E C O N O M I C S B U L L E T I N

Assessing benefit-incidence results using decompositions. The case of health policy in Argentina.

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Abstract

This paper discusses the use of aggregate and microeconometric decompositions to compare benefit-incidence results over time. Decompositions are applied to explore changes in targeting in health policies directed to pregnant women and children under 4 in Argentina. The results suggest that although health public programs are pro-poor, incidence changes in the period 1997-2001 were pro-rich due to at least two factors: a substantial reduction in the fertility rate of poor couples, and an increase in the use of public facilities by wealthier households, likely triggered by the economic crisis.

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1. Introduction

A benefit-incidence analysis allows an assessment of the degree of targeting of public spending. This paper illustrates the usefulness of both aggregate and microeconometric decomposition techniques to shed light on the factors behind changes in benefit-incidence results over time, and differences across regions or programs.

The proposed methodology is applied to the case of health policy directed to pregnant women and children under 4 in Argentina. This country has undergone dramatic changes in its economic and demographic structure in the last decade, which might have some impact on the targeting of public policies. In fact, the paper finds that although health public programs are pro-poor, benefit-incidence changes in the period 1997-2001 were pro-rich due to at least two factors: a substantial reduction in the fertility rate of poor couples, and an increase in the use of public health facilities by wealthier households, likely triggered by the economic crisis that Argentina suffered in that period.

The rest of the paper is organized as follows. Section 2 shows benefit-incidence results for different health services. Section 3 characterizes changes in incidence results by applying some simple aggregate decompositions. Section 4 is the core of the paper as microeconometric decomposition techniques are introduced, and the main results are shown and discussed. Some brief comments in section 5 close the paper.

2. Benefit-incidence results

The public sector in Argentina owns and operates an extensive network of public hospitals and primary health care centers. The public health system is universal: no requirements are needed to use most of the services in public facilities. However, in practice more affluent household usually opt-out from health public institutions in search of better quality services.

A typical benefit-incidence analysis is aimed at evaluating the degree of targeting of average public spending in a specific program. Benefits from the program are assigned to individuals according to their answers to a household survey on the program participation.[1] This methodology requires household surveys with data on a welfare indicator and information on program participation. So far, Argentina has conducted two Living Standard Measurement Surveys with questions about participation in several health public programs. The first survey, known as Encuesta de Desarrolo Social (EDS), was carried out in 1996/7 and includes 73,410 individuals (representing 83% of total population) living in urban areas. The second survey, Encuesta de Condiciones de Vida (ECV), with similar coverage and questionnaires, was carried out in 2001. Between 1997 and 2001 Argentina suffered a deep economic crisis. Per capita disposable income in real terms fell 13% over that period according to National Accounts estimates.

[1] See van de Walle and Nead (1995) and Bourguignon, Pereira da Silva and Stern (2002).

This study is focused on health programs targeted to pregnant women and children under 4. As individual welfare indicator we use the equivalized household income, defined as total household income over $(A+\alpha_1 K_1+\alpha_1 K_1)^{\theta}$, where A is the number of adults in the household, K_1 the number of children under 5, and K_2 the number of children aged 6 to 14. Parameters α allow for different weights for adults and kids, while θ regulates the degree of household economies of scale. Following Deaton and Zaidi (2002) and given the characteristics of the Argentinean economy, we take intermediate values of the α (α_1=0.5 and α_2=0.75), and a rather high value of θ (0.9) as the benchmark case.

Table 1 shows benefit-incidence results for four health services: antenatal care, attended deliveries, free medicines and hospitalizations. More details on each of these services and results for other services can be obtained from a companion paper (Gasparini and Panadeiros, 2005). Subsidies to antenatal care in public facilities are highly pro-poor. In 1997 more than 46% of total beneficiaries of this program belonged to the first quintile of the income distribution. The share of beneficiaries from the top quintile was 2%. This pro-poor pattern implies a large negative concentration index (-48.6). The degree of targeting of the public subsidy to antenatal care decreased between 1997 and 2001. The concentration index went from -48.6 to -43.8. Similar results are obtained for the rest of the health services.[2]

3. Characterizing changes in targeting

Benefit-incidence results come from aggregating individual decisions on the consumption of publicly provided services. An individual will consume a service if (i) she is eligible for that service (*e.g.* a woman for antenatal care), (ii) she decides to consume the service, and (iii) she decides to do it in the public sector. Accordingly, differences in targeting of a given program over time (or across regions) are the result of differences in the three stages described above. It is relevant to identify to what extent the change in the degree of targeting for a given program is the result of changes in the socio-demographic structure of the population, or the result of changes in the way individual decisions on the consumption of the service are made. In this section this issue is tackled using aggregate decompositions. A more rigorous analysis based on microsimulations is presented in section 4.

