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ABSTRACT

Distributional Effects of Intergovernmental Transfers in Mexico*

A rigorous understanding of the developmental effect of fiscal transfers to subnational governments remains an important policy research issue globally. This paper exploits a novel dataset of 20 years of municipal poverty maps and local public finances to study the effects on local welfare of a large fiscal transfer fund earmarked for social investment in more than 2,000 Mexican municipalities. Results show a positive but modest effect on the average household income, and positive effects on seven nonmonetary welfare measures. In contrast, these funds have no significant impact on extreme and moderate monetary poverty. These results provide important lessons for policy on the effects of earmarked funds to reduce territorial poverty and inequality in terms of incentives to design formulas to distribute earmarked fiscal resources to subnational governments.

JEL Classification: C26, D30, H72, H77, I3

Keywords: fiscal federalism, earmarked transfers, decentralization, poverty, Mexico

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1. **Introduction**

A wide literature documents the importance of and the challenges involved in increasing government revenues in developing countries (for example, see Besley and Persson 2014). The way in which revenues are spent—programmatically, as well as by whom and where—is the other part. During the 1980s and 1990s, countries around the world moved toward transferring earmarked resources to subnational governments with the objective of providing public services locally, including health care, education, and social infrastructure, such as water and sanitation services or support for urbanization (Habibi et al. 2003; Jiménez-Rubio 2011; Litvack, Ahmad, and Bird 1998; Martinez-Vazquez, Lago-Peñas, and Sacchi 2015; Musgrave 1983; Oates 1972; Ostrom et al. 1993; Wallis and Oates 1988). The success of decentralization has been associated with various factors. These include the design and implementation of reforms, the incentives facing local and national stakeholders, local accountability and responsiveness, the budgetary process, and the availability of adequate local capacity (Ahmad et al. 2005; Loayza, Rigolini, and Calvo-González 2014; Martinez-Vazquez and Vaillancourt 2011; Robinson 2007).

The empirical evidence on the effects of decentralization on poverty and inequality is mixed. Some studies suggest that the informational gains of decentralization can have a positive impact on pro-poor spending and targeting (Alderman 2002; Bardhan and Mookherjee 2005; Galasso and Ravallion 2005), while others show that, by enhancing access to basic services, decentralization can contribute to poverty reduction (Caldeira, Foucault, and Rota-Graziosi 2016). Decentralization may not lead to poverty eradication in locations where there is substantial corruption, limited local checks and balances, a lack of political commitment and policy coherence, and insufficient capacity (Steiner 2005). In poor countries with weak institutions, such as postconflict countries, decentralization may worsen poverty (Jütting et al. 2004). The effects on the poor have also been tied to the sequencing and pace of fiscal, administrative, and political decentralization (von Braun and Grote 2009). Some studies find that decentralization has an equalizing impact (Sepúlveda and Martinez-Vazquez 2011; Tselios et al. 2012), while others show the opposite (Sacchi and Salotti 2014).

This paper aims to contribute to the literature by identifying the causal effects of a fiscal transfer fund on social welfare. To explore the distributional effects of fiscal federalism, the paper examines the case of a large earmarked social infrastructure fund in Mexico, the Social Infrastructure Transfer Fund (*Fondo de Aportaciones para la Infraestructura Social,* FAIS), equivalent to 2.53 percent of "assignable federal tax revenues" (*Recaudación Federal Participable).*[1] Estimating the effects on poverty and inequality of earmarked funds is relevant in numerous developing economies, including those in which a large share of the funding of subnational governments is generated by the taxation of national resources. This paper exploits a novel dataset of 20 years of municipal poverty maps by combining the dataset with local public finance variables. The dataset also includes information from the population and establishment censuses to proxy local economic activity. The results are important for identifying who benefits within municipalities and which part of the distribution is affected and for differentiating effects between urban and rural areas, as well as in terms of the monetary and nonmonetary components of welfare.

[1] These "assignable federal tax revenues" correspond to taxes collected from federal income tax, value added tax, and ordinary taxes and fees from oil extraction and production. In practice, with the exception of extraordinary fees from oil and other extraordinary fiscal revenues by the federal government, most of the federal taxes are subject to sharing with subnational governments through earmarked and unconditional fiscal transfers.

The Social Infrastructure Transfer Fund (*Fondo de Aportaciones para la Infraestructura Social,* FAIS) is a large source of income for municipalities in Mexico.[2] In 2014, 22 percent of the total fiscal funds received by municipalities originated from this fund; with a larger share for poorer municipalities The objective of the fund is to finance investments in infrastructure to benefit the poor. To appraise the long-term impact of the fund on local welfare measures, the analysis follows a production function approach across municipalities, where the total local income depends on the available factors of production, such as employment and capital, given certain levels of taxes and transfers, including conditional and unconditional public transfers. Because the FAIS allocation formula favors municipalities with higher poverty rates, any model that fails to account for such endogeneity would underestimate the effects on poverty and other welfare indicators.[3] To mitigate this bias, the analysis implements a fixed effects method. In the case of monetary poverty and indicators of access to services, it also employs an instrumental variable model using the original allocation of the FAIS as an instrument for the observed expenditures of the fund. The analysis accounts for the fund's delayed effect and ensures that various inputs that inform the formula for assigning resources to municipalities and the estimation of indicators are not derived from contemporaneous data sources.

The main results show that the fund had a positive, but modest effect on household income per capita between 2005 and 2014, as well as a positive effect on most nonmonetary welfare measures. Despite the positive impact on income, there is no evidence of effects on extreme and moderate poverty rates, which is likely driven by a lack of effect in rural and semiurban municipalities. This lack of effect on poverty outcomes is explained by the positive impact on incomes among the relatively more well off residents of the poorer municipalities. Indeed, the fund appears to have resulted in higher income inequality within municipalities, especially within rural and semiurban ones, which represent the bulk of municipalities in Mexico, while it had a more equalizing effect within urban municipalities.

In particular, results show that a 10 percent increase in the FAIS is associated with a 0.26 percent increase in the average household income per capita, but with an unequalizing effect within municipalities. While the FAIS had a larger positive effect of 0.39 percent on the top decile of the income distribution, the bottom six deciles did not have a significant effect. Thus, the fund accounted for a 0.09 point increase in the Gini coefficient. Moreover, it did not present significant effects on the levels of poverty, but was associated with a decline in the change in extreme poverty rates of 0.45 percentage points, suggesting a convergence effect. Furthermore, the FAIS has had a positive effect in most nonmonetary measures of well-being, such as access to basic services (electricity, sewerage, drinking water), quality of the dwelling (floors, toilet), education, and health. Among the nonmonetary measures, the fund had the largest impact on the coverage of health services through a 1.8 percentage point increase in average health service coverage in the municipality.

The results differ by area of residence. The FAIS has had a positive effect on average per capita household income in urban areas, at 0.21 percent, but no significant effect in rural areas. In urban areas, the FAIS has had a positive and significant effect in the lowest part of the distribution (deciles 1 to 7), where the effect has been the greatest. In rural areas, it has had a positive, significant effect only among in the highest decile. In contrast to the overall results nationwide, FAIS was associated with a reduction in poverty and extreme poverty in urban areas of 3.2 and 2.6 percentage points, respectively, while the results in rural municipalities were not significantly different from zero. Unlike the case of income, the effects on nonmonetary welfare outcomes have tended to

[2] In 2014, total expenditures through the FAIS were equivalent to US$230 billion in 2011 purchasing power parity U.S. dollars.

[3] The formula builds on the global poverty index in each municipality based on the density of inhabitants with incomes below an extreme poverty line or large deficits in education, housing, sanitation, and electricity.

be more uniformly positive across locality type. In general, receiving earmarked resources for social infrastructure is expected to increase the coverage in electricity, sewerage, and drinking water by 0.3, 0.8, and 0.9 percentage points, respectively.

This paper contributes to the nascent literature on the distributional effects of fiscal federalism. The application, using a Mexican earmarked transfer fund, is performed on smaller administrative units relative to previous studies, that is, among municipalities instead of states. The analysis provides important policy lessons on the efficiency of earmarked funds, which depends on the incentives in the design of the allocation formula, whereby the allocation of a larger share of resources to lagging municipalities can be supported. The policy lessons also involve the rules of targeting, operations, execution, and accountability for these funds. Complementary policies are needed to ensure that the benefits of investment in social infrastructure are received by the poorest households in remote areas.

The next section presents a brief literature review of the empirical research on the effects of federal transfers on local welfare in various parts of the world. Section 3 describes the fund and offers background information. Section 4 outlines the data and the sources used in the analysis. Section 5 details the methodology of the analysis. Results are presented in section 6. Section 7 concludes.

2. Literature review

An important share of the literature on fiscal decentralization argues that local governments have a better understanding of the needs and preferences of local populations and therefore ensure a more efficient allocation of resources (Musgrave 1983; Oates 1972). One of the main arguments is that central governments lack the time and knowledge to implement policies and programs that reflect the needs and preferences of local populations (Ostrom et al. 1993). According to this argument, local governments are more well equipped to respond to local needs because they are able to adapt the allocation of resources to the preferences of smaller and more homogeneous groups (Wallis and Oates 1988).

Decentralization can improve local public service provision and local governance. Local governments are said to have better information about local needs and preferences and better incentives to implement policies to address these needs and preferences and can thus allocate public resources more efficiently, that is, realize allocative efficiency (Litvack, Ahmad, and Bird 1998). For example, Faguet (2004) finds that, in Bolivia, decentralization led to a better match between local preferences and budgetary allocations. In addition, the ability to deliver services at lower cost, that is, production efficiency, may translate into improved quality and quantity (Martinez-Vazquez, Lago-Peñas, and Sacchi 2015). Evidence suggests that decentralization reforms exert a positive impact on health care services and outcomes (Habibi et al. 2003; Jiménez-Rubio 2011; Khaleghian 2004; Robalino, Picazo, and Voetberg 2001). Kis-Katos and Sjahrir (2017) find that fiscal decentralization in Indonesia made investments in health care and infrastructure more responsive to gaps in local services.[4] Decentralization may also help improve the willingness of local people to pay for local services, because it leads to a better match with local preferences. The local provision of information to citizens may also improve accountability. For instance, Ferraz and Finan (2008) show the effects of the disclosure of local governmental corruption practices on the electoral outcomes of incumbents in municipal elections in Brazil. Fiscal decentralization may likewise have a beneficial impact on governance by curbing corruption (Altunbaş and Thornton 2012; de Mello and Barenstein 2001; Fisman and Gatti 2002).

[4] However, the authors find no evidence of any beneficial effects of direct elections on investment targeting.

Opponents argue that the lack of human, financial, and technological capacities among local governments may hinder appropriate public services under decentralization, and thus control should remain in the hands of the central government (Crook and Sverrisson 1999; Smith 1985). Moreover, given the existence of externalities, distortions to mobility, and economies of scale, decentralization often entails costs that require corrective mechanisms through the central government (Gordon 1993).

Incomplete contracts within federal systems may also limit the coordination of fiscal policies and increase the occurrence of pork barrel politics and other problems of coordination (Saiegh and Tommasi 1999; Seabright 1996; Shah 2006; Weingast 1995).[5] The literature on pork barrel politics suggests that legislators tend to support projects for which they can claim credit with the electorate (Mayhew 1974). Selod and Soumahoro (2019) find strong evidence of a prevalence of political bias in the federal funding of highways in constituencies electing legislators in Mexico. Costa-i-Font, Rodriguez-Oreggia, and Lunapla (2003) also find a positive relationship between the regional allocation of public investment and past support for the ruling party in Mexico. Using data on Turkey, Celbis, de Crombrugghe, and Muysken (2014) find evidence of a partisan bias in the allocation of public investment in regional transportation and communication. Other research finds less persuasive results. For example, Luca and Rodríguez-Pose (2015) indicate that, although electoral concerns matter in the allocation of public investment across regions in Turkey, the magnitude of pork-barreling is relatively low compared with the role played by socioeconomic factors.

Following the decentralization wave, countries have implemented, to a lesser or greater extent, decentralization in administrative responsibilities (Dick et al. 2016; Litvack, Ahmad, and Bird 1998). Many factors affect the success of these endeavors, including the dynamics of political economy, the budgetary process, and the need for effective local capacity in implementation (Loayza, Rigolini, and Calvo-González 2014). Yet, supportive conditions locally, such as accountability and responsiveness, financial resources to provision services, and administrative capacity, are often absent in many countries (Robinson 2007). Obstacles also include flaws in the design of decentralization reforms, resistance from those holding traditional or central power, and weak central government institutions (Martinez-Vazquez and Vaillancourt 2011). Indeed, in addition to the incentives available to local and national politicians, the success of decentralization in better service delivery has been associated with the design of the systems and the process of implementation (Ahmad et al. 2005). Von Braun and Grote (2009) argue that, to assess the effectiveness of decentralization in improving social indicators, one must consider the simultaneous effect of the sequencing and pace of different types of decentralization, as well as country-specific conditions, target groups, and the types of public services.

Paying attention to the specific country factors and context, as well as the management of tasks and the lines of accountability, can inform the possibility for more appropriate design and implementation (Smoke 2015). If expenditure decentralization is not accompanied by revenue decentralization, this may limit the expansionary impact on service provision (Bardhan and Mookherjee 2006b). However, effective formal institutions, such as functioning electoral rules, can play a positive role in the success of the decentralized delivery of local public goods, as suggested by the analysis of a conditional cash transfer program aiming to reduce school drop-out rates in Brazil (de Janvry et al. 2012).

Decentralization requires more monitoring and greater accountability. In the absence of an adequate system of checks and balances, local representatives have incentives to maximize their incomes rather than to seek greater regional development as their resources and authority grow. In this way, local governments may be subject to elite capture (Reinikka and Svensson 2004). The effects of decentralization may be influenced by the method

[5] More generally, Golden and Min (2013) offer a comprehensive review of studies of distributive politics around the world.

used to finance local governments, for example, user fee mechanisms versus intergovernmental transfers (Bardhan and Mookherjee 2006b).

