THE FLYPAPER EFFECT IN MEXICAN LOCAL GOVERNMENTS*

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Resumen: Presentamos evidencia del efecto papel matamoscas en las transferencias no condicionadas en los municipios mexicanos durante el periodo de 1990 a 2007. Utilizando datos de panel también se confirma la asimetría de este efecto. Es decir, la respuesta de las autoridades sobre el gasto local es mayor cuando las transferencias aumentan que cuando éstas disminuyen (Gamkhar, 2000). Estos resultados son especialmente relevantes a la luz de la discusión que se ha desarrollado en los últimos años acerca de la necesidad de una reforma sobre el federalismo fiscal en el país.

Abstract: In this paper, we present evidence of the flypaper effect on unconditional transfers in the Mexican municipalities during the 1990 to 2007 period. Using panel data, we also confirm an asymmetric effect. That is, authorities increase expenditures by a greater amount in response to an increase in transfers than the amount by which they reduce expenditures in response to a decrease in transfers (Gamkhar, 2000). These results are particularly relevant in light of the discussion that has developed in recent years about the need for a reform on the fiscal federalism in the country.

Clasificación JEL/JEL Classification: H77, H72, H54

Palabras clave/keywords: descentralización, trnasferencias federales, gobiernos locales, decentralization, federal transfers, flypaper, local governments, Mexico, Latin America.

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1. Introduction

Theory predicts that a lump-sum transfer has the same effect on local expenditure as an identical increase in income. However, as scholars started to study the effects of intergovernmental transfers, they noted that governments increase their spending more in response to a dollar of lump-sum intergovernmental grants than in response to an equivalent lump-sum transfer (Bradford and Oates, 1971a). The public finance literature began to categorize this effect as a "purely empirical phenomenon" named the flypaper effect (Courant, Gramlich and Rubinfeld, 1979). In addition, the level of unconditional federal transfers to local governments is not always the same since such transfers can increase or decrease. In this context, if local authorities respond in the same way to transfer increases as they do to cutbacks we say that the response is symmetric. Otherwise it will be asymmetric (Gamkhar, 2000).

Mexico has experienced an important process of fiscal decentralization based on transfers to state and local governments. However, the Mexican Treasury is in a structural crisis. Oil revenues have hidden the inability of the federal government to collect sufficient taxes, and the provision of public services at local level has become increasingly dependent on transfers received from the federal government. In this sense, much discussion has developed on the required reforms on fiscal federalism. Immersed in this discussion, a question that naturally arises is: What has been the behavior of states and municipalities upon receipt of transfers from the federal government? This work contributes to the debate on the reallocation of tax powers and expenditure responsibilities of the three levels of government. The analysis presented in this paper uses data at the municipal level of unconditional transfers to test the flypaper effect on expenditures of the Mexican local governments between 1990 and 2007. We confirm that a marginal change in level of transfers from the federal government induces a greater spending response than an equivalent increase in private income (flypaper effect). Also, we find evidence of the asymmetric effect of unconditional transfers on expenditure: government officials react more to transfer increases than to cutbacks (Gamkhar, 2000).

The paper is organized as follows. We start with a brief overview of the Mexican unconditional transfer system. In the second section we present the literature review of the flypaper effect. We also describe how researchers have recently begun to debate the asymmetries of the flypaper effect. The data and the list of variables used in the econometric model appear in the third section. Section four shows

the results of the econometric analysis. Finally, the last section offers some conclusions and implications of this study.

2. Unconditional Intergovernmental Transfers in Mexico

Mexico is a federal republic comprising 31 states, with over 2 400 municipalities, and a Federal District. The states and the Federal District have constitutions, elected governors and unicameral legislatures. States, but not the Federal District, are subdivided in municipalities. The municipal government includes a mayor (*alcalde*), a city council, whose members are called regidores, and a local attorney general (*síndico*) (Benton, 2007).