Suppose we group total population in quintiles h=1,…,5 according to their equivalized household income. The proportion of total consumers of a given health service j in a public facility that belong to quintile h in time t is denoted as b_{hjt}. The shares b_{hjt} are the inputs of any benefit-incidence measure. If these shares are decreasing in income, it is said that the public program j is "pro-poor". The value b_{hjt} can be written as

$$b_{hjt} = q_{hjt}.a_{hjt}.p_{hjt}$$

[2] Changes in all the concentration indices between 1997 and 2001 are statistically significant according to a bootstrap analysis.

where q_{hjt} is the proportion of people who qualify for service *j* who belong to quintile *h*, a_{hjt} is the rate of consumption of service *j* in quintile *h* (among all the eligible persons) relative to its population mean, while p_{hjt} is the share of consumers of *j* in the public sector (among all consumers of service *j*) in *h* relative to its population mean. Naturally, differences across quintiles in the value of *b* are driven by differences in *q*, *a*, and *p*.

We use this simple decomposition to get a preliminary characterization of changes in incidence results over time in Argentina. The first three panels for each health service in Table 2 reproduce the distribution of potential users, the share of consumers of the health service among the eligible population, and the share of consumers in public facilities among all consumers. Incidence results are shown in the fourth panel, while changes in incidence by quintiles over time are reported in row 5.

As mentioned above, there is a clear reduction in the degree of targeting of the antenatal care program. While in 1997 46.5% of total beneficiaries of that program belonged to the bottom quintile of the equivalized income distribution, in 2001 that share fell to 43.3%. This drop of 3.2 points has its complement in the gains of 1.6 for quintile 3, 1 for quintile 4 and 0.6 for the top quintile. Where does this reduction in targeting come from? The last panel helps us to characterize the incidence changes by showing aggregate decomposition results. The line labeled *potential users* shows incidence results if we change the distribution of pregnant women (first panel) between 1997 and 2001 but keep fixed the participation rates and the public/private decisions at the values of a given year. Since the values of *a* and *p* can be fixed at two alternative years, in Table 2 we report the average over the four possible simulations.

The distribution of pregnant women became less pro-poor between 1997 and 2001, implying a 1.4 drop in the benefit-incidence results of antenatal care on the bottom quintile.[3] This means that everything constant, the demographic changes would explain a sizeable part of the decrease in the degree of targeting of the subsidy to antenatal care in public hospitals and primary health centers.

Poor women are now more likely to be seen by medically trained persons. This increase in participation (combined with the changes for the rest of the distribution) implies an increase in incidence on the bottom quintile of 0.9 points (see line labeled *participation*). The last effect, labeled *public provision*, seems the most relevant one: the use of public hospitals increased for poor people, but it increased proportionally more for the rest of the population. This effect implies a sizeable drop in the degree of targeting of the antenatal care program.

4. Microeconometric decompositions

Although certainly informative, the aggregate decompositions are a rough way to characterize changes in benefit-incidence results. A more sophisticated analysis can be

[3] Marchionni (2005) documents changes in fertility patterns similar to those discussed here.

carried out with the help of microeconometric decomposition techniques.[4] Suppose we are interested in analyzing changes between t and t_1 in the targeting of health services in public facilities. The idea behind this methodology is to simulate for each individual the counterfactual decision of whether to consume a health service in a public hospital or not in time t if certain factors were those of time t_1 instead of those observed in time t. We consider three set of factors that can be alternatively changed between t and t_1: (i) the characteristics of each individual (and her family), (ii) the way these characteristics are linked to the decision of consuming a health service or not, and (iii) the way these characteristics are linked to the choice of attending a public facility instead of a private one.