Particularly in unequal communities, interest groups may capture benefits at the expense of the poor. In Ecuador, localities characterized by greater inequality tend to receive fewer benefits going to the poorest. Local groups with more power capture the benefits of social fund investment projects (Araujo et al. 2008). In Ukraine, while public services, financing, and administration functions were decentralized in the 1990s, most governing officials continued to be appointed by the central government. This has constrained the representativeness of local authorities, limiting accountability and leading to fragmentation and the use of health care services as a source of patronage by local elites (Belli, Dzhygyr, and Maynzyuk 2015). In a study of targeted welfare programs in Indonesia, Alatas et al. (2013) find evidence of elite capture, although the welfare losses created appear to be small. In West Bengal, evidence suggests that less employment is generated and less resources are allocated to villages with higher poverty rates, land inequality, or frequency of low caste households, although there is limited evidence of elite capture in the targeting patterns of private goods (Bardhan and Mookherjee 2006c). Galasso and Ravallion (2005) show that program targeting in Bangladesh is less efficient in communities with greater land inequality. Institutional arrangements that align incentives between public servants and local development must therefore accompany decentralization. Foster and Rosenzweig (2001) show that a 1.0 percent increase in the proportion of the poor in rural communities in India increases the likelihood of receiving pro-poor investment projects by 15 percent under a democratic regime, although the results are not significant under nondemocratic regimes. Similarly, Crook and Manor (1998) attribute the success of decentralization in Karnakata, India, to the effectiveness of the checks and balances in the democratic system.

There is also extensive research on vertical fiscal imbalances, that is, a measure of the gaps between subnational government spending and revenue (Boadway and Shah 2009; Boex and Martinez-Vazquez 2006; Bird and Smart 2002; Sutiyo and Maharjan 2013).[6] Such imbalances are generally bridged with transfers from the central government that originate as central government revenues (Bird 1993). Vertical imbalances may have important implications for autonomy, efficiency, and accountability, whereby, "if subnational governments are to be big spenders, they must, in the interests of fiscal responsibility and accountability, also become bigger taxers" (Bird 2010, 28). The consideration of vertical fiscal imbalances is also relevant in the taxation of natural resources and the revenue allocation arrangements between levels of government (Brosio 2006). An ample literature has explored the governance implications of the assignments of natural resource revenues to subnational governments and the associated policy formulations (Bahl and Tumennasan 2004; Collier and Hoeffler 2005; Davis, Ossowski, and Fedelino 2003).

The empirical literature on the effects of decentralization on economic growth and welfare is inconclusive. Some studies find a zero or negative association between fiscal decentralization and growth (Davoodi and Zou 1997; Woller and Phillips 1998; Xie et al. 1999; Zhang and Zou 1998). Yet, other studies find evidence of a positive relationship (Akai and Sakata 2002; Iimi 2005; Lin and Liu 2000; Thiessen 2003; Yilmaz 1999). Some studies show the effects of positive informational gains of decentralization in pro-poor spending and targeting. Bardhan and Mookherjee (2005) find that, at a low scale, decentralizing the delivery system of an antipoverty program promotes cost-effectiveness and improves intraregional targeting. In Albania, Alderman (2002) shows

[6] In many Latin America countries, spending decentralization has outpaced revenue decentralization, and vertical fiscal imbalances in the region are higher than in the OECD. Relative to other federal states of the region (where spending has been substantially decentralized), Mexico's subnational governments remain closely dependent on federal sources of revenue (for example, compared with Brazil, which has more revenue autonomy). Unitary states tend to be less decentralized and exhibit high levels of vertical fiscal imbalances as a share of spending because they are heavily dependent on central government transfers. This is the case of Guatemala and Honduras (Izquierdo, Pessino, and Vuletin 2018).

that local officials appear to have access to additional information that enables them to improve the targeting of social assistance on the poor. Jütting et al. (2004) find that the effects of decentralization on poverty were positive in some cases, including China, Ghana, and the Philippines, but negative in others, including Guinea, Malawi, and Mozambique. Sepúlveda and Martinez-Vazquez's (2011) cross-country analysis finds that fiscal decentralization is associated with increases in poverty, but also with reductions in inequality in the case of countries with large public sectors. Caldeira, Foucault, and Rota-Graziosi (2016) show that decentralization contributes to poverty reduction in Benin by improving access to basic services, although it also appears to increase inequality in access across local governments. Tselios et al. (2012) find that fiscal decentralization in Europe is associated with lower income inequality within regions, whereby less well-off regions seem to benefit the most from the equalizing effect. Meanwhile, using a sample of 23 OECD countries, Sacchi and Salotti (2014) find that a greater tax decentralization is associated with wider household income inequality within countries. Differences in the results across countries and studies may arise from many factors, such as conceptual distinctions in definitions of autonomy, the degree of fiscal decentralism, or simple variations in budget computation and classification (Smith 2018).

Several authors have studied the effects of increases in federal transfers on local socioeconomic outcomes. In Peru, local governments in mining districts have benefited from a rise in the resources supplied by the central government because of an increase in mining revenues. Loayza, Mier y Teran, and Rigolini (2013) find a reduction of 2.5 percentage points in extreme poverty rates in mining districts and a decline by 2.4 percentage points in the households experiencing unmet basic needs. The effect is even greater relative to non-mining districts; spending per capita in mining districts is approximately 14 percent greater, and the poverty rate and the percentage of households with unmet basic needs are 4 percentage points lower. Zambrano, Robles, and Laos (2014) confirm the significant impact on the rate of poverty reduction in mining districts. Between 2007 and 2011, poverty reduction was 2.65 percentage points a year higher in mining districts than in non-mining districts. In Colombia, before the 2012 reform, which sought to redistribute the royalties from natural resource exploitation from only the producers to all departments, there was no impact on poverty reduction or average per capita income growth (Enamorado, Rodríguez-Castelán, and López-Calva 2014). After the reform, which reassigned resources to nonproductive departments and municipalities with wider social gaps, federal transfers through the royalties fund were associated with a reduction by 1.1 percent in the extreme poverty rate. In Brazil, Corbi, Papaioannou, and Surico (2018) study the effect on labor markets of public spending through federal transfers to municipalities and find that local income multipliers reach a factor of around two. Empirical evidence shows that unearmarked federal transfers to subnational governments have little impact on infrastructure investment. In Brazil, Caselli and Michaels (2009) study the effect of an increase in transfers to local governments resulting from a rise in oil production and the royalties for producer municipalities. Although the oil producer municipalities reported a significant increase in public spending, this was not reflected in welfare outcomes, such as better infrastructure, education, health care, and transportation. The authors do not find any effect on housing variables or direct effect on average household incomes. They only find small, but significant effects in some educational and health outcomes, such as on the number of teachers and hospitals.

In Mexico, the FAIS has received less attention than the two largest earmarked funds for health care and education, which have been widely evaluated.[7] As part of the existing literature, Velázquez Guadarrama (2008) shows that about half the FAIS resources in 2004 were allocated to the municipality seat, which is rarely the location of the most disadvantaged communities. Ramones and Prudencio (2014) find a weak positive

[7] On health, see Martínez-Fritscher and Rodríguez Zamora (2016); Merino (2009); Molina, Vargas, and Londoño (2014); Moreno-Jaimes (2002). On education, see Avendaño Ramos (2012); Esquivel (1999); Latapí Sarre and Ulloa (2000).

relationship between the resources allocated by the FAIS and the reduction of asset and multidimensional poverty measures across states in 2000–10. However, they fail to find significant effects on food and capabilities poverty.[8] Yet, these results should be interpreted with caution because the study suffers from technical limitations.[9]

Fiscal federalism in Mexico has been characterized by inertia and limited redistributive outcomes; thus, despite an increase in resources, regional disparities remain (Díaz-Cayeros 2016). Inadequate subnational political accountability, rather than factors related to mobility, has been identified as a reason for the lack of results in the decentralization of efforts at poverty relief (Hernández-Trillo 2016). Voters seem to be unaware of mayoral responsibilities (Chong et al. 2015). Comparing policies on taxes and expenditures in cities in Argentina and Mexico, Smith and Revell (2016) find that decentralization has been hindered by a concentration of power at the local level and by substantial vertical fiscal imbalances.[10] Recent evidence suggests that fiscal rules act as a soft budget constraint, rather than as a solution to the regulation of the growth of municipal public debt, and often favors political cycles over long-term development (Smith 2016). The pressures being exerted on public spending in Mexico arise between the availability of sufficient revenue to satisfy public investment needs and the perils of falling into a cycle whereby fiscal fragility begets austerity policies and vice versa (Moreno-Brid, Pérez-Benítez, and Villarreal 2016).

3. Description of the FAIS

After a long history of centralized administration in Mexico, the federal government unveiled a series of institutional reforms during the 1990s that were aimed at decentralizing basic service provision and infrastructure expenditure. In 1998, a new federal transfer vehicle was created, the Federal Contributions Fund for States and Municipalities (Ramo 33). To support municipalities in their task of supplying adequate infrastructure and public services, federal transfers now earmark resources to states and municipalities through a range of funds under the Ramo 33 umbrella. This includes a new component, the FAIS. The objective of the FAIS is to finance investments in infrastructure that benefit the poor to support poverty reduction and regional development. Every year, 2.5294 percent of assignable federal tax revenues finances the FAIS. Among FAIS resources, 88 percent are distributed directly to municipalities, and 12 percent to 32 federal states.[11]

According to the law, municipalities must use the fund exclusively to finance investments that directly benefit populations that are living in conditions of extreme poverty and social backwardness. Investments are limited to the following areas: water supply, sewerage and latrines, municipal urbanization, rural electrification, poor neighborhoods, basic health infrastructure, basic educational infrastructure, housing improvements, rural roads,

[8] Before the adoption of a multidimensional poverty index in 2009, authorities in Mexico used three poverty lines: (a) food poverty, (b) capabilities poverty, and (c) asset poverty. The food poor are those people who do not have the purchasing power to acquire a basic food basket each month. The capabilities poor include those who cannot cover the basic food basket, health care and education each month. The asset poor are those with insufficient income to cover the expenditures associated with capabilities realization each month, plus the costs of housing and transportation.

[9] The analysis is performed across states, which significantly reduces the number of observations from 2,443 municipalities to 31 states, and, thus, the explanatory power of the model. Additionally, the study does not control for the unobservable and invariant characteristics of states. Rather than taking advantage of the panel data of states (with 62 to 93 total observations), the study uses a pooled regression analysis and aggregates the same units of measurement over time.

[10] Relative to institutional shifts, such as federalism, the opportunity to allocate resources locally both to advance personal careers and to serve client groups is a better determinant of municipal behavior.

[11] In municipalities, Ramo 33 consists of two funds: (a) FAIS (46 percent of total resources in 2014) and (b) the Municipal Strengthening Contribution Fund (*Fondo de Aportaciones para el Fortalecimiento Municipal y de las Demarcaciones Territoriales del Distrito Federa*l), which is mainly used to finance infrastructure in water management and citizen security.

and rural productive infrastructure. States may use the resources in localities exhibiting extreme poverty or large deficits in social infrastructure. Any other type of investment must be authorized by the federal government.

From 1998 until December 2013, the allocation of the FAIS among municipalities followed a mathematical formula.[12] The formula generated first a measure of household poverty, called the global poverty index, based on five indicators of well-being: income, education, housing, sewerage, and electricity. The index is multiplied by the number of people in extreme poverty in the household to obtain a deficient mass for each household. Subsequently, all the household masses are aggregated to obtain indexes of poverty at the municipal, state, and national levels. The percentage of the FAIS assigned to each state or municipality is thus proportional to the share of the deficiency mass by state (or municipality) with respect to the overall national deficient mass.

The unweighted average of municipal real revenue in Mexico has risen by a factor of 2.5 in 2000–14 (table 1). This increase in municipal fiscal revenues is reflected in the growth of spending on public works during the period. At the same time, there was an increase in current expenditure in the municipalities (salaries, services, and supplies). However, the ability to obtain resources remains limited. Conditional and unconditional state and federal transfers represent the largest source of income among municipalities.

Table 1. Trends in major municipal resources and investments

Category of municipal public finance	*Annual average per capita*				*Annual change*		
	2000	*2005*	*2010*	*2014*	*2000–05*	*2005–10*	*2010–14*
Investment in public works	519	915	1,442	1,917	15.26	11.52	8.24
	(0.626)	(0.776)	(1.026)	(2.207)			
Total revenue	2,066	3,142	4,149	5,082	10.42	6.41	5.62
	(1.579)	(1.992)	(2.370)	(3.702)			
Own resources (for example, taxes)	203	291	325	335	8.67	2.34	0.77
	(0.332)	(0.417)	(0.497)	(0.472)			
Unconditioned transfers	1,176	1,552	1,723	1,979	6.39	2.20	3.71
	(1.092)	(1.509)	(1.531)	(1.964)			
Conditional transfers	514	1,069	1,746	2,443	21.60	12.67	9.98
	(0.637)	(0.589)	(1.031)	(2.092)			
Other	172	230	354	325	6.74	10.78	−2.05
	(0.346)	(0.416)	(0.619)	(0.930)			
Ramo 33	449	942	1,291	1.506	21.96	7.41	4.16
	(0.576)	(0.484)	(0.573)	(0.859)			
Municipal Strengthening Contribution Fund	189	360	440	501	18.10	4.44	3.47
	(0.208)	(0.113)	(0.073)	(0.104)			
FAIS	259	582	851	1,004	24.94	9.24	4.49
	(0.451)	(0.438)	(0.567)	(0.842)			

Source: Calculations based on SIMBAD (State and Municipal System Databases), National Institute of Statistics and Geography (INEGI).
Note: In years in which the municipality does not report financial statements, these were proxied by financial statements from the nearest year within a two-year period either before or after. All monetary variables are expressed in the values as of August 2014. The data cover 2,120 municipalities on which indicators are available on poverty and public finance in around 2000, 2005, 2010, and 2014. Averages are not weighted by population. Own municipal resources include taxes, rights, and land use.

[12] Through the reform to the Fiscal Coordination Law in 2013, the allocation formula for the FAIS changed to align the distribution of resources with the new multidimensional poverty measurement. The new formula distributes resources in a two-step process. First, the allocation of resources to municipalities in 2013 is taken as a base. Then, if the resources from the fund in the current year are different from the allocation received in 2013, the difference is distributed based on official poverty indicators, as follows: (a) 80 percent to municipalities according to their weight in the national average for deprivations of the population in extreme poverty, and (b) the remaining 20 percent as a bonus to the municipalities that have been efficient in reducing extreme poverty.

Since 1998, the importance of the FAIS in municipal public finances has increased. In 2002, nearly 92 percent of the municipalities reported that they had received FAIS transfers (2,248 of 2,443 municipalities). Between 2004 and 2014, the resources allocated to the FAIS exhibited an average annual growth of 4.7 percent in real terms, reaching Mex$43.4 billion in 2014. On average, 11.5 percent of the per capita fiscal resources in a municipality in 2014 were provided through the FAIS, although the share is larger in municipalities characterized by greater marginalization. According to the 2015 marginalization index by the National Population Council of Mexico (CONAPO), those municipalities with high levels of marginalization had an average 47.1 percent of income per capita attributable to the FAIS, while municipalities with very low levels of marginalization had a share of only 11.9 percent.

