, and the future consequences of Chinese business developments (Dei Ottati 2014); and the evolution of the social mobility of the Chinese community in Prato (Berti et al. 2013). We contribute to the field by offering a method to measure and evaluate the economic flows between the Chinese immigrants and other communities in the territory, both in terms of businesses and of families.

In Sect. 2, we present the SAM as a descriptive tool for economic systems, and indicate its origin, content, and usefulness on a local scale. Section 3 shows how SAMs evolved to describe a system, and how they can estimate the contribution of different migrant communities to the functioning of the system itself. Section 4 presents the main economic values (supply-and-use accounts, production and value-added sectors, exports, and taxes paid) to quantify their overall levels in the province. We distinguish the contribution of the Chinese community from the other entities operating in the area. We describe an input–output model based on a SAM in Sect. 5. We use this model to estimate the contribution of the Chinese community to the local economy in terms not only of the value added but also of the indirect and induced effects that propagate through the inter-sectoral relationships between companies and migrant communities.

## 2 Social Accounting Matrix

A SAM is a matrix that records the flows occurring between all of the actors (production activities and institutions) in an economic system in a given time period (usually 1 year). SAMs initially appeared in traditional economic theory as an extension of the input–output matrices, and are now widely used to analyze the economies in developing countries (Pyatt and Round 1985). Specifically, SAMs can consider the problems of income distribution that are particularly acute in developing countries. In the SAM acronym, the adjective *social* links precisely to the distribution of household income. Recently, SAMs have also been used to study developed economies. This progression is because of the increased availability, reliability, and standardization of national account data; of the usefulness of reconciling all of the accounting data in a single scheme that simultaneously represents

and makes them consistent; and of the importance of performing structural analyzes and building multi-sector models that simulate economic policies (Ministero dello Sviluppo Economico 2009).

SAMs represent the economic process, stressing its circularity in a flexible way. The disaggregation of the individual accounting blocks in a matrix makes it possible to highlight the particular interdependencies that would remain hidden in traditional accounting statements (accounts in two sections). Given the availability of statistical information, it is also possible to choose a suitable classification depending on the specific needs of the economic analysis.

SAMs form the basis of information for a wide range of multi-sector models, often developed within alternative theoretical frameworks (for example, linear models, general equilibrium models, and micro-macro simulation models). The flexible SAM structure allows calibrations to analyze specific parts of the economy, while remaining within a comprehensive and consistent macroeconomic framework (Scandizzo 1994). For example, SAMs facilitate the study of the macroeconomic impacts of specific sectoral policies, or the analysis of their geographical differentiation (multi-regional models, rural-urban disaggregation of the economy, migrant and autochthonous<sup>1</sup> groups).

The amount of statistical information available at a national level makes it relatively easy to construct a sufficiently disaggregated SAM. However, constructing a SAM at a sub-national level is more difficult, and more so again at a sub-regional level. At those levels, the lack of clear boundaries for external trade flows and the insufficient statistical coverage (often only representative at a national level) make it difficult to construct the matrices.

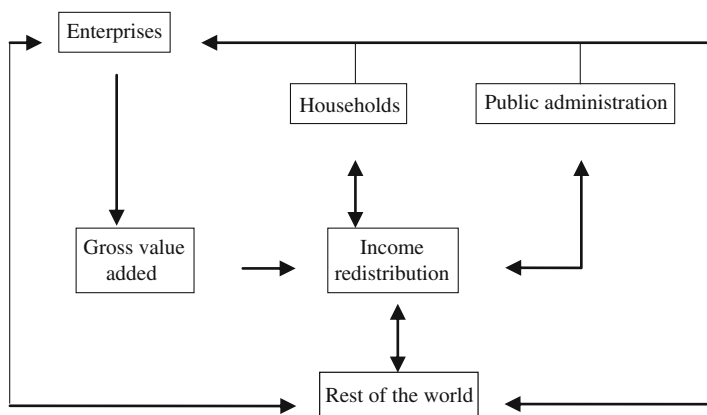
### **3 Using a Social Accounting Matrix to Describe an Economic System**

The economic cycle is a set of relationships among institutional sectors. The relationships are distinct in an aggregate way in households, businesses, and in public administration.

In an economic system, the first exchange relationship in the market takes place between businesses and households (see Fig. 1). The former sell goods and services to the latter for the market price of the consumer goods; the latter provide capital and labor to the former in return for interests and salaries (representing the remuneration for the production factors). The government is part of the economic system (for income redistribution) in organizational, regulatory, and equalization terms. The government uses tax transfers to make the economic system subject to other forces outside the market. In an open system, all of these subjects (and their

---

<sup>1</sup>In this chapter, we use the term autochthonous to refer to non-Chinese people (prevalently Italians, but also people coming from countries other than China or Italy).



**Fig. 1** Relationships among the institutional sectors of an economic system (authors' scheme)

relationships) interact with the rest of world (through exchanging goods, services, income, and transfers).

All of the flows in the economic circuit synthesized in Fig. 1 can be quantitatively described and inserted in the blocks of a SAM. We can modulate the level of detail as needed, depending on the availability of information and on the analytical objectives of the matrix.

When constructing the provincial SAM, we adopted a compact scheme that allows its use for different cognitive and simulation purposes. The economic agents included in the SAM are the local units of production located in the territory, regardless of the location of their headquarters. We often use the NACE ESA10 classifications to divide the units into production sectors. The other economic agents in the SAM are the institutional sectors, defined as decision-making centers and articulated in households, businesses, non-profit organizations, and public administrations situated in the province.

With the exception of their squareness, SAMs do not have a standard form. This leads to problems of uniformity, definition, and communication within the scientific community. However, it makes them extremely flexible instruments, adaptable to the study of particular contexts as a function of the amount of existing information and the ultimate purpose of their use. In the SAM built for Prato Province, we did not emphasize the distribution of income (as is the case with traditional SAMs). Instead, we highlighted the contribution made to the economic system by the migrant groups (particularly the Chinese) and the autochthonous groups compared with the other economic actors in the province.

