RP surveys on socio-economic, demographic characteristics and consumer behaviour in a middle-sized city. An integrated system of models to forecast freight demand and passengers demand for purchase trips.

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Abstract: - Travelers and goods that move in a given area constitute the demand for transportation service offered by the system on examination. Demand forecast is extremely important for the analysis and the modeling of transportation systems because the planning of infrastructures and services of transports results from the necessity to satisfy the needs of mobility and its characteristics. The scientific literature about freight transportation provides fewer studies than the literature about passenger transportation. A state of art of freight demand models has been proposed by Regan and Garrido [20]. Urban freight demand models could be classified into gravity models (Hutchinson [10]; List and Turnquist [12]; Taylor [28]; Fridstrom [3]; Russo and Comi [21, 22, 23]), input-output models (Harris and Liu [5]; Marzano and Papola [13]), models of spatial equilibrium of the prices (Oppenheim [19]; Nagurney [15]).
In this paper the results of an experimental survey conducted in a medium-sized city are introduced. Generation and distribution models have been specified and calibrated for shopping trips in terms of passenger trips (trip-based approach), for perishables and household products in terms of quantity movements (quantity-based approach) and for durable goods in terms of purchase movements (purchase-based approach). Furthermore, regarding generation models, more disaggregated categories have been used and family regression models have been specified, calibrated and validated for the trip-based approach, the quantity-based approach and the purchase approach taking into account the number of components of the familiar nucleus, the level of annual net income and the family car availability. Logit models simulating the choices of the size of purchased goods allow to convert, in the trip-based approach, the trips in quantities and, in the purchase-based approach, the units purchased in quantities.

Key-Words: - Urban goods movements, end-consumer, freight, purchase passenger trips, demand models

1 Introduction

In view of urban areas more and more congested, it is necessary to define solutions on the basis of a careful examination of the mobility structural factors, specifically through the valuation of demand, rather than focusing exclusively on supply.
Over the last few years, the need to use mathematical models for analysing urban freight transportation system has increased. A better organization of the territorial logistics can have positive effects not only on regional economy but also on people quality of life, because it entails the reduction of traffic congestion and consequently of many problems such as air and noise pollution.
Observations on passengers mobility must be connected to the observations on freight transportation since only in an overall view, which takes in account both flows characterizing a determined area, it is possible to find effective solutions. The importance of considering both components (people and commodities) in every urban transport policy, is underlined in the Green Paper published in 2007 by the CCE.
The purpose of this paper is the development of a demand models system for medium cities that allows the local authorities to evaluate the passenger trips for purchases and the commodities movements, differentiating by type of good and considering as decision-maker the "family" or a family component (end-consumer).

2 State of art

The scientific literature about freight transportation provides fewer studies than the literature about passenger transportation. Regan and Garrido [20] proposed a comprehensive state of the art of freight demand models, which can be classified into *gravity models*, similar to those used in the passenger analysis (Hutchinson [10, 11]; Ogden [17, 18]; List e Turnquist [12]; Taylor [28]; He e Crainic [6]; Fridstrom [3]; Gorys e Hausmanis [4]; Russo and Comi [21, 22, 23]; Nuzzolo, Crisalli e Comi [16]), *input-output models*

(Harris and Liu [5]; Marzano and Papola [13]), *models of spatial equilibrium of the prices* (Oppenheim [19]; Nagurney [15]). A classification followed by many authors distinguishes commodity-based (e.g. Ogden [18]) from truck-based models (e.g. Taniguchi e Thompson [24]; Munuzuri et alii [14]).

The general structure of commodity-based models is based on a sequential approach similar to that used for the analysis of passenger mobility, not estimating the number of trips but the quantity moved between two traffic areas. These models study the relationship *d-w* (retailers-wholesalers). They consists of a generation model (in quantity), a distribution model (in quantity), a choice of mode / service model (from quantity to vehicles), an assignment model. An alternative to this approach is to summarize into a single step the first three steps. An equilibrium model of urban passenger travel and goods movement was proposed by Oppenheim [19], in which commodity flows are generated by the need to support a given generic urban activity undertaken by individual travellers, which involves consumption of a given commodity. Travellers are assumed to maximize their utilities, through their joint choice of an activity site and travel route to it. Activity suppliers also maximize their utilities through their joint choice of commodity suppliers and freight shipping routes.