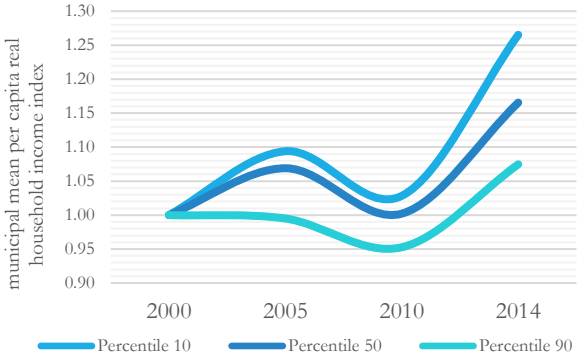
4. Data

The analysis exploits longitudinal data on municipalities from comparable poverty maps and administrative data on public expenditure. The panel includes information on 2,120 municipalities (of 2,443 municipalities across Mexico) and covers 2000, 2005, 2010, and 2014. The data are taken mainly from three sources: (a) income, poverty, and inequality variables from poverty maps; (b) public expenditure variables from administrative records; and (c) economic and other nonmonetary variables from economic and population censuses.

i. Longitudinal data on municipalities from the panel of poverty maps

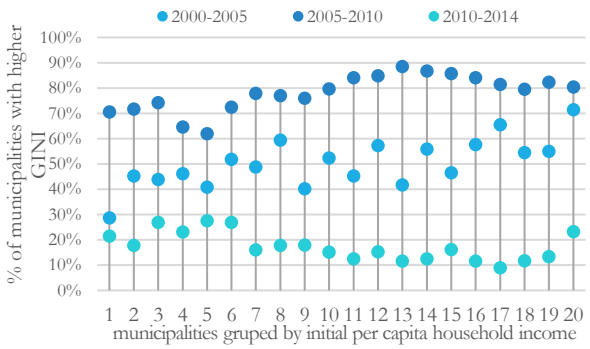
In Mexico, the agency responsible for producing official poverty rates, the National Council for the Evaluation of Social Development Policy (CONEVAL), has the mandate to measure poverty in the municipalities every five years. Given the lack of data at this geographical level, CONEVAL jointly with the World Bank, produced a panel of municipal poverty maps for 1990, 2000, 2005, and 2010.[13] More recently, the World Bank has produced a comparable municipality-level poverty map for 2014 combining the inter-census survey of 2015 with the 2014 household survey. This long-term panel of poverty maps allows an analysis of local trends and drivers of income, poverty, and inequality in Mexico.

Figure 1. Per capita household income growth across municipalities, percentiles, 2000–14



Source: Calculations using the poverty maps of 2000, 2005, 2010, and 2014.
Note: Unweighted average. The index shows the changes in a given percentile of the distribution of the municipal mean household income per capita. Municipalities at the n percentile in 2000 and 2014 do not necessarily correspond.

Figure 2. The share of municipalities that reduced inequality, by income group, 2000–14



Source: Calculations using the poverty maps of 2000, 2005, 2010, and 2014.
Note: Each quantile group is approximately 112 municipalities.

[13] The poverty mapping technique, developed by Elbers, Lanjouw, and Lanjouw (2003), allows the estimation of poverty at high levels of disaggregation.

Between 2000 and 2014, Mexico experienced income convergence across municipalities, but inequality increased within municipalities (López-Calva, Ortiz-Juárez, and Rodríguez-Castelán 2019). While the average real per capita income growth of municipalities in the lowest decile of the distribution was 25 percent in 2000–14, municipalities in the highest decile grew at an average rate of 7 percent (Figure 1). Furthermore, the average income growth of the 10th percentile and the median was positive between 2000 and 2014, unlike the 90th percentile, the average income of which declined in real terms in 2005–10. Yet, contrary to previous trends, inequality within municipalities increased between 2010 and 2014. Before 2010, most of the inequality reduction occurred in municipalities with higher income per capita, while, in 2010–14, less than 20 percent of the municipalities in the highest quantiles experienced a reduction in the Gini coefficient (Figure 2).

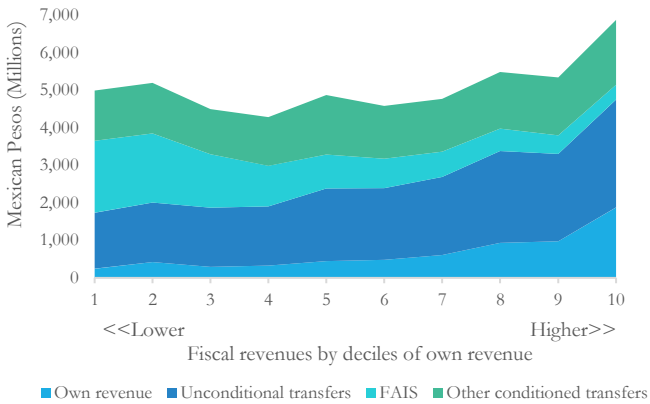
ii. Administrative data on public finances

The analysis uses administrative data on public expenditure among municipalities from the State and Municipal System Databases (SIMBAD) produced by the National Institute of Statistics and Geography (INEGI). SIMBAD provides access to public expenditure variables from 1988 until 2015, including investment spending. The analysis aggregated the fiscal accounts in the following groups: (1) own resources, including taxes; (2) unconditional transfers; (3) conditional transfers, excluding FAIS; and (4) the FAIS. (For a detailed breakdown of the fiscal accounts of municipalities, see Annex 1.)

Reported data on the observed FAIS may often differ from the original allocation of resources because of revisions and reallocations between and within municipalities. To smooth the possible effect of measurement error, the anaysis therefore generated a variable that aggregates the monthly average of the FAIS per capita for the three consecutive years of the observation. For example, the variable FAIS in 2014 corresponds to the monthly average per capita of FAIS in 2011–13.

Municipalities with less ability to collect their own fiscal revenues typically receive more resources through the FAIS and other earmarked transfers. For instance, in 2014, the FAIS accounted for 38.3 percent of the total own fiscal revenues among municipalities with the lowest own revenues. In contrast, the FAIS represented only 5.8 percent of the resources in municipalities with highest values of own fiscal resources. This finding could be problematic because some authors have shown that infrastructure projects financed through the FAIS are utilized on public works, which are not productive projects that can generate wealth (Smith 2019).

Figure 3. Fiscal revenues at the municipal level, by deciles of own revenue, 2014



Source: Calculations based on information in SIMBAD (State and Municipal System Databases), INEGI.
Note: For the years in which a municipality does not report financial statements, financial statements within the nearest two years in which information was available have been used.

iii. Using census data to establish economic and nonmonetary indicators

To study the effect of the FAIS on nonmonetary dimensions of welfare, the analysis relies on population censuses and inter-census surveys for 2005, 2010, and 2015. The relevant indicators include (a) the share of the population with access to basic services in their dwellings (electricity, drinking water, sewerage), (b) share of the population with adequate quality floors and bathrooms in their dwellings, (c) share of the population with access to health care services, (d) share of the population ages 15 or more that have completed primary education, and (e) illiteracy rates among the population age 15 or more and among children ages 5–14.

Municipality-level data were compiled to measure the stock of income earner assets and the rate at which these assets are utilized. This involved measures of physical capital, labor, and productivity. The information on these factors was taken from the economic censuses in 2004, 2009, and 2014. Data on assets, employment, and value added were used as proxies for municipality-level physical capital, skilled and unskilled labor, and productivity.

5. Identification strategy

To estimate the effect of the FAIS on welfare, the analysis uses a reduced-form specification. This includes three sets of controls. The first set considers the production factors and technology available at the local level that account for the generation of private income. In particular, the analysis controls according to the stock of physical capital, labor (by skill categories), and a measure of total factor productivity. The second set includes the fiscal resources to account generally for public income. The third set exploits the panel structure of the data to absorb any unobserved heterogeneity across municipalities and over time to control for general income shocks. The reduce form specification is thus defined as follows:

$$Log\ W_{mt} = \beta_0 + \beta_1 Log\ FAIS_{mt} + \beta_2 Log\ FIN_{mt} + \beta_3 X_{mt} + \beta_3 D_{mt} + \delta_t + \gamma_m + \epsilon_{mt} \qquad (1)$$

where W_{mt} is the outcome of interest used to proxy for the welfare of municipality *m*, and this is only observed in each population census indexed by year *t*. Welfare is measured using household per capita income and other measures of well-being, such as the poverty headcount and inequality and nonmonetary deprivation measures. The coefficient of interest is β_1, which captures the effect of the FAIS on welfare once standard orthogonality conditions are satisfied. $FAIS_{mt}$ is measured as the monthly average per capita FAIS received by municipality m over the three years before the census year t.

Similarly, FIN_{mt} controls for all the fiscal resources other than the FAIS. It is measured as the monthly average of per capita revenues over the three years preceding the census year t. X_{mt} is a vector of variables that account for the level and rate of utilization of production factors: (a) number of blue-collar and white-collar workers, (b) total value of the assets owned by the economic units, and (c) productivity (output per worker). D_{mt} are dummies that control for population size to consider scale effects that may affect local welfare.[14] Finally, δ_t is a set of time fixed effects to control for macroeconomic shocks and national policies, and γ_m is a set of municipality fixed effects that absorbs any unobserved heterogeneity affecting both the FAIS allocation and local economic welfare over the long run.

The FAIS is defined using the three-year average before the census year utilized for poverty maps for two reasons: First, this allows for a control by the local political cycle because mayors are elected every three years.

[14] Two dummies are used: one for municipalities with more than 15,000 inhabitants and another for municipalities with more than 2,500 inhabitants.

Second, because the decision on the FAIS allocation by the central government is based on information provided by the latest available population census available, the use of the lagged value of the FAIS circumvents any mechanical correlation between the contemporaneous welfare measure applied and the FAIS. This decision guarantees that, at any period, the outcome measure relies on information from the census at year t, while the FAIS is defined using information from the previous census or count, at $t-1$.

However, this specification still suffers from endogeneity because of the presence of simultaneity bias. FAIS allocations are targeted to improve welfare. If the FAIS is sufficiently flexible to respond to local welfare shocks, one will observe more resources being allocated during periods of lower welfare. Not accounting for this simultaneity may result in a downward bias in the estimates, β_1. One may even observe a negative effect of the FAIS on welfare that is only explained by the opportune response of the FAIS to local welfare shocks, but not by an actual negative effect of the resources allocated through the FAIS, which may be difficult to explain.[15]

To circumvent such a simultaneity bias, the analysis relies on an instrumental variable strategy that exploits the centralized component of the FAIS allocation across municipalities, which should be exogenous to local welfare shocks. The actual allocation of the FAIS is defined in two steps. First, the federal government suggests a formula-based allocation that considers welfare information derived from the latest available population census. The second step is defined by a set of factors that operates at the local and state levels and that may respond to contemporaneous local welfare. The analytical instrument is therefore the predicted FAIS allocation that would have been forthcoming if the allocation had followed only the lines of the federal formula. This allows the analysis to exploit the variations in the FAIS that are not endogenous to local welfare.[16]

By design, the formula-based FAIS allocation is highly correlated with the actual FAIS allocation. The first-stage estimates produced by the analysis confirm the existence of a strong relationship and validate the relevance of the analytical instrument. The exclusion restriction of the instrument relies on two characteristics of the formula-based component: First, the formula-based component is determined at the central level, and the formula applies to all municipalities; hence, the component cannot be correlated to unobserved local factors. Second, because the formula relies on information derived from the latest population census that is available at the time of the federal decision on the formula-based allocation, any local welfare change that occurs between censuses cannot affect the allocation.

A potential threat to the integrity of the identification strategy revolves around the fact that the initial welfare conditions considered in defining the formula-based allocation also affect contemporaneous welfare levels. This identification threat is countered in two ways. First, because the main reasons for the persistence of poverty across time involve unobserved structural characteristics that change only in the long run, the inclusion of municipality fixed effects can account for these characteristics. Second, because the FAIS allocation is a nonlinear function of the initial welfare conditions, the initial welfare conditions can be included as additional controls without generating multicollinearity, and, after a robustness check, the results will remain qualitatively similar.

[15] See, for instance, Ramones and Prudencio (2014), who estimate the impact of the FAIS using a simple ordinary least squares (OLS) strategy.

[16] Other authors have used the instrumental variable approach to address the endogeneity problem in estimating the effects of the FAIS. Díaz-Cayeros, Estévez, and Magaloni (2016) use geographical variables—rainfall, access to railroads, access to cities, and rugged terrain—to instrument expenditure allocations and explain changes in the provision of public goods.

6. Results

A naive ordinary least squares (OLS) equation that studies the impact of the FAIS on poverty without addressing the problem of dual causality finds a spurious correlation and underestimates the possible effect of the FAIS on poverty reduction. The results of an OLS model are counterintuitive because the FAIS has a negative effect on household mean incomes and a positive effect on poverty rates, thereby acting against the purpose of the fund's transfers (Table 2). Moreover, the OLS finds negative effects on average nonmonetary measures across municipalities. These results are equivalent to estimating an unconditional correlation between the FAIS and social indicators, which would be expected to be positive because of the allocation formula of the FAIS, which is a function of variables of social backwardness.