As with any accounting matrix, Prato's SAM was estimated using indirect methods. The Regional Institute for Economic Planning of Tuscany (IRPET) annually estimates the accounting matrices at national, regional, and (for Tuscany) sub-regional levels. IRPET commonly adopts a system of cascade estimation, with matrices that start at the national level, progress through the regional level, and end

at the provincial and local systems level. To construct the matrices, IRPET makes use of all of the available data, from Italy's national institute of statistics (ISTAT) accounts to the existing administrative statistics. IRPET make several assumptions of stability, for example, the technical coefficients of the inter-sectoral matrices, the import and taxation coefficients, and the structuring of the demand components. Using this information, IRPET estimates a matrix of initial values, also called an unbalanced matrix because the row and column sums are not equal. A balance is then executed (using a procedure devised by Stone et al. in 1942) that starts from the unbalanced initial data and their reliability values. The initial data are iteratively adjusted with an oscillation possibility that depends on the reliability assigned to each. Following the balancing procedure, the matrices obtained have equal row and column sums, and the aggregates are consistent with the data published by ISTAT.

Building a SAM combines the collection of available data from several sources with mathematical algorithms to find the coherence between all of the economic flows in one year and in one economic system (Pyatt and Round 1985). We made several assumptions for Prato's SAM, given the current data availability (from official and non-official sources) at a local scale. The assumptions relate to estimating the initial flows concerning businesses (production, value added, and exports) and families (income, direct taxes, and private consumption). This chapter does not describe the assumptions; it simply considers the use of the balanced SAM.<sup>2</sup>

The SAM produced by IRPET for the province of Prato consists of 67 rows and columns, organized according to the following classifications:

- We divide the production sectors into 28 branches that correspond to the subdivisions of ISTAT's sectoral regional accounting. For some particular branches, we separate the Chinese businesses from the other businesses in the sector.
- We divide the institutional sectors (approximately six) into Chinese and non-Chinese households, Chinese and non-Chinese businesses (including family businesses, corporations, and quasi-corporations), private non-profit institutions serving households (NPISHs), and public administration.
- We divide the rest of world into three areas: the rest of Tuscany, the rest of Italy, and abroad. We adopt this distinction to estimate the flows of imports-exports, of tourism expenditure, and of current and capital accounts.

Table 1 summarizes the accounting matrix estimated for the province of Prato (without separating the blocks according to the different classifications).

We outline below what each of the titles associated with the SAM blocks represents.

**Inter-sectoral exchanges:** the trade of goods and services bought and sold among the production branches (disaggregated using the classifications in Table 5 that show the areas and the migrant and autochthonous groups).

---

<sup>2</sup>Previous works describe the SAM estimating procedure. These include IRPET (2014), Ministero dello Sviluppo Economico (2009), Casini Benvenuti and Paniccià (2003), and Targetti (2004).

**Table 1** Block structure of Prato's SAM (estimates from Prato's 2010 provincial SAM)

	Branches	VA	Consumption	Balances	Paid transfers	Exports	Incoming tourism expenditure	Capital outflows	Incoming income flows
Production branches	Inter-sectorial exchanges	0.00	Domestic consumptions	0.00	0.00	Exports	0.00	Investments	0.00
VA and taxes	Domestic VA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Incoming VA
Domestic consumptions	0.00	0.00	0.00	0.00	Resident consumptions	0.00	Incoming tourism expenditure	0.00	0.00
Balances	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Balance of sectors	0.00
Received transfers	0.00	Primary income	0.00	0.00	Inter-sectorial current transfers	0.00	0.00	0.00	Incoming current transfers
Imports	Imports	0.00	0.00	Balance of trade	0.00	0.00	0.00	0.00	0.00
Outgoing tourism expenditure	0.00	0.00	0.00	Tourism balance	Outgoing tourism expenditure	0.00	0.00	0.00	0.00
Savings + capital revenues	0.00	0.00	0.00	0.00	Savings	0.00	0.00	Inter-sectorial capital transfers	Incoming capital transfers
Outgoing income flows	0.00	Outgoing VA	0.00	Current account balance	Outgoing current transfers	0.00	0.00	Outgoing capital transfers	0.00

VA Value added

**Domestic consumption:** the expenditure on the purchase of goods and services by (Chinese and non-Chinese) households, private non-profit social institutions, and public administration.

**Export:** the sale of goods and services to other provinces of Tuscany, to other Italian regions, and abroad.

**Investments:** the purchases of property and capital equipment for production, plus the change in inventories and acquisition less the disposal of valuables. We separate the investments by the owning institutional sector and by purchased goods and services.

**Domestic VA:** the sector's value added generated by the province's production units, distinguished by sector.

**Incoming VA:** the value added coming from outside of Prato Province (the rest of Tuscany, the rest of Italy, and abroad).

**Resident consumption:** the purchase of goods and services by the resident households, divided between Chinese and non-Chinese households.

**Primary income:** the attribution of the valued added to the local institutional sectors (households, businesses, private non-profit social institutions, and public administration).

**Current transfers:** the current transfers between institutional sectors (mainly from social benefits, social contributions, and direct taxes).

**Incoming current transfers:** the current input from outside Prato (the rest of Tuscany, the rest of Italy, and abroad).

**Outgoing current transfers:** the current output to outside Prato (the rest of Tuscany, the rest of Italy, and abroad).

**Incoming tourism expenditure:** the inbound tourism expenditure by area of origin (the rest of Tuscany, the rest of Italy, and abroad).

**Outgoing tourism expenditure:** the outbound tourism expenditure by destination (the rest of Tuscany, the rest of Italy, and abroad).

**Savings:** the savings distinguished by the institutional sector.

**Capital transfers:** the capital transfers between the institutional sectors, including capital and inheritance taxes, tax amnesties, and direct investments between institutional sectors.

**Incoming capital transfers:** the money transfers from the outside for the purchase of capital goods. The transfers correspond to the usual foreign direct investments (FDIs), in this case calculated for the flows coming from Tuscany and from Italy. Additionally, this block records a number of European investment funds.

**Outgoing capital transfers:** the money transfers to the outside for the purchase of capital goods. The transfers correspond to the usual FDIs, in this case calculated for the flows going to Tuscany and to Italy. Mirroring the incoming capital transfer block, this block also records some capital taxes intended for European institutions.