Input-output models and models of spatial equilibrium of the prices are typically commodity-based or monetary-based models.

The truck-based models, however, directly estimate the movement of commercial vehicles.

It's possible to identify, even in this case, two subcatego-ries: a sequential approach and an direct estimation approach.

Ambrosini et al [2] propose an overview of freight demand models in urban areas in the European scene, starting from the results of BESTUFS and describing some models developed in Germany, Italy and France.

Many of the models in the literature, however, do not take into account the integration of freight movements with other components of urban mobility. They focus on the movements between firms (producers) and distribution centers on a wide scale. They seldom consider the possibility of combining freight and passenger flows, and representing the interacting behavior of commodity consumers and commodity suppliers/shippers/retailers. Such models are thus unsuitable for forecasting the impacts and simulating the effects of transportation measures on a small scale.

In Russo and Comi [21] is the first formulation of a system of models to simulate passengers shopping trips and to determine the flow of commercial vehicles used to carry goods on the urban network.

Russo and Comi [22] classify freight demand models on the basis of six elements, namely the following criteria:

• modeling structure, which concerns partial share or direct/joint models to simulate explicitly or otherwise, and sequentially or simultaneously, the mean characteristics of the freight transport system;
• reference unit, which can be the commodity or the vehicles;
• distribution channel, which can be pull or push;
• aggregation level, which regards the data aggregation used for both specification and calibration of the model and for its application;
• user behavioural assumptions, which refers to the use of behavioural or descriptive model;
• level of integration with passenger models.

In recent years the interest of researchers has been directed toward *urban freight platforms*. This urban freight platform, called Urban Distribution Center (UDC), requires particular models in order to define the optimal size and location, as well as assess the impacts of their introduction. The concept of logistic terminals (multi-company distribution centers) has been proposed in Japan to alleviate traffic congestion and reduce environmental, energy and labor costs (Taniguchi et al. [24]).

Finally, in order to analyze the *stakeholder behaviour* related to some measures, a methodology for evaluating city logistics measures considering the behaviour of several stakeholders associated with urban freight transport is proposed by Taniguchi and Tamagada [27]. They consider five stakeholders: administrators, residents, shippers, freight carriers and urban expressway operators. In the urban areas of NYC a survey was carried out and the results are discussed by Holguin-Veras et al. [8]. The study shows the great complexity and nuances that exist in commercial deliveries. A similar initiative was developed in the United Kingdom by Allen et al. [1].

The interactions between the freight agents at urban scale were studied by Wisetjindawat et al. [30] who proposed a micro-simulation model for urban freight movement in which the behaviour of freight agents and their interactions in the supply chains are incorporated. Application to the Tokyo Metropolitan Area is also described. Holguin-Veras and Wang [9] developed a hybrid micro-simulation modeling framework in order to construct commercial vehicle tours that satisfy a known commodity flow origin-destination matrix in an urban freight market.

The proposed modeling framework is applied to an *84*-node test case and shows that several variables have significant impacts on the choices of destination location and the decision whether or not to return to base on each tour.

For recent developments on urban freight methods and models, the reader can refer to Thompson and Taniguchi [29].

3 Planning and design of the data collection survey

In order to specify and calibrate a system of models to analyze simultaneously the mobility of passengers for

purchases and to estimate the amount of different types of goods handled in urban areas, it was necessary to design a campaign of surveys aimed at building a database to highlight the explanatory variables.
Following the definition of the geographical areas identified in the conurbation Cosenza - Rende - Castrolibero, the research has started from a careful analysis of the commercial structure of the study area and then to focus on the analysis of consumption of resident families for different product categories and characteristics of movements related to them.
The study area was divided into 32 uniform traffic areas that represent the whole choice of destination, although an effective and practical attraction is attributable to the seven areas with the highest commercial density.