Table 2. OLS model

a. Income and monetary measures

	Income		*Poverty*		
	Mean income	*Gini*	*Food*	*Capabilities*	*Assets*
FAIS	−0.222***	0.688***	11.15***	11.88***	10.67***
	(0.00524)	(0.0978)	(0.262)	(0.262)	(0.229)

b. Nonmonetary measures: basic services

	Electricity	*Sewerage*	*Water*	*Floor*	*Restroom*
FAIS	−2.055***	−9.008***	−6.424***	−4.459***	−1.506***
	(0.119)	(0.386)	(0.335)	(0.267)	(0.212)

c. Nonmonetary measures: education and health

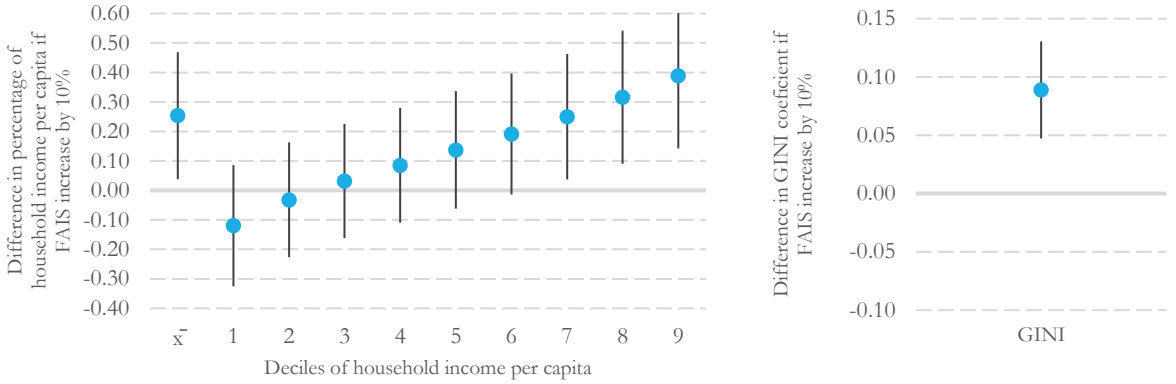
	Incomplete elementary	*Illiteracy 15+*	*Illiteracy 6–14*	*Health care*
FAIS	7.329***	4.192***	0.644***	2.401***
	(0.204)	(0.133)	(0.0614)	(0.511)
N	6,143	6,143	6,143	6,143
Municipalities	2,048	2,048	2,048	2,048

Note: Mean income corresponds to the average household income per capita in each municipality in logarithms. Monetary values are expressed in real terms in August 2014 pesos. The FAIS corresponds to the average monthly per capita value of the three previous years. Other variables included in the regression, but not shown are (a) own revenues, unconditional transfers, and conditional transfers of the municipality; (b) blue-collar and white-collar workers per inhabitant; (c) productivity (total output, divided by number of workers); (d) private business assets; (e) semiurban municipality indicators (population between 2,500 and 15,000); and (f) cities (more than 15,000 inhabitants). For the results of all variables see Annex 2.
Standard error in parentheses. *** p < .01 ** p < .05 * p < .1

To identify the causal effect of the FAIS, the analysis estimated a municipality and time fixed effects model. Figure 4 shows that the FAIS had a positive effect on average household income per capita between 2005 and 2014. A 10 percent increase in the monthly per capita FAIS results in an increase of 0.26 percent in per capita household income.

The FAIS had an unequalizing effect within municipalities. Figure 4 shows the effects by income decile in municipalities. The fund had only a positive and statistically significant effect on household income per capita in deciles 6–9. In particular, a 10 percent increase in the FAIS is associated with an increase of 0.39 percent in the per capita household income in decile 9, while the effect in deciles 1–5 is not statistically significant. As a result, an additional 10 percent in the FAIS accounts for a 0.09 point increase in the Gini coefficient.

Figure 4. Fixed effects model: the impact of the FAIS on household income per capita and the Gini, 2005–14



Note: The deciles of income correspond to the cutoff points in the division of households in each municipality into 10 equal groups. All monetary values are in real terms at August 2014 prices and expressed in logarithms. The figure represents the fixed effects model estimator, and the error bars represent the 95 percent Wald confidence interval. Other variables included in the regression, but not shown are (a) own revenues, unconditional transfers, and conditional transfers of the municipality; (b) blue-collar and white-collar workers per inhabitant; (c) productivity per employed worker; (d) private business assets; (e) semiurban municipalities (population between 2,500 and 15,000); and (f) cities (more than 15,000 inhabitants). For the results of all variables see Annex 3.

Results of a simple fixed effects model suggest that FAIS is associated with an increase of average access to basic services (Table 3, panel b)—such as electricity, sewerage, water, and a toilet in the dwelling—and the share of the population with access to health care (panel c). Additionally, a simple fixed effects model does not find any significant results for poverty measures associated with any of the three poverty (Table 3, panel a). Indeed, an endogeneity test run to confirm or reject the double causality between the FAIS and the socioeconomic conditions studied rejects the null hypothesis that the fund may be treated as exogenous.[17]

Table 3. Fixed effects model without instrumental variable: the impact of the FAIS on poverty 2005–14

a. Monetary measures: poverty

	Food	*Capabilities*	*Assets*
FAIS	−0.355	−0.531	−0.683
	(0.489)	(0.490)	(0.455)
N	6,143	6,143	6,143
Municipalities	2,154	2,154	2,154
Endogeneity test	0.4510	0.9194	0.0422

b. Nonmonetary measures: basic services

	Electricity	*Sewerage*	*Water*	*Floor*	*Restroom*
FAIS	3.107***	8.356***	9.067***	0.333	−1.956***
	(0.429)	(1.025)	(1.019)	(0.328)	(0.208)

c. Nonmonetary measures: education and health

	Incomplete elementary	*Illiteracy 15+*	*Illiteracy 6–14*	*Health care*
FAIS	−0.830***	11.27***	0.954	18.36***
	(0.163)	(0.861)	(0.599)	(1.475)
N	6,107	6,107	6,107	6,107
Municipalities	2,118	2,118	2,118	2,118

Note: Mean income corresponds to the average household income per capita in each municipality in logarithms. Monetary values are expressed in real terms in August 2014. Pooled OLS FAIS corresponds to the average monthly per capita value of the three previous years. Other variables included in the regression, but not shown are (a) own revenues, unconditional transfers, and conditional transfers of the municipality; (b) blue-collar and white-collar workers per inhabitant; (c) productivity per employed worker; (d) private business assets; (e) semiurban municipalities (population between 2,500 and 15,000); and (f) cities (more than 15,000 inhabitants).
Standard error in parentheses. *** p < .01 ** p < .05 * p < .1

[17] The endogeneity test confirms the hypothesis that the fund can be treated as exogenous.

Thus, the counterintuitive result on education may have arisen because of endogeneity problems. Even though a fixed effects model of poverty measures corrects for unobserved and invariant characteristics of the municipality and time effects, there is still an endogeneity problem because of the allocation formula of the fund based on monetary and nonmonetary poverty indicators. This problem is less important in the case of income and inequality measures because these are not part of the formula.

To tackle the endogeneity problem, the analysis estimates a fixed effects model with instrumental variables. It uses the calculated (or planned) value of the FAIS through the formula as an instrument for the observed FAIS. Evidence suggests that the calculated FAIS correlates by a factor of 0.91 with the observed FAIS, but is unlikely to be associated with other unobserved characteristics once a control is run for the effects of the individual components. Figure 5 shows the results of this model with poverty measures as the outcome variables. In the overall period 2005–14, the FAIS did not have significant impacts on the levels of any monetary poverty measure (food, capacities, or asset poverty). However, the FAIS is associated with a decline in the change in food poverty rates, suggesting a convergence effect. Through a model that studies the effect of the lag FAIS on changes in poverty rates, the analysis finds that doubling the FAIS allocation in one period would produce a reduction in the food poverty rate of 0.45 percentage points (Figure 5, panel b).

Figure 5. Fixed effects model with instrumental variable: the impact of the FAIS on poverty, 2005–14

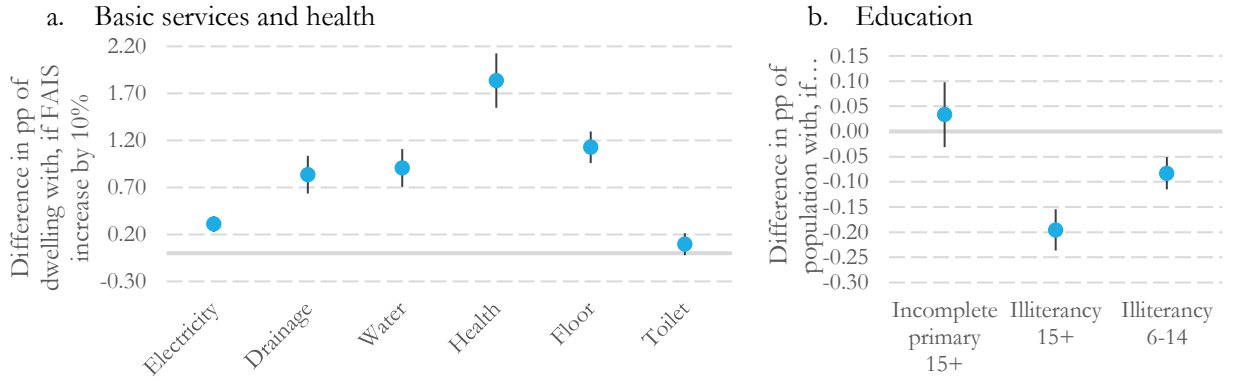
Note: Panel b corresponds to a model of first differences in poverty rates. The figure represents the estimator of the instrumental variables model with fixed effects, and the error bars represent the 95 percent Wald confidence interval. Other variables included in the regression, but not shown are (a) own revenues, unconditional transfers, and conditional transfers of the municipality; (b) blue-collar and white-collar workers per inhabitant; (c) productivity per employed; (d) private business assets; (e) semiurban municipalities (population between 2,500 and 15,000); and (f) cities (more than 15,000 inhabitants). For the results of all variables, see Annex 4A.

Between 2005 and 2014, the FAIS had a positive effect on several nonmonetary measures of poverty, such as access to basic services (electricity, sewerage, drinking water), the quality of the dwelling (floors, toilet), education, and health care. In basic services, an increase by 10 percent in the FAIS is associated with a coverage increase of 0.3, 0.8 and 0.9 percentage points in electricity, sewerage, and drinking water, respectively (Figure 6, panel a).

The differences in magnitude of the results may arise from the differences in the marginal costs of improving access in remote areas, where coverage at the national level is close to 100 percent. For example, areas that require access to electricity represent a higher marginal cost for the provision of the service and, thus, generate a smaller effect of the FAIS on the relevant indicator. On the quality of housing, the FAIS did not have a significant effect on access to a bathroom inside the dwelling, but had a 1 percentage point effect on the quality of floors. Finally, the FAIS had a large impact on the average coverage of health services. Between 2005 and 2014, a 10 percent increase in the FAIS was associated with a 1.8 percentage point increase in the average health

services in municipalities, suggesting that the FAIS may have aided in expanding the access to the *Seguro Popular* health program.

Figure 6. Fixed effects model with instrumental variable: the impact of the FAIS on nonmonetary dimensions, 2005–14



Note: Panel b corresponds to a model of first differences in poverty rates. The figure represents the estimator of the instrumental variables model with fixed effects, and the error bars represent the 95 percent confidence interval. Other variables included in the regression, but not shown are (a) own revenues, unconditional transfers, and conditional transfers of the municipality; (b) blue-collar and white-collar workers per inhabitant; (c) productivity per employed worker; (d) private business assets; (e) semiurban municipalities (population between 2,500 and 15,000); and (f) cities (more than 15,000 inhabitants). For the results of all variables, see Annex 4B.

Unlike the counterintuitive results of the simple fixed effects model, the results using the instrument suggest that the FAIS had positive effects in the reduction of illiteracy rates among the population ages 6–14 and the population ages 15 or more (Figure 6, panel b). In particular, between 2005 and 2014, a 10 percent increase in the federal transfer reduced illiteracy rates by 0.20 and 0.08 percentage points among the population ages 15 or more and the population ages 6–14, respectively. However, the fund did not have a significant effect on the share of the population ages 15 or more that had completed primary school.

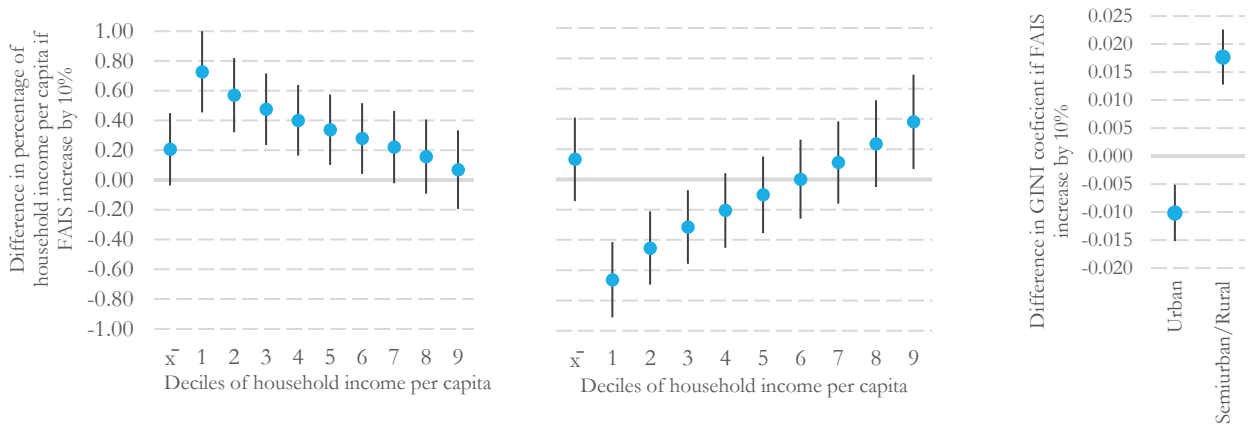
The findings by area of residence show that the FAIS had a positive effect on average household income per capita in urban areas, but not in rural areas. If urban areas are defined as municipalities with more than 15,000 inhabitants, the results show that, between 2005 and 2014, the fund for investment in social infrastructure had a positive and significant effect on household incomes in urban areas, but no significant effect in semi-urban and rural areas.[18] A 10.0 percent increase in the FAIS corresponds to a 0.2 percent increase in household incomes in urban areas (Figure 7).

While the FAIS had a positive, significant, and greater effect in the lowest level of the distribution (deciles 1–7) in urban areas, it only had a positive and significant effect in the highest decile in rural and semi-urban areas (Figure 7). One possible explanation of the equalizing effect of the FAIS in urban areas is that the resources are usually invested in the periphery of cities, which tend to have a higher share of low-income residents. In contrast, because of the need for economies of scale, FAIS resources in rural and semi-urban areas are usually invested in cabeceras (county capitals), where people with relatively higher income live.

[18] Several factors, including lower unitary costs of investments, scale economies, and government capacity, would explain the higher efficiency in urban areas (cabeceras). Therefore, by design and according to how it is implemented, the program may result in a potential urban bias. Although the available data did not allow an analysis of within-municipality geographical effects, a differentiated approach for urban areas and rural areas is worth exploring in future research.