#### 4 Analyzing the Economic System and the Contribution of the Chinese Community Using the Provincial Accounts Extracted from the Social Accounting Matrix

The SAM consists of blocks with a precise economic meaning. The blocks retrace the entire economic circuit, starting from the final demand and accounting for the production and generation of value added, the distribution and redistribution of income, the consumption and savings, the capital transfers, and the net debt.

Prato's SAM estimated for migrants includes several account aggregates referring to the entire economic context, and distinguishes whether they are ascribable to the Chinese community or to the other residents in the area. This distinction concerns the production units and the households. Table 2 is an aggregate synthesis of the matrix, containing only the flows of final demand and production (as in a traditional input–output table).

The input–output matrix (Table 2) extracted from Prato's SAM describes the economic system and the linkages among the businesses and the households of both the Chinese migrants and the other communities (including the Italian) in the province. We denote with  $T(i,j)$  the matrix blocks with row  $i$  and column  $j$  as coordinates, and discuss their significance.

Starting with the first row, block  $T(1,1)$  represents the inter-sectoral exchanges among the production units; that is, the amount of goods and services exchanged between the branches. Moving to the right, block  $T(1,2)$  gives the final consumption of the (Chinese and non-Chinese) households, block  $T(1,3)$  gives the consumption of public administration and of private non-profit social institutions, block  $T(1,4)$  gives the investments, and block  $T(1,5)$  gives the exports.

In the second row, block  $T(2,1)$  gives the value added generated by businesses (distinguished between Chinese and non-Chinese). The entire third row consists of

**Table 2** Simplified input–output migrants/autochthons matrix (million €) (estimates from Prato’s 2010 SAM)

	Chinese businesses	Non-Chinese businesses	Consumptions of Chinese household	Consumptions of non-Chinese household	PA and NPISH expenditure	Investments of Chinese households and businesses	Investments of rest of economy	Exports to rest of Italy	Exports to rest of world	Row total
	1		2		3	4		5		6
Chinese businesses	376	704	18	188	13	5	65	936	767	3,072
Non-Chinese businesses	1,072	4,571	139	2,613	1,319	115	1,346	2,802	1,378	15,355
VA	669	5,042								5,711
Net indirect taxes	15	116	16	352	3	5	63	0	18	588
Imports from rest of Italy	624	3,262								3,886
Imports from rest of world	315	1,660								1,975
Column total	3,072	15,355	173	3,153	1,335	125	1,475	3,738	2,163	

*NPISH* Private non-profit institutions serving households; *PA* Public administration; *VA* Value added

the net indirect taxes on products paid for by both the intermediate costs (column 1) and the components of final demand (columns 2–5). In the fourth row, block T(4,1) represents the imports from the rest of Italy. Finally, in the fifth row, block T(5,1) represents the imports from the rest of world.

It is possible to extract different types of economic aggregates from the SAM, distinguished both by sector (for production branches or institutional sectors) and by aggregate. This section briefly presents a series of aggregate tables extracted from Prato’s SAM. The tables outline the provincial gross domestic product (GDP) and the main component account (Table 3); the GDP decomposition (Table 4); the production, value added data, intermediate costs, and indirect taxes by sector (Table 5); the sectoral composition of the value added by the Chinese businesses (Table 6); the share of the value added by the migrant/autochthonous groups (Table 7); and the exports to the rest of Italy and the rest of world (Tables 8 and 9).

The supply-and-use account shown in Table 3 is similar to a photograph of the economic system. It has two sections: the resource section comprises GDP, and indicates the amount of income generated by the system and by imports (that is, the amount of goods and services coming from the rest of world). The use section shows the components of final demand. This represents the quantities of goods and services asked by households and tourists, NPISH and public administration expenditures, investments (in this case including changes in inventories), and exports. In the estimated account, the amounts of resources and uses will correspond.

According to the estimates, in 2010 the provincial GDP amounted to €6.29 billion, with the GDP produced by Prato’s Chinese businesses at €704.5 million (11.2% of the total). The total resident household consumption was €3.32 billion, with €172 million ascribable to Chinese households (5.2% of total domestic



**Table 3** Main components of provincial gross domestic product separated by migrant/autochthonous group (million €) (estimates from Prato's 2010 SAM)

	Values	Shares
GDP (Chinese community)	704.65	11.2%
GDP (rest of economy)	5594.38	–
Imports from rest of Italy	3886.04	–
Imports from rest of world	1975.02	–
Total (resources)	12,160.08	–
Household expenditures (Chinese community)	172.73	5.2%
Household consumption (rest of economy)	3117.59	–
Tourism expenditure	35.31	–
PA expenditure	1313.26	–
NPISH expenditure	21.56	–
Gross investments (Chinese community)	124.56	7.8%
Gross investments (rest of economy)	1474.59	–
Export to rest of Italy	3737.66	–
Export to rest of world	2162.83	–
Total (uses)	12,160.08	–

*GDP* Gross domestic product; *NPISH* Private non-profit institutions serving households; *PA* Public administration

**Table 4** GDP decomposition (€ million) (estimates from Prato's 2010 SAM)

	Allocation of GDP
Compensation of Employees (earned by Chinese households)	198
Compensation of Employees (earned by rest of households)	2470
Gross Operating Surplus allocated to Chinese businesses	514
Gross Operating Surplus allocated to other businesses	3585
Indirect taxes and Gross Operating Surplus allocated to Public Administration	725
Total	7492

*GDP* Gross domestic product

consumption). The gross fixed investments were €1.6 billion, with €124.56 ascribed to Chinese businesses and households (7.8% of the total).

The generated GDP is territorially distributed to households, businesses, and public administration through the compensation of employees, the gross operating surplus (GOS), and net indirect taxes. Two percent of GDP is allocated to Chinese households, 7% to Chinese businesses, 33% to non-Chinese households, and 48% to non-Chinese businesses (in terms of GOS). The remaining 10% is constituted by indirect taxes, and a small part of GOS is attributed to the government.