In 1980, the law of the National System of Fiscal Coordination (in Spanish *Sistema Nacional de Coordinación Fiscal* or SNCF), which allocates federal tax revenues (income tax, excise tax and value-added tax) among the states and local governments, was implemented . The central government collects almost all the tax revenues in the country, and then distributes them through a revenue sharing system among states. The Fiscal Coordination Law (in Spanish *Ley de Coordinación Fiscal* or *LCF*) establishes that twenty percent of these resources must be reallocated among the states in the form of unconditional federal transfers following a formula linked to the size of the state population (45.1%), and to the level of state taxes collected (45.1%). In this way unconditional transfers can increase or decrease according to the economic business cycle and/or the rate of growth of the population.[1] In other words, although unconditional federal transfers are allocated by formula, changes in the population and in economic growth generate variations in the level of resources. The remaining 9.6% is a compensatory criteria based on the inverse of the economic business cycle and the growth of the population.[2]

Unconditional federal transfers have been labeled *Fondo General de Participaciones*, *Participaciones* or Branch 28. This type of transfer is called unconditional because it can be allocated to any type of expenditure. However, it can only be transferred to the states. The Constitution allows municipal governments to receive *participaciones* only from the states, not from the federal government. States are

[1] DOF, 2007.

[2] This formula prevailed until 2007. Since then the formula rewards those states with higher growth in economic activity. See National Institute for Federalism and Municipal Development, better known by the acronym INAFED, 2011.

required to transfer 20 percent of the participaciones to the municipalities. Each local congress is entitled to set the distribution of these resources in accordance to the state's own formulas, either using a formula similar to that of the federal government, or it can develop a different one (LCF, 2007).

The centralization of tax revenues in Mexico represents a bargain in which states and municipalities surrendered their taxing authority to the federal government in exchange for 20 percent of federal tax revenues. This share equals between two and three points of the GDP from 1989 to 2007. Sub-national governments have always been dependent on these federal transfers: In 2007 they represented 42 percent of state revenues and 61 percent of revenues at the municipal level.[3] Thus, state governors and municipal authorities rely on the federal government to collect taxes –in order to avoid the political cost of raising local taxes (Díaz and McLure, 2000)– while retaining plenty of autonomy in how they spend *participaciones*.

In contrast to the extreme centralization of tax collections, spending and borrowing decisions have always been decentralized in Mexico. According to the Federal Constitution, sub-national governments can borrow only for productive investments, and only if they have the approval of the state congress for states, and the city council for the municipalities. Subnational governments faced soft budget constraints until 2000, when a change in the regulatory framework for debt management took place in the country, further loosening constraints. Since then, states and municipalities have been allowed to borrow from development banks and from commercial banks under market conditions (Giugale, Hernández and Oliveira, 2000).

3. Literature Review

3.1. *The Flypaper Effect*

Bradford and Oates (1971a) attempted to establish the basis of a theory on intergovernmental transfers. Their model produced a series of

[3] Not all states levy the same number and rates of taxes. Even states that levy more taxes have a relatively low revenue base. The most common state taxes in the country are levied on four categories of income: hotel stays, lotteries and raffles, payroll, and entertainment and public performances. These four types of taxes account for more than 90 percent of the proceeds at the state level (Sobarzo, 2003).

hypotheses that generated a lot of interest for their empirical testing within the scientific community. One of these hypotheses establishes that the observed effect on the allocation of the public budget between private and public goods is the same whether there is a transfer from the federal to the local government or if the transfer is made directly to the individuals (Hines and Thaler, 1995).

Empirical studies have continually rejected this hypothesis. The literature shows that the expenditure on public goods is more responsive to the intergovernmental transfers than to increases in local income. In other words, once an inter-governmental transfer has benefited a local government, the government begins to finance a series of public programs that became impossible to eliminate, even if the inter-governmental transfer no longer existed. That is, the free resources granted to local governors have a larger effect on public goods than what the theory predicts, so that many public programs built with inter-governmental transfers are difficult to eradicate even when the transfers disappear. The constant repetition of this empirical result created a challenge for scholars. At that point, the public finance literature began to categorize this result as an anomaly, a "purely empirical phenomenon", and named it the flypaper effect. Arthur Okun was responsible for the "flypaper effect" tag, identifying this phenomenon with a paper covered with sticky glue usually used to exterminate insects or rodents. A more accurate description of the flypaper effect in terms of public finance is that "money sticks where it hits" (Hines and Thaler, 1995).