Figure 7. The impact of the FAIS on household income per capita and the Gini, by urban and semiurban/rural area, 2005, 2010, and 2014

a. Urban, more than 15,000 inhabitants b. Semiurban and rural c. Gini

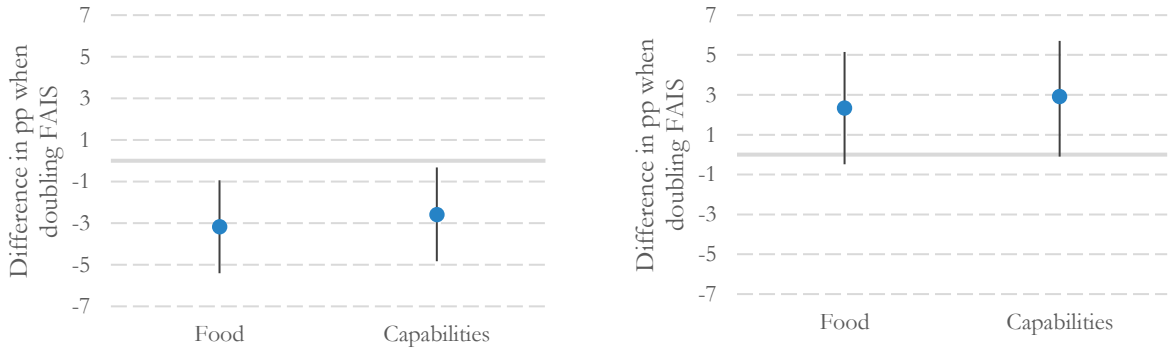


Note: The deciles of income correspond to the cutoff points in the division of households in each municipality into 10 equal groups. All monetary values are in real terms at August 2014 prices and expressed in logarithms. The figure represents the fixed effects model estimator, and the error bars represent the 95 percent confidence interval. Other variables included in the regression, but not shown are (a) own revenues, unconditional transfers, and conditional transfers of the municipality; (b) blue-collar and white-collar workers per inhabitant; (c) productivity per employed worker; (d) private business assets; (e) semiurban municipalities (population between 2,500 and 15,000); and (f) cities (more than 15,000 inhabitants). For the results by income decile, see Annex 5.

Although the analysis did not find an effect on poverty at the aggregate level, it did show a reduction of poverty in urban areas. In particular, the FAIS was associated with a 3.2 and 2.6 percentage point reduction in food and capability poverty (Figure 8), respectively, between 2005 and 2014. In contrast with urban areas, the results in rural and semi-urban municipalities are not statistically significant. The relative effectiveness in urban areas may be related to the greater capacity to implement projects or better targeting of public investments in urban areas.

Figure 8. The impact of the FAIS on income poverty, by urban and semiurban/rural area, 2005, 2010, and 2014

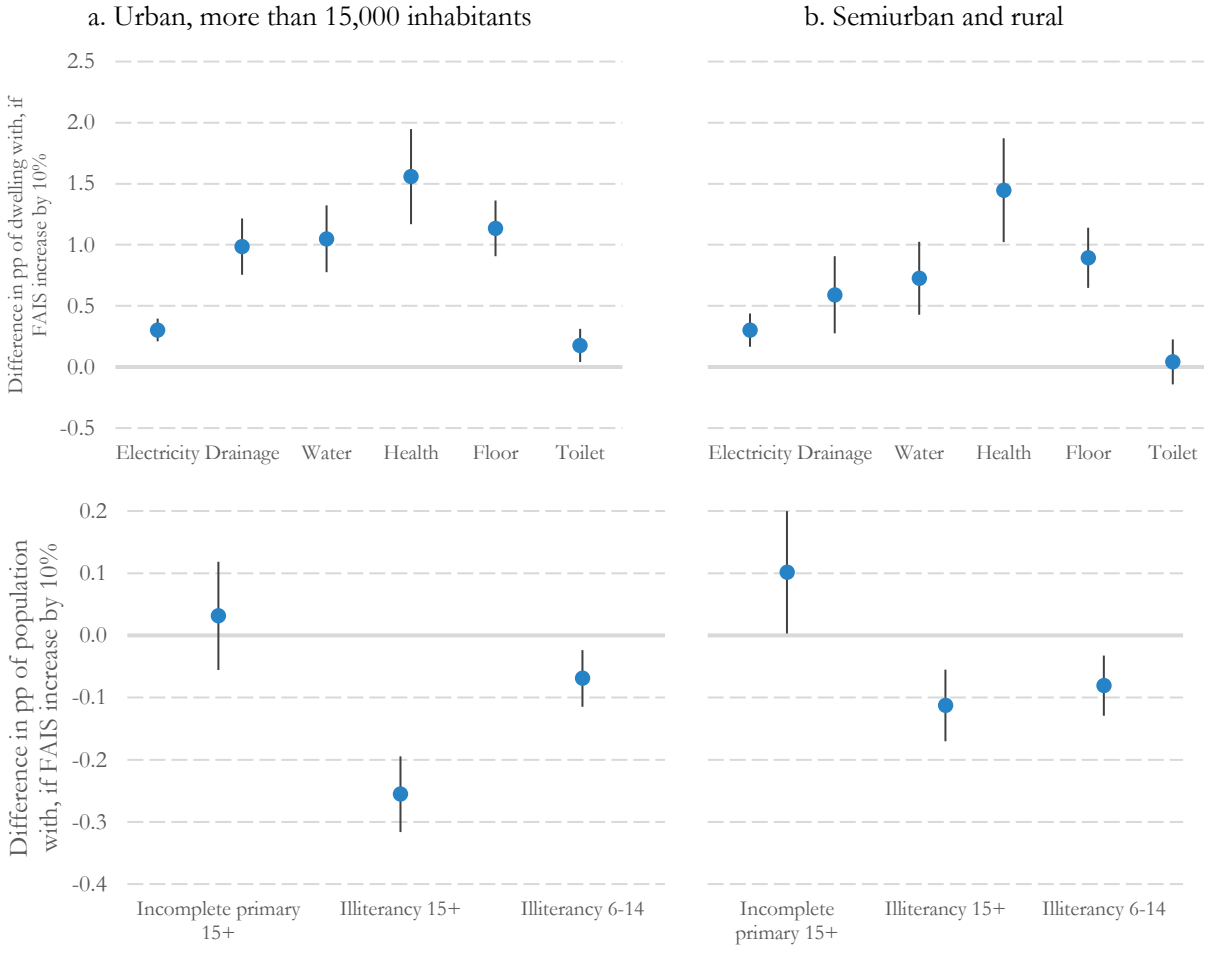
a. Urban, more than 15,000 inhabitants b. Semiurban and rural



Note: The figure corresponds to a model of first differences in poverty rates. Poverty measured by assets has been excluded from this analysis because the poverty map presents imprecisions arising from the small areas in rural municipalities or greater social backwardness. The figure represents the estimator of the instrumental variables model with fixed effects, and the error bars represent the 95 percent confidence interval. Other variables included in the regression, but not shown are (a) own revenues, unconditional transfers, and conditional transfers of the municipality; (b) blue-collar and white-collar workers per inhabitant; (c) productivity per employed worker; (d) private business assets; (e) semiurban municipalities (population between 2,500 and 15,000); and (f) cities (more than 15,000 inhabitants). For the results of all variables, see Annex 6.

The effects on nonmonetary outcomes across locality type tend to be more uniformly positive than the effects on income. In urban areas, the FAIS has had positive and significant effects on nonmonetary measures of well-being among all population groups except individuals ages 15 or more who have completed primary school and, in the case of illiteracy rates, children ages 6–14 (Figure 9). A possible reason for the lack of significant effects is that universal coverage has been reached among these age-groups in these areas.[19] In rural and semi-urban areas, FAIS also had positive and significant effects on nearly all measures except in the case of individuals ages 15 or more who have completed primary school and the case of access to toilets inside the dwelling. On the latter, this may reflect the complexity of installing bathrooms in rural dwellings, though additional analysis is required to confirm the cause of this effect.

Figure 9. The impact of the FAIS on nonmonetary dimensions, by urban and semiurban/rural area, 2005, 2010, and 2014



Note: All variables correspond to the coverage expressed between 0 and 100. The figure represents the estimator of the instrumental variables model with fixed effects, and the error bars represent the 95 percent confidence interval. Other variables included in the regression, but not shown are (a) own revenues, unconditional transfers, and conditional transfers of the municipality; (b) blue-collar and white-collar workers per inhabitant; (c) productivity per employed worker; (d) private business assets; (e) semiurban municipalities (population between 2,500 and 15,000); and (f) cities (more than 15,000 inhabitants). For the results of all variables, see Annex 6.

[19] In a regional convergence framework using the fixed effects method, the fact that some of the outcomes of interest are bounded may mechanically generate lower effects.

7. Concluding remarks

Within the growing literature on fiscal federalism, a rigorous understanding of the impact on welfare of transfers to subnational governments is an important research question. The present paper contributes to this body of work by identifying the causal effects of a fiscal transfer fund on local welfare. It makes use of a social infrastructure fund in Mexico as a case study to illustrate a larger problem that has implications at the global level, that is, how to raise the effectiveness of transfers to local governments to achieve higher-quality spending and, ultimately, improve social outcomes.

Existing systems vary in scope and arrangements. They include systems in resource-rich countries with fiscal rules for sharing or not sharing natural resource revenues among producing and nonproducing regions and systems that rely on transfer agreements in countries with no tax revenues from natural resources. In the context of these arrangements, it is critical to develop an agenda to assess the effectiveness of the resource allocations, and to push for revenue decentralization, which, in many developing countries, remains weak (Gadenne and Singhal 2014). Local governments that do not face the political cost of higher revenue collection may come across perverse incentives to overspend, leading to vertical fiscal imbalances. Meanwhile, adequate data and formulas to distribute funds can create incentives to invest efficiently. They can help in evaluating the effectiveness of transfers, such as earmarked funds dedicated to specific programs, to close coverage gaps, create appropriate incentives in design, and boost the quality of social spending.

This paper takes advantage of a novel data set to assess the effects on welfare of federal earmarked transfers in Mexico. The results show that the fund earmarked for social investment known as FAIS had a modest, but positive and statistically significant effect on average household income between 2005 and 2014. It also had a positive effect on several nonmonetary measures of well-being, such as access to services (electricity, sewerage, drinking water), the quality of the dwelling (floor materials, access to toilets), education, and health care. Overall, it finds a general, positive effect on access to services, which is markedly higher in urban areas. Yet, it does not find evidence of a significant impact on extreme and moderate poverty rates. This is likely because of the fact that, while the fund did have a positive and significant income effect in rural and semi-urban areas, the effect was only found among the highest income deciles, that is, it was concentrated among people who ran the lowest risk of poverty. This was not the case in urban areas, where the fund had a significant, positive, and greater effect at the lowest level of the distribution (deciles 1–7). A possible explanation for the greater equalizing effect of the fund in urban areas is the fact that resources are usually invested in the periphery of cities, which tends to attract higher numbers of low-income people. Simultaneously, because of factors such as economies of scale, lower unitary costs of investment, and less government capacity, FAIS resources in rural and semi-urban areas tend to be invested in cabeceras (the county capitals). Because the cabeceras typically attract people with relatively higher incomes and fewer deprivations compared with the rest of the county, the program could be exacerbating inequalities.

After 20 years of implementation, the FAIS has not delivered the expected results on welfare, at least not where they are most direly needed. To improve the targeting of FAIS resources, the program could be reformed to reflect consideration of an indicator of gaps in local social infrastructure as a component in the allocation of funds to municipalities, instead of the index of poverty and social deprivation gaps. Separating FAIS allocations from the results the program aims to achieve (multidimensional poverty) is key to minimizing potential perverse incentives, such as incentives encouraging municipalities to maintain higher rates of deprivation so they may receive more resources through the program. Resource distribution in an initial period could be determined on the basis of a component that reflects the gaps in investment in social infrastructure. In subsequent periods,

disbursements could be adjusted according to the results of regular assessments of the local implementation of the program. Rewards to municipalities that demonstrate effective reductions in local social infrastructure gaps could help establish appropriate incentives for the use of FAIS resources. In addition, the lack of monitoring of social infrastructure and the absence of social infrastructure in the allocation formula fail to create incentives for local governments to increase investments through other sources of income, thereby increasing their fiscal capacity. Thus, although improving the targeting of resources through modifications in the allocation formula is important, a bigger issue is the need to increase the capacity of local governments to raise tax revenue, which has been shown to exert a larger impact on the provision of public goods. Empirical evidence from Brazil (Gadenne 2017), Colombia (Martínez 2016), and Indonesia (Kis-Katos and Sjahrir 2017) demonstrates that higher tax revenues, accompanied by greater accountability, have a much larger effect than transfers on the provision of education, health care, and basic services even if resources are earmarked in some cases. Local governments with more fiscal autonomy show greater convergence (Smith 2018), which could explain why the analysis finds a greater positive effect on welfare in urban municipalities with larger populations and more fiscal capacity. Thus, the framework of analysis applied in this paper could be useful for other countries with similar programs and facing comparable challenges. The changes in the indicators and rules outlined above provide examples of how allocation formulas can be redesigned to create incentives to invest more efficiently.

8. References

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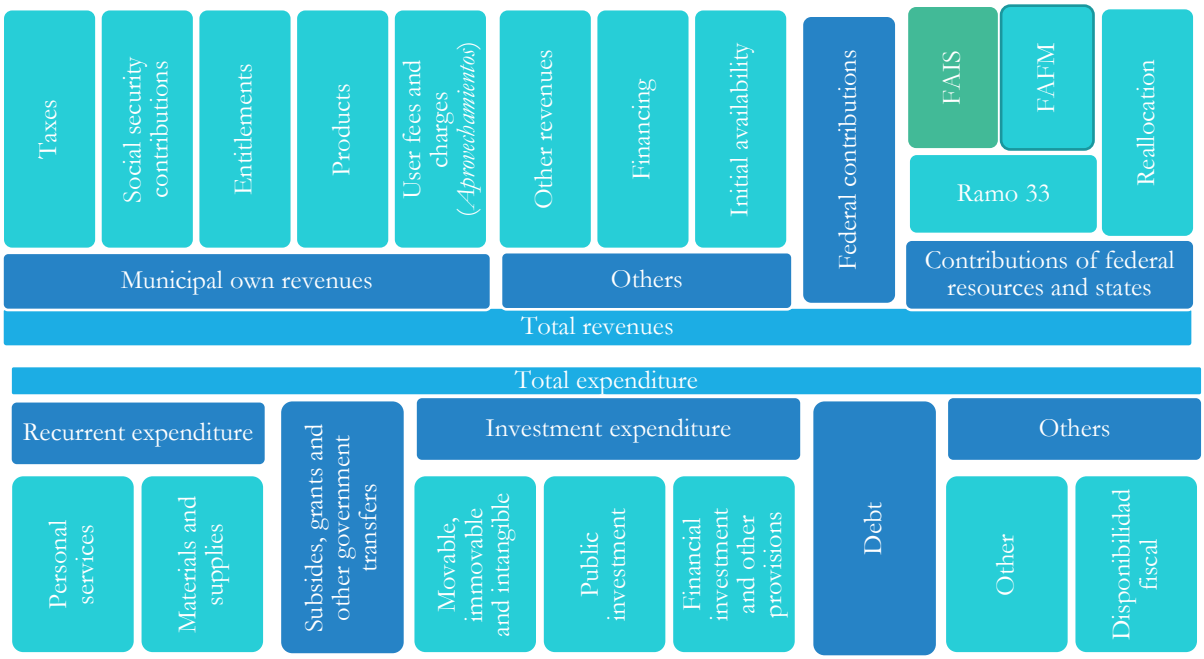
Annex 1. Fiscal accounts in Mexico

The National Institute of Statistics and Geography (INEGI) compiles all administrative records on the source and use of all financial resources in municipalities. This information is openly available through the State and Municipal System Databases (SIMBAD) on the INEGI website. Figure A1 presents the maximum degree of disaggregation of public accounts at the municipal level available in SIMBAD.