To implement this methodology we estimate econometric models of the decision of consuming a health service, and the conditional decision of attending a public facility as functions of various individual and household characteristics. Changes in a given measure of targeting are decomposed into three effects. The *population effect* is obtained by simulating the health decisions in time t if the individual and household characteristics were those of time t_1; the *participation effect* comes from simulating each individual's health decisions in time t if the parameters that govern the decision to consume a health service were those of time t_1, while the *public provision effect* is computed by assuming that the parameters governing the public/private decision were those of time t_1.

To explain the methodology analytically, suppose there are N individuals indexed with i=1, …,N. Each individual i is defined by a vector of individual observable characteristics X_i and a vector of individual unobservable characteristics U_i. Observable characteristics include age, gender, education as well as household characteristics as income and location.

People who qualify for a given health service j can use a private or a public provider. Let b_{ijt} be a binary variable that identifies people who get the service j in the public sector at time t (beneficiaries of public expenditures in the program j). As before, this variable can be expressed as

$$b_{ijt} = q_{ijt}.a_{ijt}.p_{ijt}$$

where now q is equal to 1 if the individual qualifies for the service and 0 otherwise; a is equal to 1 if the individual decides to use the health service, given that she is eligible, and 0 otherwise; and p is equal to 1 if the individual uses a public provider, given that she consumes the service.

We assume that variable q is deterministic:

$$q_{ijt} = Q(X_{it}, \alpha_{jt})$$

[4] For the use of microeconometric decompositions applied to distributional issues see Bourguignon *et al*. (2004).

Given observable characteristics X_i an individual qualifies or not for the service (*e.g.* being pregnant qualifies for antenatal care). The vector of parameters α determines the rule of access to a given service. Variables *a* and *p* instead are random variables as they depend on unobservable factors.

$$a_{ijt} = A(X_{it}, U_{it}, \beta_{jt})$$

$$p_{ijt} = P(X_{it}, U_{it}, \gamma_{jt})$$

Combining the previous equations

$$b_{ijt} = B(X_{it}, U_{it}, \alpha_{jt}, \beta_{jt}, \gamma_{jt})$$

A measure of distributional incidence of public expenditures in service *j* is a combination of (i) the distribution of *b* and (ii) certain characteristics *Y* of the vector *X* (*e.g.* household income)

$$I_{jt} = I(\{b_{ijt}\}, \{Y_{it}\})$$

where Y $\in$X. Hence,

$$I_{jt} = F(\{X_{it}\}, \{U_{it}\}, \alpha_{jt}, \beta_{jt}, \gamma_{jt})$$

A similar equation can be derived for other time period t_1

$$I_{jt1} = F(\{X_{it1}\}, \{U_{it1}\}, \alpha_{jt1}, \beta_{jt1}, \gamma_{jt1})$$

We define three effects in which the change in *I* between *t* and t_1 can be decomposed:

Participation effect

$$PA_j = F(\{X_{it1}\}, \{U_{it1}\}, \alpha_{jt1}, \beta_{jt1}, \gamma_{jt1}) - F(\{X_{it1}\}, \{U_{it1}\}, \alpha_{jt1}, \beta_{jt}, \gamma_{jt1})$$

This effect captures the change in incidence resulting from a change in the parameters governing the decision of consuming a given service (β).

Public-provision effect

$$PP_j = F(\{X_{it1}\}, \{U_{it1}\}, \alpha_{jt1}, \beta_{jt}, \gamma_{jt1}) - F(\{X_{it1}\}, \{U_{it1}\}, \alpha_{jt1}, \beta_{jt}, \gamma_{jt})$$

This effect measures the change in incidence as the consequence of changes in the parameters governing the public/private decision.

Population effect

$$PO_j = F(\{X_{it1}\},\{U_{it1}\},\alpha_{jt},\beta_{jt},\gamma_{jt}) - F(\{X_{it}\},\{U_{it}\},\alpha_{jt},\beta_{jt},\gamma_{jt})$$

This effect measures changes in incidence resulting from changes in the distribution of observable and unobservable characteristics of the population.

Assuming α does not change, the change in *I* can be expressed as

$$\Delta I_j = PA_j + PP_j + PO_j$$

A similar procedure can be applied to analyze regional differences in the benefit-incidence results, by considering *t* as a regional rather than a time index.