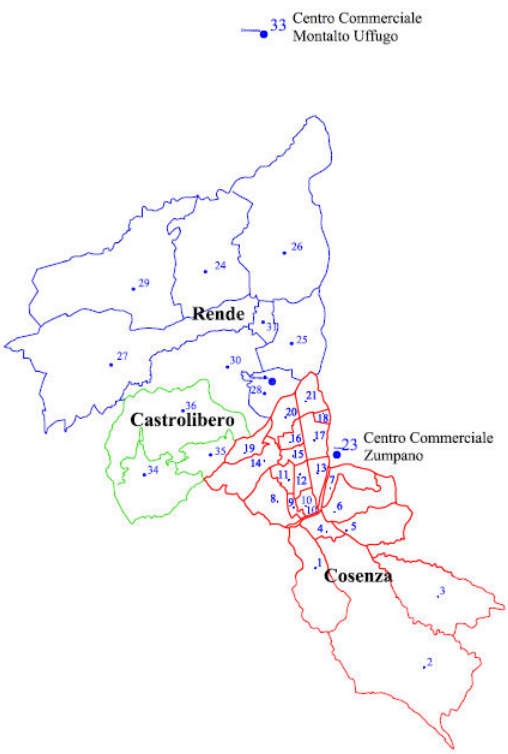

Fig. 1: The study area

The activities have been, as follows:
• home surveys at 939 families residing in the conurbation Cosenza - Rende - Castrolibero;
• destination surveys addressed to 663 consumers living in the conurbation Cosenza - Rende - Castrolibero at major shopping centers located in the study area.
The campaign of surveys among families allowed to define, for each household interviewed and for different product categories, socio-economic data (area of residence, household income, household members, education level and employment status of the interviewed, number of owned cars, driver's licenses number) and informations on quantities consumed, movements for purchase made, modes of transport used, favorite days, timeframes, preferences in the choice of places for purchases and size of each purchase.
The destination interviews allowed to analyze user behavior in the purchase of different product categories, in terms of time taken to the purchase, number of people of the group who went at the market, mode of transport used, size and influence of good characteristics such as price, brand, warranty, delivery of goods on the preference of the product.
Regarding the studied categories, 19 types of non-durable goods and 17 types of durable goods have been distinct (table 1). In particular, for non-durable goods a further distinction has been made between non-durable goods to daily replacement (e.g. bread, milk, fruits, vegetables, etc..) and non-durable goods in weekly replacement (e.g. pasta, UHT milk, frozen products, etc.). Instead, with regard to durable goods, reference is made to the ATECO 2002 classification (Code of Economic Activities).

Table 1: Commodity types analysed

Non durable (with daily replacement)	Non durable (with weekly replacement)	Durable
Dairy products	Water	Herbalist's products
Bread	Sparkling drinks	Pharmaceuticals
Egg	Fruit juices	Tobacco
Fruit and vegetable	Alcoholic drinks	Ironmongery products
Meat	Coffee	Electric materials
Pastries	UHT milk	Chemical products
	Pasta and rice	Flowers and plants
	Sweets	Toys
	Fresh fish	Books, magazines and newspapers
	Deep-frozen food	Stationery products
	Canned products	Music products
	House cleaning products	Optical products
	Personal care products	Jewellery
		Sport products
		Clothing
		Footwear
		Household appliances

4 The system of models

In the system of models proposed three different approaches are characterized: a *trip-based* approach, a *quantity-based* approach, a *purchase-based* approach (fig. 2).

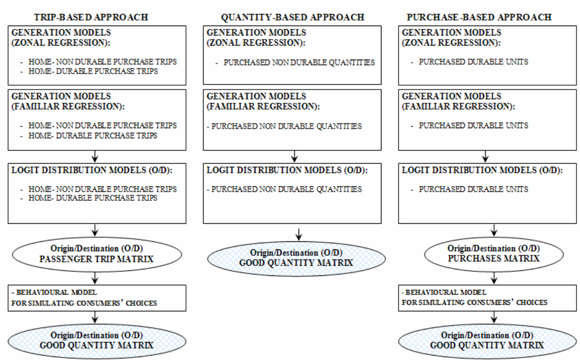

Fig. 2: The system of models

Generation models allow to estimate for every type of non durables and durables in table 1:
- the number of daily trips for purchases originated from the zone *o* for the commodity type *k* (trip-based approach);

- the quantity of non durable of type k that every day is attracted (consumed) from o (quantity-based approach);
- the number of durable daily purchases originated from every zone o for the commodity type k (purchase-based approach).