In terms of the resources available to the municipalities, the analysis aggregated accounts the following way:

- Own income: those that are generated from taxes, contributions to social security, products, and uses
- Unconditional transfers: federal participation (considered in Branch 28): federal resources assigned to states and municipalities that are not conditioned on their use and destination
- Conditional transfers (mostly through *Ramo* 33) including FAIS resources. Branch 33, federal contributions respond to demands in: education, health care, basic and educational infrastructure, public safety, and social assistance; the FAIS contribution can be disaggregated from this item
- Other resources, such as unexecuted accounts from other periods and other financial instruments
- In terms of expenditure, accounts were grouped in: current expenditure, transfers and subsidies, investments, debt, and other expenditures.

Figure A1. Fiscal accounts, municipal level



Source: Constructed using SIMBAD (State and Municipal System Databases), National Institute of Statistics and Geography (INEGI).
Note: FAFM = Municipal Strengthening Contribution Fund.

Annex 2. OLS model without double-causality correction

A. Impact on income and monetary poverty

	Income		*Poverty*		
	Mean income	*Gini*	*Food*	*Capabilities*	*Assets*
FAIS ∞	−0.222***	0.688***	11.15***	11.88***	10.67***
	(0.00524)	(0.0978)	(0.262)	(0.262)	(0.229)
Own revenues ∞	0.0678***	0.368***	−3.058***	−3.105***	−2.707***
	(0.00333)	(0.0623)	(0.167)	(0.167)	(0.146)
Unconditional revenue ∞	0.0998***	0.285**	−5.344***	−5.729***	−5.038***
	(0.00639)	(0.119)	(0.320)	(0.320)	(0.279)
Conditional revenue ∞	0.0443***	−0.746***	−1.908***	−1.915***	−1.320***
	(0.00673)	(0.126)	(0.337)	(0.337)	(0.294)
Direct workers ‡	0.644***	−1.880	−21.82***	−22.03***	−18.36***
	(0.0707)	(1.322)	(3.541)	(3.536)	(3.090)
Indirect workers ‡	−1.453***	−15.08***	105.5***	95.62***	53.14***
	(0.218)	(4.073)	(10.91)	(10.90)	(9.521)
Productivity per occupied ‡‡	0.0387***	0.449***	−3.011***	−3.182***	−2.879***
	(0.00489)	(0.0914)	(0.245)	(0.245)	(0.214)
Private business assets ‡‡	0.0489***	0.275***	−0.946***	−0.871***	−0.478***
	(0.00327)	(0.0610)	(0.164)	(0.163)	(0.143)
Semiurban	0.00735	1.113***	−2.652***	−2.973***	−2.693***
	(0.0120)	(0.225)	(0.602)	(0.601)	(0.525)
City	−0.0189	1.135***	−0.614	−0.568	0.138
	(0.0158)	(0.295)	(0.790)	(0.789)	(0.690)
Constant	6.682***	29.15***	59.57***	67.42***	81.38***
	(0.0404)	(0.756)	(2.025)	(2.022)	(1.767)
N	6,143	6,143	6,143	6,143	6,143
R-2	0.717	0.065	0.644	0.662	0.655
Municipalities	2,048	2,048	2,048	2,048	2,048

Note: The mean income corresponds to the average household income per capita in each municipality in logarithms. Monetary values are expressed in real terms in August 2014. Pooled OLS. Semiurban refers to municipalities with a population between 2,500 and 15,000. City refers to municipalities with more than 15,000 inhabitants.

∞ Fiscal revenue items in the logarithm of the average monthly per capita value three previous years. ‡ Occupied per inhabitant, employees of the economic units or indirect workers, reported in the economic census of the circa year. ‡ ‡ Productivity by the total of occupied and active of the economic units of each municipality.

Standard error in parentheses. *** p < .01 ** p < .05 * p < .1

B. Impact on nonmonetary dimensions of poverty

	Electricity	*Sewerage*	*Water*	*Health*	*Incomplete elementary*	*Illiteracy 15+*	*Illiteracy 6–14*	*Floor*	*Restroom*
FAIS ∞	−2.055***	−9.008***	−6.424***	2.401***	7.329***	4.192***	0.644***	−4.459***	−1.506***
	(0.119)	(0.386)	(0.335)	(0.511)	(0.204)	(0.133)	(0.0614)	(0.267)	(0.212)
Own revenues ∞	0.114	2.296***	0.214	−2.395***	−0.311**	−1.755***	−0.0394	−0.0706	1.975***
	(0.0759)	(0.246)	(0.213)	(0.325)	(0.130)	(0.0846)	(0.0391)	(0.170)	(0.135)
Unconditional revenue ∞	0.244*	4.376***	6.037***	10.64***	−2.469***	−2.084***	−0.522***	7.692***	−1.800***
	(0.146)	(0.472)	(0.409)	(0.624)	(0.249)	(0.162)	(0.0750)	(0.326)	(0.259)
Conditional revenue ∞	1.952***	4.538***	1.765***	8.324***	−3.747***	−1.410***	−0.503***	3.140***	0.573**
	(0.153)	(0.497)	(0.431)	(0.657)	(0.263)	(0.171)	(0.0790)	(0.344)	(0.273)
Direct workers ‡	14.44***	14.88***	19.04***	13.26*	−7.233***	−2.726	−3.236***	20.85***	8.782***
	(1.612)	(5.222)	(4.530)	(6.906)	(2.760)	(1.795)	(0.830)	(3.611)	(2.868)
Indirect workers ‡	−23.90***	−124.9***	−54.03***	56.00***	−2.075	32.82***	−1.342	−76.36***	2.167
	(4.967)	(16.09)	(13.96)	(21.28)	(8.503)	(5.531)	(2.557)	(11.13)	(8.838)
Productivity per occupied ‡‡	−0.375***	0.704*	−0.433	−1.157**	0.180	−0.993***	0.0544	0.476*	−0.227
	(0.112)	(0.361)	(0.313)	(0.478)	(0.191)	(0.124)	(0.0574)	(0.250)	(0.198)
Private business assets ‡‡	0.213***	2.518***	1.377***	4.027***	−2.339***	−0.594***	−0.163***	1.904***	0.328**
	(0.0744)	(0.241)	(0.209)	(0.319)	(0.127)	(0.0829)	(0.0383)	(0.167)	(0.132)
Semiurban	−1.091***	2.267**	−3.148***	3.997***	−0.508	0.414	1.052***	5.020***	−5.415***
	(0.274)	(0.888)	(0.770)	(1.174)	(0.469)	(0.305)	(0.141)	(0.614)	(0.488)
City	−1.020***	1.952*	−5.831***	2.443	−0.587	1.324***	1.637***	3.761***	−7.083***
	(0.360)	(1.165)	(1.011)	(1.541)	(0.616)	(0.401)	(0.185)	(0.806)	(0.640)
Constant	93.47***	33.92***	62.93***	−66.62***	83.11***	27.38***	7.793***	27.33***	99.26***
	(0.922)	(2.986)	(2.590)	(3.949)	(1.578)	(1.026)	(0.475)	(2.065)	(1.640)
N	6,143	6,143	6,143	6,143	6,143	6,143	6,143	6,143	6,143
R-2	0.175	0.430	0.234	0.213	0.593	0.566	0.124	0.397	0.133
Municipalities	2,048	2,048	2,048	2,048	2,048	2,048	2,048	2,048	2,048

Note: The mean income corresponds to the average household income per capita in each municipality in logarithms. Monetary values are expressed in real terms in August 2014. Pooled OLS. Semiurban refers to municipalities with a population between 2,500 and 15,000. City refers to municipalities with more than 15,000 inhabitants.

∞ Fiscal revenue items in the logarithm of the average monthly per capita value three previous years. ‡ Occupied per inhabitant, employees of the economic units or indirect workers, reported in the economic census of the circa year. ‡‡ Productivity by the total of occupied and active of the economic units of each municipality.

Standard error in parentheses. *** p < .01 ** p < .05 * p < .1

Annex 3. Fixed effects model: the FAIS impact on income

	Mean	*Income quantile*									
	Income	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*Gini*
FAIS ∞	0.0254**	−0.0119	−0.00320	0.00319	0.00850	0.0137	0.0191*	0.0250**	0.0316***	0.0388***	0.889***
	(0.0110)	(0.0105)	(0.00995)	(0.00988)	(0.00995)	(0.0101)	(0.0104)	(0.0109)	(0.0115)	(0.0125)	(0.213)
Own revenues ∞	−0.00198	0.00784	0.00482	0.00292	0.00139	0.000241	−0.000796	−0.00169	−0.00240	−0.00314	−0.199*
	(0.00463)	(0.00509)	(0.00469)	(0.00452)	(0.00445)	(0.00445)	(0.00450)	(0.00462)	(0.00485)	(0.00529)	(0.107)
Unconditional revenue ∞	0.0262*	0.0170	0.0196	0.0214*	0.0228*	0.0239*	0.0248*	0.0253*	0.0261*	0.0271*	0.286
	(0.0136)	(0.0140)	(0.0131)	(0.0128)	(0.0127)	(0.0128)	(0.0130)	(0.0134)	(0.0140)	(0.0151)	(0.262)
Conditional revenue ∞	−0.0324***	−0.00306	−0.0117	−0.0173**	−0.0218***	−0.0259***	−0.0299***	−0.0340***	−0.0386***	−0.0431***	−0.688***
	(0.00741)	(0.00807)	(0.00722)	(0.00685)	(0.00668)	(0.00667)	(0.00679)	(0.00708)	(0.00764)	(0.00876)	(0.201)
Direct workers ‡	0.265	−0.0759	−0.00797	0.0391	0.0832	0.124	0.168	0.219	0.287	0.387*	9.087***
	(0.180)	(0.171)	(0.162)	(0.160)	(0.160)	(0.163)	(0.167)	(0.173)	(0.183)	(0.201)	(2.899)
Indirect workers ‡	−0.237	−0.506	−0.375	−0.301	−0.262	−0.245	−0.231	−0.223	−0.230	−0.231	3.583
	(0.272)	(0.346)	(0.311)	(0.292)	(0.282)	(0.278)	(0.276)	(0.275)	(0.279)	(0.286)	(4.748)
Productivity per occupied ‡‡	−0.00719	−0.0216***	−0.0187***	−0.0164**	−0.0144**	−0.0124*	−0.0104	−0.00838	−0.00591	−0.00271	0.387**
	(0.00704)	(0.00750)	(0.00682)	(0.00664)	(0.00660)	(0.00669)	(0.00688)	(0.00713)	(0.00751)	(0.00815)	(0.166)
Private business assets ‡‡	0.00872	0.0151**	0.0137**	0.0126**	0.0116**	0.0106**	0.00962*	0.00871	0.00747	0.00637	−0.117
	(0.00569)	(0.00594)	(0.00538)	(0.00519)	(0.00514)	(0.00518)	(0.00533)	(0.00557)	(0.00595)	(0.00658)	(0.130)
Semiurban	0.0968**	0.00947	0.0309	0.0462	0.0592	0.0715	0.0834*	0.0955**	0.108**	0.123**	1.870**
	(0.0452)	(0.0481)	(0.0444)	(0.0431)	(0.0429)	(0.0435)	(0.0443)	(0.0460)	(0.0486)	(0.0524)	(0.951)
City	0.114**	0.0788	0.0858*	0.0924*	0.0984**	0.105**	0.111**	0.117**	0.121**	0.124**	0.440
	(0.0471)	(0.0552)	(0.0507)	(0.0487)	(0.0478)	(0.0477)	(0.0477)	(0.0485)	(0.0501)	(0.0529)	(1.025)
Year 2010	−0.0279***	0.0995***	0.0769***	0.0611***	0.0470***	0.0327***	0.0172**	−0.000916	−0.0238***	−0.0606***	−3.894***
	(0.00760)	(0.00720)	(0.00687)	(0.00684)	(0.00690)	(0.00705)	(0.00723)	(0.00751)	(0.00790)	(0.00855)	(0.136)
Year 2014	0.152***	0.119***	0.130***	0.140***	0.149***	0.157***	0.163***	0.168***	0.170***	0.166***	0.452**
	(0.00882)	(0.00869)	(0.00823)	(0.00812)	(0.00814)	(0.00826)	(0.00846)	(0.00875)	(0.00921)	(0.0100)	(0.178)
Constant	7.084***	6.102***	6.367***	6.552***	6.713***	6.864***	7.017***	7.184***	7.389***	7.683***	34.40***
	(0.0915)	(0.0945)	(0.0886)	(0.0866)	(0.0861)	(0.0865)	(0.0879)	(0.0904)	(0.0946)	(0.102)	(1.793)
N	6,143	6,143	6,143	6,143	6,143	6,143	6,143	6,143	6,143	6,143	6,143
R-2	0.250	0.123	0.140	0.163	0.188	0.211	0.233	0.253	0.268	0.278	0.300
Municipalities	2,154	2,154	2,154	2,154	2,154	2,154	2,154	2,154	2,154	2,154	2,154

Note: Semiurban refers to municipalities with a population between 2,500 and 15,000. City refers to municipalities with more than 15,000 inhabitants. The average income corresponds to the average per capita household income in each municipality in logarithms. The deciles of income correspond to the cut-off points of dividing in each municipality the households into ten equal groups and is expressed in logarithms. All monetary values were in real terms in August 2014. Fixed effects model by year and municipality for the years 2005, 2010, and 2014. Gini refers to the Gini coefficient.