In order to reconcile the theory with the empirical evidence, Acosta and Loza (2001) developed a model based on two Niskanen's (1968) premises regarding rulers' bureaucratic behavior. The first one states that the local government maximizes its budget, taking as a given citizens' public spending demands (otherwise, citizens would not vote for the government). Such maximization is subject to the fact that the budget must be equal to, or greater than, the minimum total costs of the provision of goods in equilibrium. The second premise affirms that the local government exchanges the provision of goods only for its total budget, rather than do it at a "one to one" rate. As a result, the objective of the local ruler is similar to that of the bureaucrat, consisting in maximizing her local budget. This characteristic allows the local government to have a market power similar to that of a monopoly, so that its decision is "all or nothing".

Acosta and Loza (2001) assume that bureaucratic governments preferences, as well as those each individual in the community, are quasi-linear, which allows them to mathematically derive the flypaper

effect.[4] In their model, G is the level of public spending, y is the income of individual members of the community, and α represents the proportion of a public good financed by the intergovernmental transfer. The main conclusions of the model are the following:

1. The change in the level of public spending due to a change in the income of the members of the community is positive:

$$\partial G/\partial y > 0$$

2. The change in the level of public spending due to a change in the intergovernmental transfer is positive:

$$\partial G/\partial \alpha > 0$$

For the purposes of this work, the more interesting conclusion is that the flypaper effect holds whenever the intergovernmental transfers have a greater impact on public spending than the income of the members of the community:

$$\partial G/\partial y < \partial G/\partial \alpha$$

In this way the flypaper effect can be consistent at the theoretical level.

3.2. *The Asymmetry of the Flypaper Effect*

Many authors have examined whether the government's response to changes in public expenditure is the same when the level of unconditional federal transfers marginally increases or decreases. Symmetric responses, where a dollar reduction in intergovernmental transfers reduces local expenditure in the same dollar, are the exception. Thus,

[4] According to Acosta and Loza (2001) the conclusion holds even if they drop this assumption. The complete model is presented in annex A.

this body of literature has been named the examination of the asymmetry of the flypaper effect. There are two forms of asymmetry. Fiscal replacement is the case when local government officials, faced with a cut in grants, try to maintain the existing spending levels of programs by raising higher levels of taxes or local debt (Heyndels, 2001; Melo, 2002). On the other hand, fiscal restraint takes place when local government officials reduce spending by an amount greater than would take place in the symmetric response case.

These alternative responses of local government spending to reductions in federal grants have very different implications for the revenue effort required of these governments. The fiscal replacement paradigm places the heaviest burden of raising revenues on the state and local governments, the symmetrical response places a relatively smaller burden on their tax-raising capacities, and the fiscal restraint paradigm places the smallest burden.

This body of literature has paid close attention to the marginal effect of the transfers on the expenditure, yet knowledge about why different types of asymmetry appear remains limited. Gramlich (19 87) suggests that fiscal replacement comes into view due to political factors: government programs take "roots" and generate "clients" making them politically difficult to be cut off or removed –even in the event of a reduction in intergovernmental transfers.

3.3. *Empirical Evidence of Fiscal Replacement*

The large availability of data at the local level in developed countries allows testing for the presence of the flypaper effect. Deller and Maher (2006), for instance, conducted a study of the flypaper effect according to the type of expenditure in Wisconsin (United States). They confirmed the presence of the flypaper effect, as well as asymmetric fiscal replacement behavior on the part of county governments in response to unconditional transfers. Pallesen (2006) conducted a comparable analysis for Danish municipalities obtaining similar results, during a period of time when the country was in a period of transition from conditional to unconditional transfers. Shaw (2005) found evidence of the flypaper effect in the Canadian provinces between 1981 and 2000. In addition, he found asymmetries pointing to the existence of fiscal replacement. Heyndels (2001) also confirmed the presence of fiscal replacement in Flemish municipalities. Other empirical studies that reveal fiscal replacement are Levaggi and Zanola (2003), Deller and

Walzer (1995), Benton (1992) and Gramlich (1987). On the contrary, Stine (1994) found that cuts in federal transfers to Pennsylvania led to a decrease in overall local-government tax revenues.