**Table 5** Production and sectoral value added by migrant/autochthonous group, (million €) (estimates from Prato's 2010 SAM)

Production sectors	Production	VA	Intermediate costs	Indirect taxes
Agriculture, hunting and forestry	41	25	15	0
Fisheries, fish farming and related services	1	0	1	0
Extractive industry	6	4	2	0
Food, beverages and tobacco industries	96	16	80	0
Textiles, apparel and leather industries (Chinese community)	1730	483	1237	10
Textiles, apparel and leather industries (rest of economy)	1820	468	1341	11
Wood, paper and publishing industries	114	37	77	1
Coke industries, refineries, chemical and pharmaceutical industries	84	24	60	1
Manufacture of rubber, plastic and non-metallic mineral products	93	28	64	1
Metallurgy, except machinery and equipment	110	43	66	1
Electrical and electronic equipment, machinery (n.e.c.)	426	132	292	2
Manufacture of transport equipment	34	4	30	0
Manufacture of furniture; other manufactures; repairs (Chinese community)	39	13	25	0
Manufacture of furniture; other manufactures; repairs (rest of economy)	164	60	103	1
Electricity, gas, steam and air conditioning supply	263	137	123	2
Water supply; sewerage, waste management	188	90	96	2
Other industrial activities (Chinese community)	26	9	17	0
Construction (Chinese community)	4	2	2	0
Construction	869	295	568	6
Wholesale and retail trade; repair of motor vehicles and motorcycles (Chinese community)	207	94	110	3
Wholesale and retail trade; repair of motor vehicles and motorcycles (rest of economy)	1142	584	541	17
Transportation and storage	758	323	424	11

(continued)

**Table 5** (continued)

Production sectors	Production	VA	Intermediate costs	Indirect taxes
Accommodation and food service activities (Chinese community)	27	15	13	0
Accommodation and food service activities	263	149	112	2
Information and communication services	329	179	148	2
Financial and insurance activities	361	195	156	10
Real estate activities (Chinese community)	40	24	16	0
Real estate activities	1176	1007	165	3
Professional, scientific and technical activities	488	262	220	5
Administrative and support service activities	369	164	201	4
Public Administration	380	261	108	12
Education	330	278	46	6
Human health and social work activities	285	129	144	12
Arts, entertainment and recreation	69	32	35	2
Other service activities (Chinese community)	21	15	6	0
Other service activities (rest of economy)	176	119	55	2
Other services (Chinese community)	38	15	23	1
<b>Total</b>	<b>12,566</b>	<b>5711</b>	<b>6723</b>	<b>131</b>
–Chinese community	2132	669	1448	15
–Rest of economy	10,433	5042	5275	116
Chinese community's percentage share on total value	17.0%	11.7%	21.5%	11.6%

ISTAT Branch classification of regional accounts (Aggregation of NACE REV.2 Classification)  
VA Value added

**Table 6** Sectoral composition of Chinese businesses (% share) (estimates from Prato's 2010 SAM)

Textile and clothing	81.1%
Other manufactures	3.0%
Construction	0.2%
Trade	9.7%
Accommodation and food service activities	1.3%
Other services	4.6%

In addition to the snapshot of the economic system offered by the supply-and-use account, we can observe the amounts of production, value added, intermediate costs, and indirect taxes produced at the sectoral level. We can distinguish the

**Table 7** Percentage share of sectoral production by migrant/autochthonous group (estimates from Prato's 2010 SAM)

Production sectors	Chinese community (%)	Rest of the economy (%)
Agriculture	0	100
–Textile and clothing	49	51
–Furniture and other manufactures	19	81
Other industries	1	99
Construction	0	100
–Trade	15	85
–Accommodation and food service activities	9	91
Other services	1	99

**Table 8** Exports by sector and migrant/autochthonous group (million €) (estimates from Prato's 2010 SAM)

Production sectors	Export to rest of Italy	Export to rest of world
Agriculture, hunting and forestry	29.8	3.3
Fisheries, fish farming and related services	0.2	0.1
Extractive industry	1.9	0.9
Food, beverages and tobacco industries	76.9	12.9
Textiles, apparel and leather industries (Chinese community)	850.5	695.7
Textiles, apparel and leather industries (rest of economy)	897.6	739.7
Wood, paper and publishing industries	90.9	9.8
Coke industries, refineries, chemical and pharmaceutical industries	33.3	29.3
Manufacture of rubber, plastic and non-metallic mineral products	48.5	33.5
Metallurgy, except machinery and equipment	85.3	9.4
Electrical and electronic equipment, machinery (n.e.c.)	265.5	103.8
Manufacture of transport equipment	6.4	17.1
Manufacture of furniture; other manufactures; repairs (Chinese community)	16.7	18.9
Manufacture of furniture; other manufactures; repairs (rest of economy)	72.3	80.9
Electricity, gas, steam and air conditioning supply	1.8	0.0
Water supply; sewerage, waste management	35.4	0.0
Other industrial activities (Chinese community)	16.5	4.9
Construction (Chinese community)	0.0	0.0
Construction	4.7	1.6

(continued)

**Table 8** (continued)

Production sectors	Export to rest of Italy	Export to rest of world
Wholesale and retail trade; repair of motor vehicles and motorcycles (Chinese community)	31.2	45.5
Wholesale and retail trade; repair of motor vehicles and motorcycles	150.4	232.5
Transportation and storage	309.2	27.4
Accommodation and food service activities (Chinese community)	4.9	0.1
Accommodation and food service activities	46.4	1.3
Information and communication services	103.3	10.8
Financial and insurance activities	65.1	2.3
Real estate activities (Chinese community)	6.3	0.5
Real estate activities	314.3	18.7
Professional, scientific and technical activities	32.9	19.0
Administrative and support service activities	59.0	18.9
Public Administration	0.2	0.1
Education	26.2	0.2
Human health and social work activities	0.7	0.0
Arts, entertainment and recreation	10.2	1.1
Other service activities (Chinese community)	4.6	0.4
Other service activities (rest of economy)	33.5	3.1
Other services (Chinese community)	5.3	0.8
<b>Total</b>	<b>4098.7</b>	<b>2314.2</b>
–Chinese community	935.9	766.8
–Rest of economy	3162.8	1547.5
Chinese community's percentage share on total value	22.8%	33.1%

ISTAT Branch classification of regional accounts (Aggregation of NACE REV.2 Classification)

**Table 9** Percentage share of sectoral exports by migrant/autochthonous group with respect to the sectoral total (estimates from Prato's 2010 SAM)

Value of foreign exports	Chinese community (%)	Rest of economy (%)
Textile and clothing	48.5	52
Furniture and jewelry	19.0	81
Other manufacturing activities	0.5	100

Chinese sectors and production units from the other units operating in the context under scrutiny.