Distribution models for non durable goods with daily replacement, for non durable goods with weekly replacement and for eight groups of durable e non durable goods have been specified, calibrated and validated. For every approach, different specifications have been formulated, diversified for typology of commodity, considering as attributes of choice: the air distance among the centroids of the zones; the number of retailers (trip-based) and the number of retail shops (quantity-based and purchase-based) of goods of type k in the zone d; a dichotomous variable that is equivalent to 1 if a shopping center is present in d; a dichotomous variable that is equivalent to 1 if the trip from o to d has been gone by auto; a dichotomous variable that is equivalent to 1 if the net annual income of the family is superior to 40.000,00 €; spatial dominance variables.

At a third level, some logit models simulating the choices of the size of purchased goods are proposed, in which consumer socio-economic characteristics (income, number of family members, number of people making the purchase) and product characteristics (price, assistance, instalment) are introduced as attributes in the utility function. Purchased product units are then converted into quantities of goods. Models of choice of the purchase dimension allow to convert, in the trip-based approach, the trips in quantities and, in the purchase-based approach, the units purchased in quantities.

4.1 Generation models

The generation models enable to assess:

- the number of daily shopping trips issued by area o for the product category k (*trip-based* approach);
- the quantity of commodity type k that is attracted (consumed) every day from the area o (or quantity-based approach);
- the number of daily purchases generated by each area o for the product category k (purchase-based approach).

The estimates were obtained as a function of both number of households and number of residents in the area of traffic o considered. The k categories considered are:

- Non-durable goods with daily replacement: dairy products, bread and pasta, eggs, fruits and vegetables, meat, fresh pastries;
- Changed weekly non-durable goods: water, soft drinks, fruit juices, carbonated non-alcoholic beverages, coffee, UHT milk, pasta and rice, sweets, fresh fish, frozen products, canned food, household products, products for the person;
- Durable goods: herbal products, pharmaceuticals, tobacco products, hardware and metal products, electrical equipment, chemicals, plants and flowers, toys, books, newspapers and magazines, stationery, music, optics and accessories, sporting goods, textiles and clothing, footwear, household appliances.

The regression model for estimating of the number of shopping trips N_o^k takes two different formulations that take into account the number of resident households (1) or number of residents (2) in the traffic zone o:

$$N_o^k = \beta_{fam}^k \cdot N_{o,fam} \quad (1)$$

$$N_o^k = \beta_{res}^k \cdot N_{o,res} \quad (2)$$

where N_o^k is the number of trips of type purchases, made for the purchase of generic goods of type k required in the area o[movements / day], β^k is the coefficient for the type of commodity k, $N_{o,fam}$ is the number of families living in each area of traffic o, $N_{o,res}$ is the number of residents in each traffic area o.

The regression model for estimating the quantities of goods consumed Q_o^k takes two different formulations that take into account the number of resident families (3) or the number of resident people (4) in the traffic zone o:

$$Q_o^k = \beta_{fam}^k \cdot N_{o,fam} \quad (3)$$

$$Q_o^k = \beta_{res}^k \cdot N_{o,res} \quad (4)$$

In the case of durable goods (*purchase-based approach*), the generation model provides, for each type, the number of daily purchases generated by each traffic area o:

$$Acq_o^k = \beta_{fam}^k N_{0,\,fam} \quad (5)$$

$$Acq_o^k = \beta_{res}^k N_{0,\,res} \quad (6)$$

In Table 2 the results obtained from the calibration models are reported, differentiating by commodity type and approach.