There are only few studies available for Latin American countries. For Colombia, Melo (2002) and Trujillo (2006) found evidence that the flypaper effect was present in municipalities that were highly dependent on intergovernmental transfers and also confirmed asymmetric fiscal replacement behavior. Acosta and Loza (2001) found evidence of a greater-than-proportional increase in local spending and in tax collection when federal transfers increased in the provinces of Buenos Aires between 1995 and 1997.

Ibarra and Varella (2003) studied the flypaper effect in the Mexican case using a time-series analysis from 1975 to 2000 to conduct a linear and first-difference analysis at the state level. They confirm the flypaper effect and conclude that the results can be explained by the rather lax budget restrictions local governments faced during this period. Espinosa (2011) also confirms the presence of the flypaper effect at the state level in Mexico. We take the analysis further to present an empirical measurement of the flypaper effect at the local level in Mexico, and also to test for the presence of an asymmetric response in public expenditures.

4. Data

We use the panel data of 2 372 Mexican local (municipal) governments, obtained from the National Institute of Statistics, Geography and Data Processing (INEGI) for the period from 1990 to 2007. INEGI provides expenditure, income and financial information for all governments that comply with the definition of "local governments" by law.[5] We collect data on non-capital expenditure (E), unconditional transfers (T) and financial services (F).

INEGI reports gross local expenditures and it categorizes in non-capital expenditure and capital expenditure.[6] In order to verify the

[5] This definition excludes the Federal District. The sample represents the 98.9% of the Mexican local governments in the country.

[6] Gross municipal expenditure is composed by the sum of the following: Personal services, materials and supplies, general services, acquisition of real state and furniture, civil works and social actions, financial investment, subsidies, transfers and aid, federal and state resources to municipalities, other expenditures, and public debt. The Non-Capital Expenditure includes only personal services, materials and supplies, general services, and acquisition of real state and furniture.

existence of the flypaper effect at the local level we use the non-capital expenditure category into the analysis (E).[7] The "unconditional transfers" (T) are the money that local authorities receive from the states in which they are located through *participaciones*. We control the fact that local governments have access to financial resources to balance their budgets (F). This funding comes from national or international credits, loans, and other obligations under the subscription or issuance of debt or other documents made payable to term.

The research on the flypaper effect explores the effect of unconditional transfers and local tax base on public expenditure. However, there is debate about the best way to calculate the local tax base. Martinez-Vazquez and Jameson Boex (1997) propose the following five methods: revenue collections, *per-capita* personal income, gross regional product, total taxable resources and a representative tax system.

Per-capita personal income is a very popular method for calculating the local tax base due to its high accessibility and simplicity. However, historical data on personal income is not available for Mexico at the local level. Thus, we use the municipal revenue collection as calculated by INEGI to construct a proxy for the local tax base (I). INEGI includes in the category of local revenue collection all taxes paid by individuals and corporations under the law (*impuestos*), fees for services (*derechos*), payments received from the alienation of assets (*productos*),[8] fines, penalties, enforcement costs, reinstatements, and compensations (*aprovechamientos*).[9]

[7] We perform the analysis using different categories of public expenditure. However, only the model with non-capital expenditure as dependent variable passes the omitted variable test. We thank two anonymous referees for this suggestion.

[8] *Productos* are government revenues from activities that do not correspond to the performance of its functions in accordance with the law, or by exploitation of their assets. *Derechos* are the contributions by the use or enjoyment of the public property of the nation, as well as the services provided by the state and that correspond to the performance of its duties in accordance with law. *Aprovechamientos* are government revenues that the government receives due to the performance of its duties in accordance with law, but receives in the form of penalties, default interest or penalties, or any income not classifiable.