As shown in Table 5, the production value of the Chinese businesses in Prato is approximately €2.13 billion (17% of the total provincial production) and the value added is approximately €669 million (11.7% of the provincial total). The value

added percentage share is lower than the production percentage share because Chinese businesses concentrate in low-value-added sectors.

Table 6 highlights the importance of the textile and clothing sector for Chinese businesses in Prato. Over 81% of the total Chinese production in the province is in the textile and clothing sector.

Table 7 shows the percentage of the total production (per macro-sector) generated by Chinese businesses. The table shows that Chinese firms produce 49% of Prato's total textile and clothing outputs, 19.17% of its furniture and fittings, 15.36% of its trade, and 9.45% of its housing and food services. Chinese businesses have a marginal impact in the other sectors in the province.

To verify the reasonableness of the estimates obtained, we look at the foreign exports of Chinese businesses. In 2010, Chinese businesses in Prato had exports of approximately €766.8 million (33.1% of the total exports from the province) (Table 8). These data are in line with the sectoral export coefficients for the rest of Tuscany. Chinese businesses export a high share of the total exports of goods for two reasons. First, because of the sectoral composition (Chinese businesses are concentrated in manufacturing sectors with high export rates). Second, because of the high degree of internationalization that characterizes these businesses. For example, Chinese firms export 48.5% of Prato's textile and clothing, and 19.0% of its furniture and jewelry (Table 9).

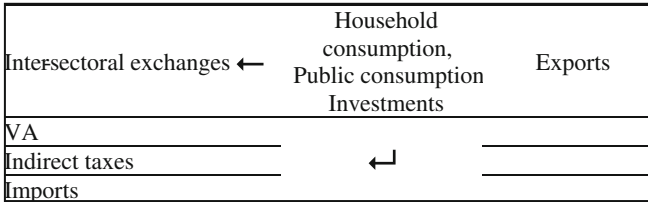
## 5 From the Matrix to the Economic Impact Model

Accounting matrices provide a partial or whole representation of the flows among the agents of an economic system for a particular year. The single blocks and the single cells in these matrices indicate the level of specific economic aggregates. Accordingly, the matrices provide a descriptive analysis of the economic systems, and are models that are capable of linking these aggregates.

IRPET constructs the accounting matrices annually, and continually enhances its analysis and the modelling tools drawn from accounting matrices. IRPET starts with elementary models and gradually incorporates increasingly complex models. The most traditional products of this modeling are Vassily Leontief's input-output models, also called Leontievan models. Their best-known reduced form is:

$$X = (I - A)^{-1}Y,$$

where  $X$  is the vector of sectoral production (the model's endogenous variable),  $Y$  is the vector of final demand (the model's exogenous variable), and  $(I - A)^{-1}$  is Leontief's inverse matrix (also called Leontief's matrix), with  $A$  as the matrix of the technical coefficients of the symmetric input-output table. The dimension of the vectors and of the inverse matrix will match with the number of the production sectors classified in the inter-sectoral matrix.



**Fig. 2** One-year economic process using input–output matrices (authors’ scheme). VA Value added

The Leontievan input–output equation is based on the most elementary assumptions made in the table. It supposes that the economy is closed to external trade (no imports or exports), and that there are no indirect taxes, trade margins, or induced effects on household consumption. As the matrices are gradually filled with additional information, the resulting inter-sectoral models are extended with improved specifications, more appropriate to describe the economic system in the short term.

The one-region input–output models produced by IRPET use symmetrical one-region input–output matrices and describe one part of the economic process. The part described starts from demand, and leads to the import of goods and services, their domestic production, and their income generation (Fig. 2).

This simulation allows the definition of the exogenous components (the final demand vectors of the symmetric matrices), and accordingly determines the endogenous components (production, value added, net indirect taxes, and imports). The exogenous variables used in the evaluation are precisely the demand vectors, with as many elements as the number of sectors in the model’s input–output table. In the case of the Prato province, there are 28 branches, some of which distinguish between Chinese businesses and other businesses. The impact results can be presented in an aggregate form, or by sector, in terms of direct, indirect, and induced impact.

The tables in Sect. 4 descriptively illustrate the shares of production, value added, GDP, domestic final demand, and exports generated by the Chinese community compared with the total economy. When an input–output model accounts for the existing interrelationships between branches and institutional sectors, then we can infer the indirect and induced contributions to the economy of the Chinese households and businesses.

Table 10 shows the overall quantity of the entries in the supply-and-use account that are directly or indirectly attributable to Chinese businesses and households. If Prato’s Chinese community did not exist, and if the demand addressed to its firms was not met by local producers, then the various entries in the supply-and-use

**Table 10** Impact of the Chinese community's final demand (input–output model estimates)

Supply-and-use account	Entries of the supply-and-use account due to (million euro and total percentage share)							Total	Share of total economy (%)
	Consumptions of Chinese households	Investments of Chinese businesses and households	Regional exports of Chinese businesses	Foreign exports of Chinese businesses	Rest of demand met by Chinese businesses' production				
<i>VA of Chinese community</i>	5.5	1.4	292.3	238.5	131.3		669.0	100.0	
<i>VA of rest of economy</i>	76.0	39.4	134.4	111.3	107.8		469.0	9.3	
<b>Total VA</b>	<b>81.56</b>	<b>40.83</b>	<b>426.68</b>	<b>349.82</b>	<b>239.15</b>		<b>1138.0</b>	<b>19.9</b>	
<i>Net indirect taxes</i>	16.99	5.26	9.31	120.58	141.78		293.9	33.2	
<b>GDP</b>	<b>98.54</b>	<b>46.09</b>	<b>435.99</b>	<b>470.40</b>	<b>380.93</b>		<b>1432.0</b>	<b>21.7</b>	
Inter-regional import	51.03	50.70	316.54	258.68	730.70		1,407.6	36.2	
Foreign import	23.16	27.76	183.41	150.49	375.04		759.9	38.5	
<b>Resources</b>	<b>172.73</b>	<b>124.56</b>	<b>935.94</b>	<b>879.57</b>	<b>1486.67</b>		<b>3599.5</b>	<b>28.9</b>	
Intermediate demand	0.00	0.00	0.00	0.00	1189.40		1189.4	0.0	
Household expenditure	172.73	0.00	0.00	0.00	211.22		384.0	11.5	
PA and NPISH consumption	0.00	0.00	0.00	0.00	13.03		13.0	1.0	
Gross investment	0.00	124.56	0.00	0.00	73.01		197.6	12.4	