∞ Fiscal revenue items in the logarithm of the average monthly per capita value three previous years. ‡ Occupied per inhabitant, employees of the economic units or indirect workers, reported in the economic census of the circa year. ‡‡ Productivity by the total of occupied and active of the economic units of each municipality.

Standard error in parentheses. *** p < .01 ** p < .05 * p < .1

Annex 4. The instrumental variable fixed effects model: the FAIS impact on monetary and nonmonetary poverty

A. Poverty

	Poverty		
	Food	*Capabilities*	*Assets*
FAIS ∞	−0.998	−0.617	0.849
	(0.921)	(0.918)	(0.824)
Own revenues ∞	−0.339	−0.258	0.0452
	(0.289)	(0.273)	(0.205)
Unconditional revenue ∞	−0.427	−0.895	−2.059***
	(0.803)	(0.801)	(0.710)
Conditional revenue ∞	0.846**	0.962**	0.981***
	(0.410)	(0.415)	(0.378)
Direct workers ‡	−12.67*	−13.78*	−10.68
	(7.116)	(7.757)	(7.875)
Indirect workers ‡	10.10	9.447	6.082
	(11.34)	(12.80)	(12.75)
Productivity per occupied ‡‡	0.488	0.559	0.612**
	(0.354)	(0.353)	(0.303)
Private business assets ‡‡	−0.310	−0.331	−0.330
	(0.294)	(0.292)	(0.248)
Semiurban	−2.824	−3.386	−3.933**
	(2.244)	(2.241)	(1.919)
City	−4.110*	−4.655*	−4.999**
	(2.433)	(2.440)	(2.107)
Year 2010	0.879***	1.444***	2.745***
	(0.337)	(0.343)	(0.307)
Year 2014	−1.441***	−1.457***	−1.349***
	(0.390)	(0.397)	(0.353)
N	6,107	6,107	6,107
R-2	0.024	0.033	0.070
Municipalities	2,118	2,118	2,118

Note: Semiurban refers to municipalities with a population between 2,500 and 15,000. City refers to municipalities with more than 15,000 inhabitants. The average income corresponds to the average per capita household income in each municipality in logarithms. The deciles of income correspond to the cut-off points of dividing in each municipality the households into ten equal groups and is expressed in logarithms. All monetary values were in real terms in August 2014. Model with fixed effects by the municipality and by year for 2005, 2010, and 2014, also using the FAIS formulated as the instrumental variable.

∞ Fiscal revenue items in the logarithm of the average monthly per capita value three previous years. ‡ Occupied per inhabitant, employees of the economic units or indirect workers, reported in the economic census of the circa year. ‡ ‡ Productivity by the total of occupied and active of the economic units of each municipality.

Standard error in parentheses. *** p < .01 ** p < .05 * p < .1

B. Nonmonetary dimensions of poverty

	Electricity	*Sewerage*	*Water*	*Health*	*Floor*	*Toilet*	*Incomplete primary 15+*	*Illiteracy 15+*	*Illiteracy 6–14*
FAIS ∞	3.107***	8.356***	9.067***	18.36***	0.333	−1.956***	−0.830***	11.27***	0.954
	(0.429)	(1.025)	(1.019)	(1.475)	(0.328)	(0.208)	(0.163)	(0.861)	(0.599)
Own revenues ∞	0.0245	0.0129	0.536*	−1.149**	−0.264***	0.0794	0.0701*	−1.710***	−0.0726
	(0.119)	(0.306)	(0.298)	(0.461)	(0.0553)	(0.0680)	(0.0397)	(0.307)	(0.157)
Unconditional revenue ∞	−1.426***	−4.378***	−3.604***	−7.925***	0.411**	1.001***	0.217	−3.662***	−0.392
	(0.334)	(0.798)	(0.869)	(1.475)	(0.197)	(0.188)	(0.134)	(0.866)	(0.450)
Conditional revenue ∞	−0.524***	−2.178***	−2.092***	−6.336***	−0.320***	0.548***	0.165**	−3.632***	−0.245
	(0.181)	(0.442)	(0.444)	(0.706)	(0.112)	(0.0991)	(0.0729)	(0.459)	(0.243)
Direct workers ‡	−3.520**	3.259	−8.907*	39.28***	8.058***	−2.440*	−0.711	0.367	11.17***
	(1.729)	(6.241)	(4.747)	(11.40)	(2.880)	(1.272)	(1.152)	(5.737)	(3.238)
Indirect workers ‡	2.532	−34.71***	−24.21***	−119.2***	7.646	13.18***	4.258**	−60.44***	−9.402**
	(3.151)	(8.565)	(7.444)	(31.71)	(5.206)	(3.740)	(2.076)	(14.14)	(4.601)
Productivity per occupied ‡‡	0.104	0.197	−0.142	−0.239	−0.0824	0.0747	0.0178	−0.197	−0.0359
	(0.143)	(0.345)	(0.351)	(0.572)	(0.0760)	(0.0741)	(0.0550)	(0.355)	(0.171)
Private business assets ‡‡	0.0397	0.706***	0.299	1.273***	−0.180**	−0.258***	−0.0251	0.961***	0.0966
	(0.125)	(0.245)	(0.258)	(0.426)	(0.0722)	(0.0598)	(0.0442)	(0.305)	(0.147)
Semiurban	−0.541	−0.705	2.065	−1.482	−1.039*	−1.106**	0.492*	3.553	−1.127
	(0.910)	(2.098)	(1.798)	(2.602)	(0.555)	(0.512)	(0.298)	(2.233)	(1.001)
City	−0.541	−0.433	1.792	−4.945*	−1.620**	−1.370**	0.657**	3.060	−0.579
	(0.983)	(2.268)	(2.059)	(2.977)	(0.642)	(0.553)	(0.324)	(2.500)	(1.182)
Year 2010	2.868***	5.689***	−0.218	28.85***	−6.084***	−2.506***	−0.907***	10.28***	5.184***
	(0.104)	(0.315)	(0.311)	(0.556)	(0.0842)	(0.0638)	(0.0493)	(0.361)	(0.138)
Year 2014	4.910***	12.07***	10.97***	52.42***	−12.76***	−4.842***	−2.443***	15.40***	8.364***
	(0.157)	(0.379)	(0.402)	(0.633)	(0.107)	(0.0898)	(0.0663)	(0.412)	(0.195)
N	6,107	6,107	6,107	6,107	6,107	6,107	6,107	6,107	6,107
R-2	0.407	0.360	0.346	0.798	0.914	0.674	0.468	0.474	0.500
Municipalities	2,118	2,118	2,118	2,118	2,118	2,118	2,118	2,118	2,118

Note: Semiurban refers to municipalities with a population between 2,500 and 15,000. City refers to municipalities with more than 15,000 inhabitants. The average income corresponds to the average per capita household income in each municipality in logarithms. The deciles of income correspond to the cut-off points of dividing in each municipality the households into ten equal groups and is expressed in logarithms. All monetary values were in real terms in August 2014. Model with fixed effects by the municipality and by year for 2005, 2010, and 2014, also using the FAIS formulated as the instrumental variable. The nonmonetary dimensions are expressed in 0–100, understanding 100 as 100% of coverage.

∞ Fiscal revenue items in the logarithm of the average monthly per capita value three previous years. ‡ Occupied per inhabitant, employees of the economic units or indirect workers, reported in the economic census of the circa year. ‡‡ Productivity by the total of occupied and active of the economic units of each municipality.

Standard error in parentheses. *** p < .01 ** p < .05 * p < .1

Annex 5. Fixed effects model: effect of the FAIS on income, by population size

A. Urban: cities with at least 15.000 inhabitants

	Mean	*Income quantile*									
	Income	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*Gini*
FAIS ∞	0.0207*	0.0727***	0.0571***	0.0475***	0.0401***	0.0337***	0.0279**	0.0222*	0.0157	0.00695	−1.015***
	(0.0124)	(0.0139)	(0.0127)	(0.0123)	(0.0121)	(0.0121)	(0.0122)	(0.0124)	(0.0127)	(0.0134)	(0.256)
Own revenues ∞	−0.00213	0.0122	0.00835	0.00609	0.00435	0.00291	0.00151	−0.000124	−0.00228	−0.00514	−0.356
	(0.00957)	(0.0117)	(0.0107)	(0.0102)	(0.00988)	(0.00970)	(0.00962)	(0.00968)	(0.00993)	(0.0105)	(0.222)
Unconditional revenue ∞	0.0380**	−0.0282	−0.0134	−0.00369	0.00470	0.0125	0.0205	0.0295	0.0410**	0.0579***	1.799***
	(0.0186)	(0.0187)	(0.0170)	(0.0166)	(0.0167)	(0.0171)	(0.0177)	(0.0184)	(0.0194)	(0.0211)	(0.381)
Conditional revenue ∞	−0.0238**	−0.0270**	−0.0254**	−0.0240**	−0.0229**	−0.0224**	−0.0224**	−0.0229**	−0.0242**	−0.0266**	−0.201
	(0.00980)	(0.0123)	(0.0109)	(0.0103)	(0.00987)	(0.00965)	(0.00959)	(0.00970)	(0.0100)	(0.0108)	(0.242)
Direct workers ‡	−0.201	0.342	0.206	0.0976	0.00921	−0.0688	−0.138	−0.201	−0.263	−0.332	−11.28**
	(0.221)	(0.351)	(0.302)	(0.275)	(0.257)	(0.241)	(0.228)	(0.217)	(0.210)	(0.213)	(5.183)
Indirect workers ‡	−0.349	−1.859***	−1.346***	−1.060***	−0.859**	−0.700*	−0.563	−0.431	−0.282	−0.0688	31.66***
	(0.435)	(0.396)	(0.363)	(0.360)	(0.367)	(0.382)	(0.402)	(0.425)	(0.451)	(0.491)	(8.405)
Productivity per occupied ‡‡	−0.00678	−0.0235**	−0.0205**	−0.0179**	−0.0154*	−0.0130	−0.0106	−0.00806	−0.00528	−0.00190	0.362
	(0.00983)	(0.0111)	(0.00967)	(0.00904)	(0.00871)	(0.00862)	(0.00873)	(0.00908)	(0.00975)	(0.0112)	(0.249)
Private business assets ‡‡	0.0135*	0.0261***	0.0235***	0.0216**	0.0202**	0.0188**	0.0174**	0.0158**	0.0136*	0.0102	−0.303*
	(0.00767)	(0.0101)	(0.00904)	(0.00849)	(0.00814)	(0.00788)	(0.00769)	(0.00759)	(0.00758)	(0.00787)	(0.177)
Year 2010	−0.0526***	0.105***	0.0752***	0.0540***	0.0351***	0.0166**	−0.00292	−0.0250***	−0.0524***	−0.0946***	−4.692***
	(0.00859)	(0.0101)	(0.00923)	(0.00881)	(0.00856)	(0.00841)	(0.00836)	(0.00840)	(0.00859)	(0.00907)	(0.159)
Year 2014	0.110***	0.127***	0.125***	0.126***	0.128***	0.128***	0.128***	0.126***	0.120***	0.107***	−0.637***
	(0.00868)	(0.0120)	(0.0105)	(0.00962)	(0.00907)	(0.00873)	(0.00857)	(0.00860)	(0.00888)	(0.00964)	(0.236)
Constant	7.277***	6.079***	6.397***	6.621***	6.807***	6.983***	7.160***	7.354***	7.590***	7.935***	39.97***
	(0.107)	(0.132)	(0.120)	(0.115)	(0.111)	(0.109)	(0.109)	(0.108)	(0.109)	(0.113)	(2.187)
N	2,859	2,859	2,859	2,859	2,859	2,859	2,859	2,859	2,859	2,859	2,859
R-2	0.291	0.184	0.179	0.188	0.206	0.228	0.255	0.283	0.313	0.344	0.450
Municipalities	985	985	985	985	985	985	985	985	985	985	985

Note: Semiurban refers to municipalities with a population between 2,500 and 15,000. City refers to municipalities with more than 15,000 inhabitants. The average income corresponds to the average per capita household income in each municipality in logarithms. The deciles of income correspond to the cut-off points of dividing in each municipality the households into ten equal groups and is expressed in logarithms. All monetary values were in real terms in August 2014. Gini refers to the Gini coefficient. Fixed effects model by year and municipality for the years 2005, 2010, and 2014. Include 985 municipalities with at least 15,000 inhabitants.

∞ Fiscal revenue items in the logarithm of the average monthly per capita value three previous years. ‡ Occupied per inhabitant, employees of the economic units or indirect workers, reported in the economic census of the circa year. ‡ ‡ Productivity by the total of occupied and active of the economic units of each municipality.