[9] Local governments collect very few taxes due to the LCF. Unconditional transfers in Mexico mainly fill the gap between the expenditures and own resources at the local level even though governments have access to financial resources. We recognize the underlying empirical problems of this proxy. We leave this limitation

The analysis requires that all variables be expressed in real terms to avoid that the inflationary component affects the outcomes. To transform the variables into real units we use the National Consumer Price Index (INPC).[10] We also need to compensate for the strong differences in population among Mexican municipalities. Municipalities range from urban cities with millions of inhabitants to small towns with populations under 2 500. This is particularly true in the 2 071 rural municipalities (84.4 per cent of the data). To control for differences in size, we transform the real variables into *per-capita* terms using the data on municipal populations from the National Council of Population (CONAPO).

5. Model Specification and Estimation of the Mexican Flypaper Effect

The empirical literature of the flypaper effect employs relatively simple econometric models to capture directly the effect of unconditional transfers and municipal income on the level of local public expenditures.[11] However, a major concern is the fact that there may be a specification error due to the omission of variables that affect both transfers and spending in the analysis (Hamilton 1983, Hines and Thaler 1995). Thus, the estimation of the flypaper effect is sensitive to the functional form, which may lead to biased parameters estimates (Becker, 1996). We test the hypotheses of this study using a fixed effects panel model with robust errors to solve the identification problem.[12] The functional form is the following:

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as a possible extension for future research due to the lack of information at the municipal level in Mexico.

[10] We obtain the INPC from INEGI (constant prices June 2002).

[11] The effect of federal transfers and local income on local government expenditures is equivalent only for unconditional transfers (Bradford and Oates, 1971b). Thus, it would be incorrect to include conditional transfers or matching grants in the estimation (Karnik and Lavani, 2005).

[12] We use the STATA linktest routine to examine for specification error. The idea behind linktest is that if the model is properly specified, one should not be able to find any additional predictors that are statistically significant except by chance. This routine uses the linear predicted value (y hat) and linear predicted value squared (y hatsq) as the predictors to rebuild the model. The variable "y hat" should be a statistically significant predictor, since it is the predicted value from the model. This will be the case unless the model is completely misspecified. On the other hand, if our model is properly specified, the variable "y hatsq"

$$log\ E_{it} = \alpha_0 + \beta_1\ log\ T_{it} + \beta_2\ log\ I_{it} + \beta_3\ log\ F_{it} + \beta_4\ [D_{it}\ (log\ T_{it} - log\ T_{it-1})] + e_{it} \quad (1)$$

Where:

α = Constant

β_1 = Unconditional transfer response coefficient

β_2 = Local income response coefficient

β_3 = Financial resources response coefficient

β_4 = Symmetry effect response coefficient

E_{it} = Per capita non-capital expenditure of municipality i in year t

T_{it} = Per capita unconditional federal transfers of municipality i in year t

I_{it} = Per capita municipal income of municipality i in year t

F_{it} = Per capita financial resources of municipality i in year t

$D_{it}\ (log\ T_{it} - log\ T_{it-1})$ = Symmetry of the flypaper effect of municipality i in year t

e = Error term

i = Municipality (i = 1...2 372)

t = Year (t = 1...17)

If $\beta_1 > \beta_2$ there is evidence of the flypaper effect. In order to test the symmetry effect we estimate a different coefficient within the same econometric analysis to capture the exclusive impact of a

shouldn't have much predictive power except by chance. Therefore, if "y hatsq" is significant, then the linktest is significant. This usually means that either we have omitted (a) relevant variable(s) or our link function is not correctly specified. We perform the link test in models specified both in logarithmic and linear forms. We also include temporal effects. All of them but the one we present in this paper have a significant linktest. We are grateful to two anonymous referees for this suggestion.

reduction on federal transfers. We construct a variable called symmetry (S), which is $D_{it}(log\ T_{it} - log\ T_{it-1})$, where D_{it} is a dichotomous variable that equals one when the municipality experiences a reduction in unconditional transfers and zero in all other cases. A non-significant coefficient β_4 would suggest that a reduction and an increase in transfers affect public expenditure equally. Conversely, a significant coefficient β_4 would point to an asymmetric flypaper effect. By construction, if this coefficient is negative and significant it means that local authorities respond more to increases than to decreases on unconditional transfers.