(continued)



**Table 10** (continued)

Supply-and-use account	Entries of the supply-and-use account due to (million euro and total percentage share)						Total	Share of total economy (%)
	Consumptions of Chinese households	Investments of Chinese businesses and households	Regional exports of Chinese businesses	Foreign exports of Chinese businesses	Rest of demand met by Chinese businesses' production			
Inter-regional export	0.00	0.00	935.94	0.00	0.00		935.9	25.0
Foreign export	0.00	0.00	0.00	879.57	0.00		879.6	35.8
<b>Uses</b>	<b>172.73</b>	<b>124.56</b>	<b>935.94</b>	<b>879.57</b>	<b>1486.67</b>		<b>3599.5</b>	<b>28.9</b>

*GDP* Gross domestic product; *NPISH* Private non-profit institutions serving households; *PA* Public administration; *VA* Value added

**Table 11** Share of provincial GDP activated by the Chinese community's final demand (input-output model estimates)

	Chinese businesses (%)	Businesses of other groups (%)
Consumption of Chinese households	0.1	1.3
Investments of Chinese businesses and households	0.0	0.7
Regional exports of Chinese businesses	5.1	2.4
Foreign exports of Chinese businesses	4.2	1.9
Rest of demand met by Chinese businesses' production	2.3	1.9

account would reduce. The final column in Table 10 represents the size of such a reduction for each item. If the Chinese community did not exist, then the GDP of Prato Province would be 21.7% lower, the value added of non-Chinese firms would reduce by 9.3%, and regional and foreign imports would decrease by 36.2 and 38.5%, respectively.

The community's overall contribution corresponds to the sum of the single contributions for each component of demand whose presence is explained by the very existence of Prato's Chinese community. According to the results presented in Table 11, setting the total value added of the Prato province at 100, the portion of consumption by Chinese households represents 1.4%, where 0.1% is satisfied by the Chinese businesses and 1.3% is satisfied by other businesses. The investments of Chinese businesses and households produce 0.7% of GDP, all of which is achieved by non-Chinese businesses. The regional exports of Chinese businesses generate 7.5% of provincial value added (5.1% relates to the Chinese firms and 2.4% to the rest of economy). The foreign exports of Chinese businesses activate an overall value added of €349.8 million, which corresponds to 6.1% (4.2% generated by the Chinese firms and 1.9% by the rest of economy) of Prato's total. Finally, the rest of the (intermediate and final) demand<sup>3</sup> represents a share of 4.2% of provincial value added, where 2.3% is obtained by Chinese businesses and 1.9% by those of other groups. Table 12 gives the sectoral distribution of the direct and indirect contributions of the Chinese community.

The indigenous sectors that take the most advantage of the existence of Chinese businesses and households are, in order of importance: electricity supply, in which 23% of provincial value added is owing to the presence of the Chinese community; professional activities (16.8%); administrative activities (16.0%); financial and insurance activities (13.1%), and trade (10.1%).

<sup>3</sup>For this case, we assumed that if Chinese businesses did not exist, then this section of demand would not be met by the local production of indigenous businesses, and would thus vanish.

Table 12 Final demand related to the Chinese community (input-output model estimates)

VA	VA due to (million euro and total percentage share)							Total	Share of total economy (%)
	Consumptions of Chinese households	Investments of Chinese businesses and households	Regional exports of Chinese businesses	Foreign exports of Chinese businesses	Rest of demand met by Chinese businesses' production				
Agriculture, hunting and forestry	0.11	0.01	0.48	0.38	0.16		1.1	4.5	
Fisheries, fish farming and related services	0.00	0.00	0.00	0.00	0.00		0.0	0.0	
Extractive industry	0.02	0.02	0.14	0.11	0.07		0.4	8.2	
Food, beverages and tobacco industries	0.04	0.00	0.04	0.03	0.02		0.1	0.9	
Textiles, apparel and leather industries (Chinese community)	0.37	0.05	249.30	203.94	29.15		482.8	100.0	
Textiles, apparel and leather industries (rest of economy)	0.14	0.04	10.51	8.60	2.28		21.6	4.6	
Wood, paper and publishing industries	0.08	0.04	0.17	0.15	0.09		0.5	1.4	
Coke industries, refineries, chemical and pharmaceutical industries	0.06	0.03	0.59	0.49	0.25		1.4	6.0	
Manufacture of rubber, plastic and non-metallic mineral products	0.03	0.07	0.24	0.20	0.09		0.6	2.2	
Metallurgy, except machinery and equipment	0.07	0.13	0.16	0.12	0.07		0.5	1.3	
Electrical and electronic equipment, machinery (n.e.c.)	0.12	1.16	0.33	0.28	0.19		2.1	1.6	

(continued)

Table 12 (continued)