Table 2– Generation models

		Trip-based approach				Quantity-based approach				Purchase-based approach			
	Commodity type	β^k_{fam}	t	β^k_{res}	t	β^k_{fam}	t	β^k_{res}	t	β^k_{fam}	t	β^k_{res}	t
Non durable (with daily replacement)	Dairy products	0,395	19,4	0,107	19,4	0,63	29,0	0,172	30,1				
	Bread	0,477	31,9	0,130	33,0	0,51	32,1	0,139	38,9				
	Egg	0,151	36,4	0,041	34,0	0,08	24,8	0,023	22,4				
	Fruit and vegetable	0,281	21,3	0,041	21,0	0,68	30,4	0,183	25,9				
	Meat	0,188	37,7	0,051	36,3	0,33	19,7	0,090	19,3				
	Pastries	0,057	31,3	0,016	36,3	0,05	34,8	0,014	36,8				
Non durable (with weekly replacement)	Water	0,138	29,4	0,038	33,7	2,37	28,7	0,646	31,2				
	Sparkling drinks	0,107	21,8	0,029	22,7	0,34	25,4	0,092	25,8				
	Fruit juices	0,103	29,1	0,028	28,8	0,23	33,7	0,062	35,0				
	Alcoholic drinks	0,082	32,7	0,022	30,2	0,19	40,4	0,053	36,5				
	Coffee	0,188	37,7	0,020	71,5	0,09	27,1	0,024	30,8				
	UHT milk	0,105	22,0	0,029	21,1	0,24	36,6	0,066	34,3				
	Pasta and rice	0,120	26,8	0,033	29,5	0,43	65,0	0,116	55,3				
	Sweets	0,117	46,2	0,032	60,7	0,16	89,2	0,043	70,2				
	Canned products	0,107	75,5	0,029	58,7	0,14	42,1	0,038	35,4				
	Deep-frozen food	0,102	40,1	0,028	46,6	0,16	60,8	0,043	58,6				
	Fresh fish	0,104	27,2	0,028	23,7	0,12	46,3	0,034	41,0				
	House cleaning products	0,082	48,3	0,022	33,3	0,16	53,2	0,044	57,1				
	Personal care products	0,075	40,3	0,020	38,2	0,07	29,7	0,019	29,8				
Durable	Herbalist's products	0,025	57,7	0,007	53,9					0,068	30,5	0,019	32,3
	Pharmaceuticals	0,107	34,0	0,014	30,8					0,133	37,5	0,036	38,4
	Tobacco	0,255	25,9	0,069	23,5					0,436	67,6	0,119	70,3
	Ironmongery products	0,013	28,8	0,003	26,5					0,022	27,1	0,006	28,0
	Electric materials	0,013	39,7	0,004	36,9					0,046	40,4	0,013	43,5
	Chemical products	0,006	30,3	0,002	28,0					0,029	34,2	0,008	35,5
	Flowers and plants	0,024	71,8	0,006	44,9					0,036	39,1	0,010	40,3
	Toys	0,008	34,5	0,002	34,9					0,010	37,0	0,003	49,6
	Magazines and newspapers	0,295	34,9	0,080	30,4					0,431	30,9	0,117	27,5
	Stationery products	0,021	37,6	0,006	34,6					0,147	35,8	0,040	36,6
	Music products	0,007	34,9	0,002	30,0					0,011	37,7	0,003	38,9
	Optical products	0,011	23,5	0,003	21,7					0,016	33,5	0,004	34,6
	Jewellery	0,003	50,6	0,001	36,4					0,004	51,3	0,001	36,4
	Sport products	0,007	31,5	0,002	27,3					0,029	32,2	0,008	32,3
	Clothing	0,011	46,4	0,003	38,1					0,046	43,6	0,013	40,0
	Footwear	0,007	34,4	0,002	34,3					0,026	32,7	0,007	29,1
	Household appliances	0,003	29,2	0,001	32,3					0,004	24,0	0,001	23,9

All the models prove largely the statistical tests on the overall goodness of the estimate, in particular ρ^2 ranges in a minimum of 0.8943 for the category metals and hardware (*purchase-based* approach) and a maximum of 0.9974, achieved for the model related to the pasta category (*quantity-based* approach).