The estimation strategy benefits from a rich panel of 2 372 municipalities during a period of 17 years.[13] First, we estimate the pooled model.

The assumption behind the pooled model is that the dependent variable responds in the same way to all explanatory variables, including the constant. The coefficient associated with the unconditional transfer (T) is higher that the income coefficient (I) and both are significant. The R^2 is 0.8014. Then, we estimate the fixed effects model.

The fixed effects model assumes that there are unobservable variables, which remain constant over time and which are different for each individual in the sample. Again the coefficient associated with the unconditional transfer (T) is higher that of the income coefficient (I). The F-test at the end of the estimation compares the fixed effects model with the pooled model previously estimated. STATA provides this test by default.

The null hypothesis is that there is uniformity in the coefficients and that the pooled model would therefore provide the best specification. According to the results, we reject the null: the fixed effects model performs better than the pooled model. We proceed to estimate the random effects model.

We use the Hausman test to choose between the fixed and the random effects model. The null hypothesis of the Hausman test indicates that the random effects model is the most efficient estimator. The alternative hypothesis is that the estimates of the random effects model are biased and inconsistent. In other words, if we reject the null hypothesis we have enough evidence to accept that the fixed effects model is consistent.

The results indicate that the fixed effects model is preferable to

[13] The STATA outputs were omitted for reasons of space. They can be ordered directly to the author.

the random effects model. We test for autocorrelation and for heteroscedasticity. To correct them we estimate the fixed effects model with robust errors, then, we estimate the random effects model with robust errors and run the Hausman test to compare again the robust models.

We reject the random effects as an efficient estimator. The presence of both the flypaper and the asymmetric effect are tested using fixed effects with robust errors (bootstrap errors). This model allows us to correct for autocorrelation and heteroskedasticity. The estimations are shown in table 1.

Table 1
Econometric results

Independent variable	*Pooled*	*Fixed*	*Random*	*Fixed (bootstrap errors)*	*Random (bootstrap errors)*
Income	.1880	.1620	.1695	.1620	.1605
	.002	.0042	.0031	.0095	.0063
Unconditional	.8025	.8251	.8230	.8251	.8230
transfers	.004	.0067	.0054	.026	.01698
Financial	.0416	.0322	.0335	.0322	.0335
resources	.001	.0013	.0013	.0017	.0018
Symmetry	-.6387	-.6566	-.6538	-.6566	-.6538
effect	.011	.0109	.01006	.03501	.0317
Constant	.1462	.1535	.1027	.1535	.1027
	.026	.0420	.0340	.1390	.0967
Observations	16 310	16 310	16 310	16 310	16 310
Number of municipalities	2 372	2 372	2 372	2 372	2 372
R-squared	0.801				
within		.636		.6366	.6366
between		.852		.852	.8523
overall		.8		.799	.8

Standard errors in brackets. All coefficients are significant at 1%.

All regressions show that the flypaper effect is present in the Mexican municipalities since the coefficient for the unconditional federal transfers, T, is larger than the coefficient for the municipal own income, I, at the one percent significance level. These results suggest that public expenditure in Mexican municipalities is more stimulated by *participaciones*, than by individuals' incomes.

The symmetry coefficient is also significant in all estimations. The negative sign of S indicates that local public expenditure is more sensitive to increases than to reductions in unconditional transfers. That is, during periods of growth in *participaciones*, local officials are likely to build them into their budgets, while they are unlikely to reduce budgets in response to a decrease in *participaciones*. Consequently, the change in local public expenditure will be bigger than the change that we would observe in the case of a decrease in unconditional transfers. These results support the notion of asymmetry. That is, local governments tend to treat increases and decreases in *participaciones* differently (Gamkhar, 2000). These results suggest that, in the event of a reduction in the unconditional transfers, it would be worthwhile test Gramlich's (1987) hypothesis: Municipal governments use transfers to finance certain programs that later, when these moneys are reduced, are politically difficult to eliminate.

The coefficient of financial resources F is positive and significant at one percent. This situation can be explained by the fact that in Mexico local governments had rather lax debt restrictions before 2000, and were subject to market conditions after that. Throughout this time public debt conditions at the state level allow municipal governments to widen their budget restrictions. However, the information available does not let us evaluate in more detail the debt behavior of local authorities.