VA	VA due to (million euro and total percentage share)							Share of total economy (%)
	Consumptions of Chinese households	Investments of Chinese businesses and households	Regional exports of Chinese businesses	Foreign exports of Chinese businesses	Rest of demand met by Chinese businesses' production	Total		
Manufacture of transport equipment	0.01	0.05	0.02	0.02	0.02	0.1	3.1	
Manufacture of furniture; other manufactures; repairs (Chinese community)	0.02	0.03	5.83	6.59	1.00	13.5	100.0	
Manufacture of furniture; other manufactures; repairs (rest of economy)	0.06	0.15	0.07	0.06	0.04	0.4	0.6	
Electricity, gas, steam and air conditioning supply	0.93	0.42	13.82	11.41	5.97	32.6	23.7	
Water supply; sewerage, waste management	1.34	0.22	5.65	4.61	2.31	14.1	15.8	
Other industrial activities (Chinese community)	0.01	0.02	5.82	1.77	1.34	9.0	100.0	
Construction (Chinese community)	0.00	0.07	0.01	0.01	1.65	1.7	100.0	
Construction	0.38	14.88	1.60	1.32	1.08	19.3	6.5	
Wholesale and retail trade; repair of motor vehicles and motorcycles (Chinese community)	2.12	0.83	18.01	23.81	49.35	94.1	100.0	
Wholesale and retail trade; repair of motor vehicles and motorcycles	6.86	4.84	21.37	17.66	8.16	58.9	10.1	

(continued)

Table 12 (continued)

VA	VA due to (million euro and total percentage share)								Total	Share of total economy (%)
	Consumptions of Chinese households	Investments of Chinese businesses and households	Regional exports of Chinese businesses	Foreign exports of Chinese businesses	Rest of demand met by Chinese businesses' production					
Transportation and storage	3.03	1.13	10.91	9.04	5.79				29.9	9.3
Accommodation and food service activities (Chinese community)	0.38	0.06	2.98	0.42	10.66				14.5	100.0
Accommodation and food service activities	2.61	0.57	4.01	3.33	2.77				13.3	8.9
Information and communication services	1.65	1.85	5.50	4.58	3.66				17.2	9.6
Financial and insurance activities	3.28	0.95	8.38	6.77	6.03				25.4	13.1
Real estate activities (Chinese community)	1.51	0.22	3.80	0.32	17.95				23.8	100.0
Real estate activities	44.58	10.32	17.78	15.14	12.86				100.7	10.0
Professional, scientific and technical activities	2.29	1.17	17.36	14.46	8.77				44.0	16.8
Administrative and support service activities	1.39	0.76	10.06	8.32	5.60				26.1	16.0
Public Administration	0.11	0.03	0.36	0.30	0.14				0.9	0.4
Education	2.08	0.14	1.72	1.43	0.97				6.3	2.3
Human health and social work activities	0.19	0.01	0.05	0.04	0.04				0.3	0.3
	0.42	0.09	1.17	0.96	0.64				3.3	10.3

(continued)

Table 12 (continued)

VA	VA due to (million euro and total percentage share)							Total	Share of total economy (%)
	Consumptions of Chinese households	Investments of Chinese businesses and households	Regional exports of Chinese businesses	Foreign exports of Chinese businesses	Rest of demand met by Chinese businesses' production				
Arts, entertainment and recreation									
Other service activities (Chinese community)	0.99	0.05	3.46	0.49	9.74		14.7	100.0	
Other service activities (rest of economy)	4.15	0.37	1.90	1.55	0.79		8.8	7.4	
Other services (Chinese community)	0.12	0.10	3.07	1.14	10.50		14.9	100.0	
<b>Total</b>	<b>81.56</b>	<b>40.83</b>	<b>426.68</b>	<b>349.82</b>	<b>239.15</b>		<b>1,138.0</b>	<b>19.9</b>	
-Chinese community	5.5	1.4	292.3	238.5	131.3		669.0	100.0	
-Rest of economy	76.0	39.4	134.4	111.3	107.8		469.0	9.3	
Chinese community's percentage share on total value	6.8%	3.5%	68.5%	68.2%	54.9%		58.8%		

VA Value added

## 6 Economic Evaluation of Provincial Policies

It is difficult to evaluate the economic development in the area reproduced by the accounting matrix, because there are several complex and interacting growth determinants. However, considering the development prospects of the area's predominant economic sector (textile and clothing) we can envisage a scenario with the following characteristics:

1. The technological and qualitative improvement of the entire fashion sector, entailing an increased quality (and price) of the products.
2. The reduction in the local production of semi-finished goods, resulting in an intensification of foreign imports (especially from China).
3. The growth in the demand for intermediate and sector-specific ancillary services, such as marketing and sales, and research and development services.

**Table 13** Scenarios in the textile and clothing sector and changes in the SAM's exogenous variables (authors' assumptions)

1	Technological and qualitative improvement of the entire fashion sector, entailing an increased quality (and price) of products	The T&C sector's investments in machinery and equipment increase by 1% of current value
		The T&C sector's investments in research and development increase by 1% of current value
2	Reduction in the local production of semi-finished goods, resulting in an intensification of foreign import (especially from China)	The coefficient of imports (ratio between imports and total domestic demand) of products in the T&C sector increases by 1 percentage point
		The T&C sector's export prices increase by 1% of current price
3	Growth in the demand for intermediate and sector-specific, ancillary services, like marketing and sales, research and development services	The T&C sector's technical coefficient of business services (demand for business services on production) increases by 1 percentage point
		The T&C sector's share of VA (VA on production) increases by 1 percentage point, with a consequent reduction of technical coefficients
4	Increase in the exports to the EU and US	The exports of products in the T&C sector experience a real increase (net of prices) of 1%
5	Upgrade of Chinese firms to meet the quality and economic standards set by the Italian firms	The labour costs for the Chinese businesses in the T&C sector increase, taxation and insurance contributions align to the Italian standards, with a consequent negative impact on income and induced consumption

T&C Textile and clothing; VA Value added

4. The increase in the exports to the European Union (EU) and the United States (US).
5. The upgrade of Chinese businesses to meet the quality and economic standards set by Italian firms.

We can use the SAM as an economic evaluation tool for such scenarios, providing the assumptions are quantified in terms of (intermediate and final) demand. We use the SAM estimated for 2010 as the benchmark value of the provincial economy's annual flows. By modifying the level of some of the exogenous components of the SAM, we can consider the economic effect of these transformations in terms of the gap from the benchmark. Table 13 shows the equivalence between the above-illustrated scenarios and the percentage changes (compared with the benchmark value) in some of the demand components.