Using more disaggregated categories, made possible by the high number of information gathered from sample surveys, allowed to specificate, calibrate and validate family regressions, according to socio-economic variables such as the size of the household (number of components of the familiar nucleus) (DF), the level of annual net income (MLA) and the car availability (DA) are used to estimate: the daily trips N_i^k made by the generic family i residing in the traffic area o to purchase goods of the product category k, in the *trip-based* approach (7); the Q_i^k daily amounts of non-durable goods of k category, in the *quantity-based* approach (8) and the number of purchases of durable goods of category Acq_i^k generated by a generic family residing in o, in the purchase-based approach (9).

$$N_i^k = \beta_{DF_i}^k \cdot DF_i + \beta_{DA_i}^k \cdot DA_i + \beta_{LRDi}^k \cdot LRD_i \quad (7)$$

$$Q_i^k = \beta_{DF_i}^k \cdot DF_i + \beta_{DA_i}^k \cdot DA_i + \beta_{LRDi}^k \cdot LRD_i \quad (8)$$

$$Acq_i^k = \beta_{DF_i}^k \cdot DF_i + \beta_{DA_i}^k \cdot DA_i + \beta_{LRDi}^k \cdot LRD_i \quad (9)$$

In Table 3 the results of the calibration models for each approach and for each commodity type under investigation are reported. All the presented models prove the statistical tests on the overall goodness of the estimate, in particular ρ^2 ranges in a minimum of 0.2654 for the category optical and accessories (*trip-based* approach) and a maximum of 0.9239 for the category products for the individual in the *trip-based* approach).