The outcomes of this study allow researchers and stake holders to have a better understanding of the spending behavior of transfers recipients during these years. Up to now unconditional transfers have been stable and expanding, but the fiscal uncertainty facing federal government in Mexico has introduced a great degree of insecurity into the local process of expenditure planning. This study thus provides the opportunity to explore the effects of asymmetry on the flypaper effect in Mexico. There are two possibilities if federal government reduces transfers to the municipalities: they might replace them by higher levels of taxes or public debt issued by the local government. The first alternative is very unlikely since the tax bases of local governments have limited revenue-generation potential, which imposes a considerable restriction on the amount of tax col-

lection. Thus, it is more likely that local authorities will choose to increase public debt.

6. Concluding comments

One of the most cited phenomena in the empirical fiscal federalism literature is the "flypaper effect". However, only a small number of studies have focused on Latin America. This paper conducts an analysis of the impact of unconditional federal transfers on Mexican municipalities from 1990 until 2007. The main contribution of this paper is based on seventeen years of data available at the local level to explore the behavior of subnational governments in Mexico. We find evidence of the flypaper effect in a double logarithmic specification model that does not provide evidence of omitted variables (Becker, 1996), using a fixed effect model with bootstrap errors. Local governments spending is stimulated more by an increase in unconditional federal transfers than by an equivalent increase on the level of income of the members of the community, although both effects are pure income transfers to localities.

We also find evidence of an asymmetric behavior in the Mexican municipalities. In other words, public spending responds more to increases in unconditional transfers than it does in the case of a decrease in transfers (Gamkhar, 2000). This result opens a new line of research. In the future, with more detailed information, we might be able to corroborate Gramlich's (1987) hypothesis: once a local government is benefited by intergovernmental transfers, it begins to finance a series of public programs that adhere to the public agenda, which become very difficult to eliminate, even in the event of a reduction of the intergovernmental transfers.

These results have thought-provoking policy implications. First, it makes clear that the impact of the revenue-sharing transfers have been significant during this period and it might have deterred the willingness of local authorities to rely on local taxes to finance public goods. This in addition to the fact that –under the current revenue-sharing system–, the states' tax base has a limited revenue-generation potential, which imposes a considerable restriction on revenue collection levels.

Second, these results are particularly relevant in light of the discussion that has developed in recent years concerning the need for transparency and accountability in all level of government in the country. The financial resources variable (F) does not include public debt

amortization (amortization, interest, commissions). More detailed financial information will allow us to explore in greater detail the impact of these obligations on the asymmetric effect. These results highlight the importance of promoting transparency and accountability at the local level in order to evaluate in detail the effectiveness of the unconditional transfers in the case of Mexico over public expenditure.

Finally, the presence of the flypaper effect and the fact that public expenditure in local governments has been more sensitive to increases in federal transfers than to decreases (Gamkhar, 2000) must be considered in any fiscal decentralization reform that takes place in Mexico.

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Annex A

Deriving the flypaper effect based on the model of bureaucratic behavior

The bureaucrat is a monopolist within the government, but, unlike private monopolies, she cannot transform her power into monetary benefits. Rather, the bureaucrat maximizes a utility function that considers not only the size of the budget but also citizens demands to establish the size of public spending. Otherwise, the bureaucrat could be thrown out of office. The bureaucratic maximization function (in *per capita* terms) is thus:

$$B = B\left\{U\left(c; G\right); h\right\}$$

where c is consumption, G is public spending, and the usual requirements of decreasing marginal returns are met:

$$U_C > 0, U_{CC} < 0, B_U > 0, B_{UU} < 0$$

subject to the following restrictions:

$y = c + 1$ is the individual budget restriction.

$h = \frac{pG}{L} = t + d$ is the government budget restriction.

$d = \alpha \frac{pG}{L}$ is the amount of transfers, with $\alpha \in (0, 1)$.

where α represents the fraction of the public good financed by the central government.