In scenarios 1–4, the considered variations are equal to one (as a percentage compared with the current value or a percentage point change in the corresponding coefficient). This is because it is impossible to accurately predict how the variables will evolve. By setting the variables equal to one, it is possible to calculate (using the simulation model based on the estimated SAM) their elasticity on GDP and on labor units. This corresponds to the percentage change the two variables will make, depending on the unit percentage change of each exogenous variable (modified as in Table 13). The fifth scenario differs from the others in that its corresponding assumption consists of the alignment of the contribution and tax burden to the

**Table 14** Growth evaluation in association with the province's development prospects (SAM model estimates)

	Increase of GDP (million euro)	Increase of LUs (in units)	GDP percentage change (%)	LUs percentage change (%)
Investments in machinery and equipment (1% of current value)	0.03	0.33	0.00	0.00
Investments in research and development (1% of current value)	0.90	12.75	0.03	0.03
Increase of T&C's import coefficient (1 percentage point)	-2.28	-54.50	-0.05	-0.05
Increase of exports (1% of current value)	10.43	168.00	0.18	0.17
Increase of technical coefficient of business services (1 percentage point) and reduction of the other technical coefficients	10.33	380.00	0.18	0.39
Increase of the VA coefficient (1 percentage point) and reduction of technical coefficients	26.85	-141.83	0.47	-0.15
Real increase of exports (1% of current value)	10.43	168.00	0.17	0.17
Reduction of induced consumptions due to the actual increase of contribution and taxation (adjusted to the rest of economy)	-27.00	-215.00	-0.50	-0.20

*GDP* Gross domestic product; *LU* Labor unit; *T&C* Textile and clothing; *VA* Value added



standard levels of the other businesses, which implies a reduction of job and fiscal irregularities. The results (in terms of elasticity) are presented in the last two columns of Table 14.

Table 14 indicates the absolute and relative variations of the province of Prato's GDP and employment rate, obtained by modifying the demand variables according to the scenarios assumed in Table 13. Once the percentage change of a specific exogenous variable is reliably known, we can estimate its effects on GDP and on labor units. We simply multiply the estimated variation by the elasticity figure contained in the last columns of Table 14. For example, assume that we know that textile exports will grow 20%. We then multiply 20 by the elasticity values 0.18 and 0.17 (fourth row in Table 14) to respectively get the GDP and labor unit growth estimates resulting from this increase of exports (3.6 and 2.4%, respectively). We can apply the same calculation to any other hypothesized exogenous variable.

## 7 Conclusions

The SAM employed in this chapter provides an accurate picture of the province's current economic structure and an ex-ante measure of the possible economic effects of integration. However, this tool gives only a partial impact evaluation of an immigrant community's integration. This is because the social aspects of integration cannot be measured simply by generated GDP. From a political and social viewpoint, there are considerably more influential non-economic dimensions in modern societies, such as social cohesion, the environment, and the landscape. A further reason for the partial impact evaluation by the SAM is that—even if we restrict the analysis to the economic impact alone—the long-term random, non-linear effects might generate in the future larger economic advantages than the immediate effects convey. For example, consider the huge socio-economic potential of the children from other communities who follow the same education path. Further, consider the growing use of local public services by immigrants (who can partly access health and welfare services, follow building procedures, or enroll their siblings in primary and secondary schools) until some of them enter local politics. Such occurrences could lead to new forms of collaboration, union agreements, and organizations, with unpredictable dynamics and indirect effects on the province's economy.

Clearly, the integration between old and new residents is a long-term process, and foreign immigration to Italy is a relatively recent phenomenon, dating from the 1990s. Currently, the integration is insufficiently mature; however, it might reach maturity if the actors in the provincial economic system are willing to move in that direction.

The Prato district is currently in a vulnerable period of development. It contains both critical elements (precarious—if not illegal—working conditions, exacerbated by the high level of price competition and the conflicts between the two local communities) and exploitable potentials (the Chinese community's strong industriousness, work ethic, and motivation, and international relationships that are not

limited to the sale of final products). Public policies should seek to enhance these potentials, and to recreate the combination of cooperation and competition that previously drove the economic development and the social integration of the Prato district.

The scenarios, based on the assumption of integration, presuppose overcoming the local liabilities through a synergy between the Chinese and the autochthonous communities. The Chinese community would increase its relationships with local companies, institutions, and families (with increases in its product retail). The autochthonous community would increase its foreign market share through the intermediation by Chinese companies.

Contrastingly, if conflict prevailed, then social unrest would undoubtedly increase in both communities, and the Prato economy would not adapt to the changed international competition scenario. Clearly, the integration of such a substantial part of the population, which has steadily immigrated into the province, is necessary for social cohesion. However, it is also necessary for the economic competitiveness of the district, and therefore the future development of the area.

## References

- Berti F, Pedone V, Valzania A (eds) (2013) *Vendere e comprare. Processi di mobilità sociale dei cinesi a Prato*. Pacini Editore, Pisa
- Casini Benvenuti S, Paniccà R (2003) *A multi-regional input-output model for Italy*. IRPET, Firenze
- Colombi A (ed) (2002) *L'imprenditoria cinese nel distretto industriale di Prato*. Leo S. Olschki Editore, Firenze
- Dei Ottati G (2014) *A transnational fast fashion industrial district: an analysis of the Chinese businesses in Prato*. *Camb J Econ* 38(5):1247–1274
- IRPET, Provincia di Prato, ASEL (2014) *Prato: il ruolo economico della comunità cinese*. IRPET, Firenze
- Ministero dello Sviluppo Economico (2009) *La matrice di contabilità sociale: uno strumento per la valutazione*. IPI, Roma
- Pyatt G, Round J (1985) *Social accounting matrices: a basis for planning*. The World Bank
- Scandizzo PL (1994) *I modelli di equilibrio economico generale e la valutazione dei progetti d'investimento*. ISPE, Roma
- Stone JRN, Champernowne DG, Meade JE (1942) *The precision of national income estimates*. *Rev Econ Stud* 9:111–125
- Targetti R (ed) (2004) *Matrici regionali di contabilità sociale & analisi di politiche economiche: il caso della Liguria, Toscana e Marche*. F. Angeli, Milano