Some of the functions and parameters in the decomposition are either known or assumed, and some should be estimated. We observe the function and parameters that determine potential users (*Q* and α) and vector *X*. We assume a form for *A* and *P*, and propose an index *I*. We estimate parameters β and γ and the vector of unobservables *U*.

Table 3 reports the results of performing the decompositions over the changes in the concentration indices (CI).[5] The first row shows the change in the absolute value of the CI between 1997 and 2001 for each health service, while the last three rows show the values of each of the effects discussed above. The concentration index for the program of antenatal care in public facilities went down 4.8 points (in absolute value) between 1997 and 2002, implying lower targeting. If only the way individual decisions on consuming antenatal care services are taken had changed between 1997 and 2001, the CI would have increased 0.4 points, which represents a negligible change. The effect of the changing public/private decisions between 1997 and 2001 contributed with 1.7 points to the overall fall of the CI. However, the most significant factor behind this fall is the change in the population characteristics: this effect contributed with 3.5 points to the drop in the CI. The reduction in the number of children in poor families and the generalized fall in incomes are likely the main factors behind this result.

The large relevance of the population effect is also present for attended deliveries, medicines and hospitalizations. The public provision effect is negative (except for attended deliveries), likely reflecting an increase in the propensity to consume health services in public hospitals by middle and high-income groups, as the result of the economic crisis. The participation effect is negligible in all cases, except for hospitalizations, which is a sign of the increase in hospitalizations for children from the poorest quintile.

[5] Notice that decomposing concentration indices (computed at the micro level) was not possible in section 3, since aggregate decompositions are based on grouped data.

5. Concluding remarks

This paper illustrates the use of decompositions techniques to contribute to the understanding of benefit-incidence results. The paper analyzes the degree of targeting of health policies directed to pregnant women and children under 4 in Argentina, using information from two Living Standards Measurement Surveys (1997 and 2001). By performing a benefit-incidence analysis we find that health public programs are pro-poor. However, the results of aggregate and microeconometric decompositions suggest that incidence changes in the period 1997-2001 were pro-rich, due to mainly two different factors: a substantial reduction in the fertility rate of poor couples, and an increase in the use of public facilities by wealthier households, likely triggered by the economic crisis that Argentina suffered in that period. It is interesting to notice that, in contrast to the general presumption, in this case changes in benefit-incidence results are mainly driven by changes in the potential beneficiaries' behavior, and not by specific social policy measures.

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Table 1
Benefit-incidence results
Share of benefits by equivalized household income quintiles, and concentration indices
1997 and 2001

	Share of benefits by quintiles						Concentration
	1	2	3	4	5	Total	index
1. Antenatal care							
1997	46.5	26.8	17.7	7.0	2.0	100.0	-48.6
2001	43.3	26.8	19.3	8.0	2.5	100.0	-43.8
Change	-3.2	0.0	1.6	1.0	0.6		4.8
2. Attended deliveries							
1997	44.5	27.7	17.9	7.1	2.7	100.0	-46.6
2001	41.9	27.0	18.4	9.5	3.2	100.0	-41.4
Change	-2.6	-0.8	0.5	2.4	0.4		5.2
3. Medicines							
1997	51.6	26.1	14.8	6.1	1.4	100.0	-50.7
2001	49.4	21.7	16.3	8.7	3.9	100.0	-39.1
Change	-2.2	-4.4	1.4	2.6	2.5		11.6
4. Hospitalizations							
1997	42.5	35.0	15.1	5.9	1.5	100.0	-47.6
2001	44.5	17.5	27.1	9.1	1.8	100.0	-40.5
Change	2.0	-17.5	12.0	3.2	0.3		7.2

Source: authors´ calculations based on the EDS and ECV.
Note: concentration indices are multiplied by 100.