Thus, the bureaucrat faces the following problem:

$$\max B = B\left\{U\left[y - (1-\alpha)\frac{pG}{L}; G\right]; \frac{pG}{L}\right\}$$

$$\{G\}$$

This problem can be solved in general form. We assume that both the bureaucrat's and the individual's preferences are quasi-linear. This assumption can be dropped and we can treat the general case without affecting any of the following conclusions.

$$\max B = B\left\{U\left[y-(1-\alpha)\frac{pG}{L}+G\right]+\frac{pG}{L}\right\}$$

$$\{G\}$$

The first-order condition is the following:

$$-(1-\alpha)B_{\alpha}U_{c}\frac{P}{L}+B_{u}+\frac{P}{L}=0 \qquad (A.1)$$

If we re-order the arguments we obtain the following condition for optimal provision of the public good in this problem:

$$\frac{1}{U_{c}}=\left[1-\frac{1}{(1-\alpha)B_{u}U_{c}}\right]\frac{p}{L}(1-\alpha) \qquad (A.2)$$

This condition shows that the amount of the public good provided is not the socially optimal amount because it does not meet Samuelson's equality condition between the marginal rate of transformation and the sum of the marginal rates of substitution:

$$p=L\frac{1}{U_{c}}$$

Re-ordering (A.2):

$$\frac{1}{U_{c}}=\left[(1-\alpha)-\frac{1}{B_{u}U_{c}}\right]\frac{p}{L}$$

which means that:

$$\frac{1}{U_c} < \frac{P}{L}(1-\alpha) \qquad (A.3)$$

This means that the public good is provided in excess if we compare the results with the equilibrium solution in a benevolent ruler's model of transfers. The bureaucrat uses the consumer's surplus for her own benefit, decreasing the community's welfare. In order to visualize the transfers within this context, we conduct a comparative statics analysis and observe, starting from the first-order condition (A.1), what would happen with the public good if we first increased the level of income, and second, the fraction financed by the central government. If we differentiate (A.1):

$$\left[(1-\alpha)^2 B_{uu} U_c^2 \frac{p^2}{L^2} - (1-\alpha) B_{uu} U_c \frac{P}{L} + (1-\alpha)^2 B_u U_{cc} \frac{p^2}{L^2} \right.$$
$$\left. -(1-\alpha) B_{uu} U_c \frac{p}{L} + B_{uu} \right] dG +$$

$$\left[(1-\alpha)^2 B_{uu} U_c^2 \frac{p}{L} - (1-\alpha)\, B_{uu} U_c \frac{P}{L} + B_{uu} U_c \right] dy +$$

$$\left[B_u U_c \frac{p}{L} - (1-\alpha) B_{uu} U_c^2 \frac{P^2}{L^2} G - (1-\alpha)^2 B_u U_{cc} \frac{p^2}{L^2} G \right.$$
$$\left. +B_{uu} U_c \frac{p}{L} + B_{uu} \right] d\alpha = 0$$

Re-ordering to solve $\frac{dG}{dy}$, keeping α constant:

$$\frac{dG}{dy} = \frac{-B_{uu} U_c \left[(1-\alpha)\, U_c \frac{P}{L} - 1\right] - (1-\alpha) B_u U_{cc} \frac{P}{L}}{B_{uu} \left[(1-\alpha) U_c \frac{P}{L} - 1\right]^2 + (1-\alpha)^2 B_u U_{cc} \frac{p^2}{L^2}} > 0$$

given that the sign of the hook is positive according to the relationship found in (A.3). Keeping the level of income, y, constant:

$$\frac{dG}{dy} =$$

$$\frac{\left\{-B_{uu}U_c\left[(1-\alpha)\,U_c\frac{P}{L}-1\right]-(1-\alpha)B_uU_{cc}\frac{P}{L}\right\}\frac{P}{L}G+B_uU_c\frac{P}{L}}{B_{uu}\left[(1-\alpha)U_c\frac{P}{L}-1\right]^2+(1-\alpha)^2B_uU_{cc}\frac{p^2}{L^2}}>0$$

And what is more interesting, we can verify that

$$\frac{dG}{d\alpha}>\frac{dG}{dy},$$

which shows the flypaper effect.