Table 3 – Family regression models

		Trip-based approach			Quantity-based approach			Purchase-based approach		
	Commodity type	β^k_{DF} (t)	β^k_{DA} (t)	β^k_{LRD} (t)	β^k_{DF} (t)	β^k_{DA} (t)	β^k_{LRD} (t)	β^k_{DF} (t)	β^k_{DA} (t)	β^k_{LRD} (t)
Non durable (with daily replacement)	Dairy products	0,087 (15,8)	0,072 (2,99)	-	0,168 (57,4)	-	-			
	Bread	0,101 (19,6)	2,7*10^-6 (5,3)	-	0,127 (27,5)	1,1*10^-6 (2,5	-			
	Egg	0,023 (12,4)	0,053 (7,0)	5,1*10^-7 (3,1)	0,014 (8,2)	0,018 (2,4)	3,9*10^-7 (2,5)			
	Fruit and vegetable	0,035 (17,6)	0,063 (7,3)	-	0,109 (11,2)	2,9*10^-6 (3,3	0,187 (4,6)			
	Meat	0,035 (17,6)	0,063 (7,3)	-	0,069 (14,8)	0,041 (2,1)	9,9*10^-7 (2,4)			
	Pastries	0,006 (4,8)	0,063 (3,5)	4,9*10^-7 (4,4)	0,008 (6,1)	0,012 (2,3)	3,4*10^-7 (2,3)			
Non durable (with weekly replacement)	Water	0,021 (8,5)	0,029 (2,8)	8,9*10^-7 (4,1)	0,454 (13,2)	-	1,8*10^-5 (5,3)			
	Sparkling drinks	0,0148 (7,3)	0,038 (4,9)	5,6*10^-7 (3,1)	0,074 (12,8)	-	1,9*10^-6 (3,3)			
	Fruit juices	0,018 (10,1)	5,3*10^-7 (3,3)	0,0237 (3,1)	0,061 (41,7)	-	-			
	Alcoholic drinks	0,014 (9,0)	-	7,2*10^-7 (4,4)	0,053 (38,1)	-	-			
	Coffee	0,024 (5,5)	0,011 (10,9)	3,4*10^-7 (3,7)	0,024 (34,5)	-	-			
	UHT milk	0,018 (7,3)	0,043 (4,0)	-	0,048 (9,3)	0,075 (3,3)	-			
	Pasta and rice	0,022 (16,3)	0,037 (6,2)	-	0,103 (33,9)	0,055 (4,2)	-			
	Sweets	0,023 (13,5)	0,035 (4,7)	-	0,042 (42,8)	-	-			
	Canned products	0,016 (10,1)	0,056 (8,2)	-	0,027 (14,5)	0,045 (5,5)	-			
	Deep-frozen food	0,014 (11,9)	0,029 (5,6)	6,1*10^-7 (5,6)	0,034 (21,6)	0,039 (5,7)	-			
	Fresh fish	0,009 (6,3)	0,042 (6,4)	7,9*10^-7 (5,8)	0,020 (9,6)	0,023 (2,5)	7,7*10^-7 (4,1)			
	House cleaning pro	0,013 (17,8)	-	9,1*10^-7 (12,2)	0,030 (33,8)	0,041 (11,0)	3,8*10^-7 (4,8)			
	Personal care produ	0,013 (15,5)	0,012 (3,2)	5,8*10^-7 (7,3)	0,026 (22,0)	0,025 (4,9)	-			
Durable	Herbalist's products	0,003 (7,9)	-	3,5*10^-7 (8,2)				0,013 (6,2)	-	5,9*10^-7 (2,9)
	Pharmaceuticals	0,005 (6,7)	0,026 (8,2)	1,9*10^-7 (2,9)				0,025 (14,2)	-	8,6*10^-7 (4,8)
	Tobacco	0,051 (8,1)	-	2,0*10^-6 (3,3)				0,119 (29,7)	-	-
	Ironmongery produ	0,002 (10,9)	0,004 (4,7)	-				0,005 (12,2)	-	1,1*10^-7 (2,6)
	Electric materials	0,001 (6,7)	0,002 (2,8)	1,5*10^-7 (8,1)				0,008 (15,6)	-	4,2*10^-7 (8,0)
	Chemical products	0,0009 (7,0)	-	8,0*10^-8 (6,5)				0,006 (15,7)	-	9,7*10^-8 (2,4)
	Flowers and plants	0,002 (4,5)	-	4,3*10^-7 (8,1)				0,005 (7,3)	-	4,7*10^-7 (6,6)
	Toys	0,001 (8,1)	-	9,8*10^-8 (7,1)				0,002 (7,3)	-	1,4*10^-7 (6,5)
	Magazines and new	0,017 (3,1)	-	6,4*10^-6 (11,5)				0,042 (5,6)	-	7,7*10^-6 (10,3
	Stationery products	0,004 (7,5)	-	2,1*10^-7 (4,2)				0,031 (14,4)	-	9,7*10^-7 (4,5)
	Music products	0,0006 (2,9)	-	1,4*10^-7 (6,6)				0,001 (4,2)	-	1,9*10^-7 (6,5)
	Optical products	0,003 (18,4)	-	-				0,001 (2,4)	-	3,7*10^-7 (7,8)
	Jewellery	0,0003 (7,3)	-	7,0*10^-8 (20,0)				0,0003 (6,8)	-	8,0*10^-8 (16,2
	Sport products	0,0011 (18,2)	-	8,7*10^-7 (14,7)				0,006 (18,1)	-	1,9*10^-7 (5,6)
	Clothing	0,0006 (5,7)	0,003 (4,9)	1,7*10^-7 (15,5)				0,007 (14,6)	0,01 (4,6)	5,1*10^-7 (11,2
	Footwear	0,0008 (16,7)	0,003 (12,6)	5,8*10^-8 (12,5)				0,006 (28,4)	-	8,3*10^-8 (3,9)
	Household applian	0,0002 (7,4)	-	6,4*10^-8 (23,4)				0,0004 (7,6)	-	7,7*10^-8 (16,2

5 Conclusion

Data collected in the experimental survey conducted allowed to specify, in addition to zonal regression models, generation model with very disaggregated categories such as families. The deterministic models and behavioural models, which analyze the behaviour of the decision-maker, are characterized by the breakdown level reached, which allows specific predictions for various categories. The models developed are an important decision support system (DSS) for local governments and authorities allowing to estimate freight and passenger demand and plan, for example, measures of "city logistics". For example, data on number of consumers who gravitate in a traffic area allow to estimate, in the planning stage, parking demand and to take strategic measures (demand management) to avoid congestion of that area. Furthermore, the models developed allow a control of the forecasts by comparing the results of the three different approaches (fig 2).

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