Table 2
Aggregate decomposition of incidence results
Health services, 1997 and 2001

Antenatal care

	1	2	3	4	5	Total
1. Potential users						
1997	29.7	24.6	19.1	13.6	13.0	100.0
2001	27.6	21.7	20.1	15.6	15.1	100.0
2. Participation						
1997	94.8	96.3	99.5	99.4	98.4	97.1
2001	97.6	96.5	97.6	98.5	99.2	97.7
3. Public provision						
1997	81.6	56.0	46.0	25.7	7.6	51.6
2001	85.6	68.1	52.4	27.7	9.0	54.9
4. Incidence						
1997	46.5	26.8	17.7	7.0	2.0	100.0
2001	43.3	26.8	19.3	8.0	2.5	100.0
5. Difference	-3.2	0.0	1.6	1.0	0.6	
6. Effects						
Potential users	-1.4	-2.1	1.7	1.4	0.4	
Participation	0.9	-0.2	-0.5	-0.1	0.0	
Public provision	-2.7	2.4	0.4	-0.2	0.1	

Attended deliveries

	1	2	3	4	5	Total
1. Potential users						
1997	29.7	24.6	19.1	13.6	13.0	100.0
2001	27.6	21.7	20.1	15.6	15.1	100.0
2. Participation						
1997	98.3	99.4	99.9	100.0	100.0	99.3
2001	98.3	99.4	99.9	100.0	100.0	99.3
3. Public provision						
1997	79.5	59.4	49.1	27.3	10.9	53.4
2001	83.4	67.5	49.5	33.0	11.3	55.0
4. Incidence						
1997	44.5	27.7	17.9	7.1	2.7	100.0
2001	41.9	27.0	18.4	9.5	3.2	100.0
5. Difference	-2.6	-0.8	0.5	2.4	0.4	
6. Effects						
Potential users	-1.5	-2.2	1.7	1.5	0.6	
Participation	0.0	0.0	0.0	0.0	0.0	
Public provision	-1.1	1.5	-1.2	1.0	-0.1	

Medicines

	1	2	3	4	5	Total
1. Potential users						
1997	30.1	24.5	18.4	14.8	12.1	100.0
2001	27.8	21.6	20.4	15.6	14.6	100.0
2. Participation						
1997	24.2	25.6	26.6	28.5	26.2	25.9
2001	51.6	52.0	57.8	54.8	63.1	55.5
3. Public provision						
1997	49.7	29.2	21.4	10.1	3.1	27.2
2001	64.8	36.4	25.9	19.1	8.0	32.3
4. Incidence						
1997	51.6	26.1	14.8	6.1	1.4	100.0
2001	49.4	21.7	16.3	8.7	3.9	100.0
5. Difference	-2.2	-4.4	1.4	2.6	2.5	
6. Effects						
Potential users	-1.7	-1.9	2.3	0.7	0.6	
Participation	0.6	-0.9	0.6	-0.6	0.3	
Public provision	-1.1	-1.6	-1.5	2.6	1.6	

Hospitalizations

	1	2	3	4	5	Total
1. Potential users						
1997	30.1	24.5	18.4	14.8	12.1	100.0
2001	27.8	21.6	20.4	15.6	14.6	100.0
2. Participation						
1997	8.8	10.6	6.9	7.1	7.0	8.4
2001	9.6	6.8	10.9	9.1	4.5	8.4
3. Public provision						
1997	84.3	70.5	62.1	29.1	9.2	63.1
2001	91.9	66.0	67.3	35.1	15.0	65.4
4. Incidence						
1997	42.5	35.0	15.1	5.9	1.5	100.0
2001	44.5	17.5	27.1	9.1	1.8	100.0
5. Difference	2.0	-17.5	12.0	3.2	0.3	
6. Effects						
Potential users	-1.8	-2.2	3.0	0.6	0.4	
Participation	2.7	-12.2	8.7	1.6	-0.8	
Public provision	1.1	-3.2	0.4	0.9	0.7	

Source: authors´ calculations based on the EDS and ECV.
Note: Potential users are pregnant women for antenatal care and attended deliveries, and children under 4 for medicines and hospitalizations.

Table 3
Microeconometric decompositions
Change in the absolute value of the concentration index 1997-2001

	Antenatal care (i)	Attended deliveries (ii)	Medicines (iii)	Hospitalizations (iv)
Change 1997-2001	-4.8	-5.2	-11.6	-7.2
Effects				
Population	-3.5	-5.8	-7.2	-3.6
Participation	0.4	0.0	-0.8	2.1
Public provision	-1.7	0.6	-3.6	-5.7

Source: authors´ calculations based on the ECV.
Note: concentration indices are multiplied by 100.