Standard error in parentheses. *** p < .01 ** p < .05 * p < .1

B. Semiurban and rural: Municipalities with fewer than 15.000 inhabitants.

	Mean	*Income quantile*									
	Income	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*Gini*
FAIS ∞	0.0133	−0.0663***	−0.0453***	−0.0315**	−0.0205	−0.0101	0.000144	0.0112	0.0236	0.0380**	1.767***
	(0.0141)	(0.0127)	(0.0124)	(0.0124)	(0.0126)	(0.0129)	(0.0133)	(0.0139)	(0.0146)	(0.0159)	(0.251)
Own revenues ∞	0.00106	0.00522	0.00348	0.00244	0.00163	0.00117	0.000811	0.000711	0.00103	0.00170	−0.0472
	(0.00644)	(0.00651)	(0.00624)	(0.00618)	(0.00621)	(0.00626)	(0.00632)	(0.00645)	(0.00666)	(0.00701)	(0.117)
Unconditional revenue ∞	0.0282	0.0425**	0.0401**	0.0391**	0.0379**	0.0365**	0.0345*	0.0314	0.0275	0.0211	−0.357
	(0.0193)	(0.0193)	(0.0182)	(0.0179)	(0.0179)	(0.0181)	(0.0185)	(0.0192)	(0.0202)	(0.0219)	(0.382)
Conditional revenue ∞	−0.0332***	0.0126	−0.00169	−0.0110	−0.0184*	−0.0248**	−0.0307***	−0.0363***	−0.0422***	−0.0471***	−0.907***
	(0.00987)	(0.0117)	(0.0107)	(0.0103)	(0.00999)	(0.00985)	(0.00981)	(0.00991)	(0.0102)	(0.0109)	(0.219)
Direct workers ‡	0.406*	−0.251	−0.112	−0.0108	0.0803	0.163	0.247	0.338	0.452**	0.614***	16.62***
	(0.207)	(0.207)	(0.193)	(0.188)	(0.188)	(0.190)	(0.196)	(0.205)	(0.218)	(0.237)	(3.957)
Indirect workers ‡	0.0519	0.167	0.165	0.177	0.173	0.155	0.139	0.119	0.0719	0.00909	−4.842
	(0.272)	(0.321)	(0.305)	(0.295)	(0.290)	(0.287)	(0.285)	(0.280)	(0.281)	(0.282)	(5.274)
Productivity per occupied ‡‡	−0.00746	−0.0217**	−0.0187**	−0.0164**	−0.0145*	−0.0127	−0.0107	−0.00880	−0.00634	−0.00305	0.427**
	(0.00803)	(0.00934)	(0.00854)	(0.00819)	(0.00801)	(0.00791)	(0.00790)	(0.00800)	(0.00829)	(0.00885)	(0.178)
Private business assets ‡‡	0.00567	0.00758	0.00722	0.00679	0.00611	0.00547	0.00484	0.00438	0.00374	0.00391	0.00289
	(0.00748)	(0.00831)	(0.00769)	(0.00745)	(0.00735)	(0.00730)	(0.00731)	(0.00741)	(0.00764)	(0.00816)	(0.142)
Year 2010	−0.00254	0.103***	0.0852***	0.0733***	0.0627***	0.0517***	0.0391***	0.0241**	0.00450	−0.0282**	−3.301***
	(0.0102)	(0.0117)	(0.0107)	(0.0103)	(0.0101)	(0.00999)	(0.0101)	(0.0102)	(0.0106)	(0.0113)	(0.212)
Year 2014	0.190***	0.140***	0.154***	0.168***	0.180***	0.191***	0.200***	0.208***	0.214***	0.212***	0.826***
	(0.0101)	(0.01000)	(0.00898)	(0.00867)	(0.00871)	(0.00895)	(0.00936)	(0.00991)	(0.0107)	(0.0120)	(0.252)
Constant	7.072***	6.154***	6.399***	6.573***	6.727***	6.872***	7.020***	7.182***	7.378***	7.658***	32.45***
	(0.0985)	(0.103)	(0.0961)	(0.0937)	(0.0932)	(0.0940)	(0.0954)	(0.0977)	(0.102)	(0.110)	(1.981)
N	3,284	3,284	3,284	3,284	3,284	3,284	3,284	3,284	3,284	3,284	3,284
R-2	0.244	0.112	0.135	0.162	0.189	0.213	0.235	0.253	0.265	0.270	0.243
Municipalities	1,169	1,169	1,169	1,169	1,169	1,169	1,169	1,169	1,169	1,169	1,169

Note: Semiurban refers to municipalities with a population between 2,500 and 15,000. City refers to municipalities with more than 15,000 inhabitants. The average income corresponds to the average per capita household income in each municipality in logarithms. The deciles of income correspond to the cut-off points of dividing in each municipality the households into ten equal groups and is expressed in logarithms. All monetary values were in real terms in August 2014. Gini refers to the Gini coefficient. Fixed effects model by year and municipality for the years 2005, 2010, and 2014. Include 1169 municipalities with fewer than 15000 inhabitants.
∞ Fiscal revenue items in the logarithm of the average monthly per capita value three previous years. ‡ Occupied per inhabitant, employees of the economic units or indirect workers, reported in the economic census of the circa year. ‡‡ Productivity by the total of occupied and active of the economic units of each municipality.
Standard error in parentheses. *** p < .01 ** p < .05 * p < .1

Annex 6. Fixed effects model with instrumental variable: the effect of the FAIS on poverty, by population size

A. Poverty, by population size

	Urban			*Semiurban / rural*		
	Food	*Capabilities*	*Assets*	*Food*	*Capabilities*	*Assets*
FAIS ∞	−3.176***	−2.577**	−0.429	2.337	2.912**	4.084***
	(1.139)	(1.151)	(1.066)	(1.440)	(1.427)	(1.280)
Own revenues ∞	−0.295	−0.420	−0.484	−0.317	−0.238	0.0402
	(0.436)	(0.430)	(0.368)	(0.341)	(0.322)	(0.244)
Unconditional revenue ∞	1.326	0.821	−0.839	−2.574**	−3.212***	−4.181***
	(0.965)	(0.973)	(0.859)	(1.206)	(1.221)	(1.136)
Conditional revenue ∞	0.529	0.544	0.657	0.534	0.661	0.668
	(0.533)	(0.534)	(0.475)	(0.584)	(0.594)	(0.554)
Direct workers ‡	−17.56*	−14.03	3.461	−10.29	−12.85	−15.40
	(10.27)	(11.19)	(12.32)	(9.308)	(10.12)	(10.07)
Indirect workers ‡	30.68**	27.67**	15.57	−5.150	−7.324	−10.19
	(12.08)	(12.86)	(13.71)	(13.65)	(15.65)	(16.10)
Productivity per occupied ‡‡	0.210	0.228	0.346	0.681	0.755*	0.709*
	(0.481)	(0.488)	(0.427)	(0.448)	(0.447)	(0.391)
Private business assets ‡‡	−0.334	−0.353	−0.420	−0.268	−0.283	−0.245
	(0.359)	(0.370)	(0.337)	(0.406)	(0.401)	(0.335)
Year 2010	1.078***	2.110***	4.304***	0.308	0.457	1.016**
	(0.384)	(0.395)	(0.374)	(0.522)	(0.527)	(0.462)
Year 2014	−0.493	−0.0211	0.630	−3.021***	−3.415***	−3.565***
	(0.459)	(0.462)	(0.405)	(0.573)	(0.585)	(0.527)
N	2,843	2,843	2,843	3,264	3,264	3,264
R-2	0.017	0.029	0.121	0.034	0.040	0.050
Municipalities	969	969	969	1,149	1,149	1,149

Note: Semiurban refers to municipalities with a population between 2,500 and 15,000. City refers to municipalities with more than 15,000 inhabitants. The average income corresponds to the average per capita household income in each municipality in logarithms. The deciles of income correspond to the cut-off points of dividing in each municipality the households into ten equal groups and is expressed in logarithms. All monetary values were in real terms in August 2014. Model with fixed effects by the municipality and by year for 2005, 2010–14, also using the FAIS formulated as the instrumental variable.

∞ Fiscal revenue items in the logarithm of the average monthly per capita value three previous years. ‡ Occupied per inhabitant, employees of the economic units or indirect workers, reported in the economic census of the circa year. ‡ ‡ Productivity by the total of occupied and active of the economic units of each municipality.

Standard error in parentheses. *** p < .01 ** p < .05 * p < .1

B. Nonmonetary dimensions, urban areas

	Electricity	*Sewerage*	*Water*	*Health*	*Incomplete primary 15+*	*Illiterancy 15+*	*Illiterancy 6-14*	*Floor*	*Toilet*
FAIS ∞	3.025***	9.845***	10.49***	15.58***	0.313	−2.554***	−0.690***	11.35***	1.769**
	(0.476)	(1.174)	(1.397)	(1.983)	(0.444)	(0.311)	(0.232)	(1.168)	(0.695)
Own revenue ∞	−0.244	−0.396	−0.430	−1.574*	−0.357***	0.141	0.201**	−0.691	−0.205
	(0.299)	(0.528)	(0.814)	(0.914)	(0.112)	(0.160)	(0.0851)	(0.660)	(0.372)
Unconditional revenue ∞	−0.789*	−3.579***	−2.287**	−2.672	0.143	0.509*	−0.0137	−2.191*	0.784
	(0.406)	(0.969)	(1.166)	(1.740)	(0.297)	(0.276)	(0.184)	(1.170)	(0.587)
Conditional revenue ∞	−0.603**	−3.094***	−2.716***	−6.908***	−0.366**	1.043***	0.303***	−4.576***	−0.798**
	(0.258)	(0.500)	(0.677)	(1.006)	(0.163)	(0.152)	(0.0962)	(0.681)	(0.373)
Direct workers ‡	−2.918	7.275	10.77	33.49**	2.903	−5.355***	−1.400	3.397	12.55***
	(2.619)	(7.419)	(7.998)	(13.47)	(2.788)	(1.597)	(1.193)	(7.175)	(3.996)
Indirect workers ‡	0.817	−48.99***	−59.38***	−266.7***	18.01**	33.22***	15.52***	−128.3***	−35.73***
	(5.078)	(15.93)	(17.29)	(42.55)	(7.723)	(5.335)	(2.961)	(20.08)	(8.710)
Productivity per occupied ‡‡	0.275	0.220	−0.592	−2.230***	−0.0221	0.109	0.0757	−0.647	−0.0624
	(0.193)	(0.434)	(0.554)	(0.832)	(0.136)	(0.101)	(0.0725)	(0.521)	(0.280)
Private business assets ‡‡	0.0363	0.681**	0.607	2.792***	−0.260***	−0.325***	−0.0839	1.352***	0.383**
	(0.116)	(0.283)	(0.442)	(0.571)	(0.0973)	(0.0782)	(0.0518)	(0.363)	(0.187)
Year 2010	3.191***	4.842***	−0.879*	24.60***	−5.782***	−2.399***	−0.876***	7.818***	5.189***
	(0.149)	(0.349)	(0.476)	(0.706)	(0.0901)	(0.0800)	(0.0571)	(0.461)	(0.188)
Year 2014	4.880***	11.23***	10.64***	47.44***	−12.23***	−4.877***	−2.491***	13.53***	8.654***
	(0.212)	(0.481)	(0.627)	(0.944)	(0.144)	(0.128)	(0.0866)	(0.561)	(0.305)
N	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843	2,843
R-2	0.502	0.474	0.380	0.820	0.926	0.727	0.581	0.463	0.630
Municipalities	969	969	969	969	969	969	969	969	969

Note: Semiurban refers to municipalities with a population between 2,500 and 15,000. City refers to municipalities with more than 15,000 inhabitants. The average income corresponds to the average per capita household income in each municipality in logarithms. The deciles of income correspond to the cut-off points of dividing in each municipality the households into ten equal groups and is expressed in logarithms. All monetary values were in real terms in August 2014. Model with fixed effects by the municipality and by year for 2005, 2010, and 2014, also using the FAIS formulated as the instrumental variable. The nonmonetary dimensions are expressed in 0–100, understanding 100 as 100% of coverage. Include observation from urban municipalities only, defined as municipalities with at least 15,000 inhabitants.

∞ Fiscal revenue items in the logarithm of the average monthly per capita value three previous years. ‡ Occupied per inhabitant, employees of the economic units or indirect workers, reported in the economic census of the circa year. ‡‡ Productivity by the total of occupied and active of the economic units of each municipality.

Standard error in parentheses. *** p < .01 ** p < .05 * p < .1

C. Nonmonetary dimensions, semiurban and rural areas

	Electricity	*Sewerage*	*Water*	*Health*	*Incomplete primary 15+*	*Illiterancy 15+*	*Illiterancy 6-14*	*Floor*	*Toilet*
FAIS ∞	3.015***	5.911***	7.267***	14.47***	1.015**	−1.128***	−0.809***	8.932***	0.418
	(0.691)	(1.612)	(1.525)	(2.166)	(0.501)	(0.293)	(0.246)	(1.259)	(0.941)
Own revenues ∞	0.0533	0.148	0.759**	−0.757	−0.261***	0.0587	0.0372	−1.731***	−0.0615
	(0.129)	(0.346)	(0.315)	(0.500)	(0.0642)	(0.0721)	(0.0449)	(0.336)	(0.175)
Unconditional revenue ∞	−1.720***	−3.822***	−3.581***	−7.563***	0.207	1.026***	0.284	−3.224***	−0.927
	(0.499)	(1.137)	(1.209)	(1.948)	(0.284)	(0.245)	(0.189)	(1.136)	(0.657)
Conditional revenue ∞	−0.365	−1.188*	−1.358**	−4.468***	−0.481***	0.108	0.0558	−2.574***	0.201
	(0.249)	(0.638)	(0.595)	(0.915)	(0.158)	(0.126)	(0.104)	(0.600)	(0.329)
Direct workers ‡	−3.719*	1.653	−15.32**	41.35***	10.76***	−2.188	−0.672	−0.197	12.40***
	(2.234)	(8.389)	(6.164)	(14.88)	(4.032)	(1.656)	(1.702)	(7.490)	(4.330)
Indirect workers ‡	3.274	−21.59**	−8.927	−23.93	1.402	4.683	−1.147	−21.37**	0.364
	(3.939)	(8.776)	(9.023)	(24.92)	(6.056)	(2.977)	(2.243)	(10.49)	(5.356)
Productivity per occupied ‡‡	0.00404	0.202	0.0376	0.623	−0.0799	0.0596	−0.0178	0.0875	−0.0145
	(0.180)	(0.441)	(0.429)	(0.686)	(0.0931)	(0.0910)	(0.0703)	(0.438)	(0.207)
Private business assets ‡‡	0.0294	0.655**	0.119	0.225	−0.130	−0.203***	0.0213	0.647	−0.0852
	(0.175)	(0.333)	(0.319)	(0.547)	(0.0975)	(0.0785)	(0.0612)	(0.408)	(0.202)
Year 2010	2.567***	6.592***	0.427	32.76***	−6.383***	−2.684***	−0.981***	12.53***	5.085***
	(0.151)	(0.501)	(0.448)	(0.793)	(0.130)	(0.0918)	(0.0752)	(0.530)	(0.215)
Year 2014	4.939***	13.25***	11.67***	57.16***	−13.37***	−5.077***	−2.476***	17.44***	8.227***
	(0.217)	(0.560)	(0.555)	(0.799)	(0.173)	(0.121)	(0.0982)	(0.567)	(0.268)
N	3,264	3,264	3,264	3,264	3,264	3,264	3,264	3,264	3,264
R-2	0.361	0.340	0.339	0.811	0.907	0.658	0.420	0.504	0.425
Municipalities	1,149	1,149	1,149	1,149	1,149	1,149	1,149	1,149	1,149

Note: Semiurban refers to municipalities with a population between 2,500 and 15,000. City refers to municipalities with more than 15,000 inhabitants. The average income corresponds to the average per capita household income in each municipality in logarithms. The deciles of income correspond to the cut-off points of dividing in each municipality the households into ten equal groups and is expressed in logarithms. All monetary values were in real terms in August 2014. Model with fixed effects by the municipality and by year for 2005, 2010, and 2014, also using the FAIS formulated as the instrumental variable. The nonmonetary dimensions are expressed in 0–100, understanding 100 as 100% of coverage. Include observation from semiurban and rural municipalities only, defined as municipalities with fewer than 15,000 inhabitants.

∞ Fiscal revenue items in the logarithm of the average monthly per capita value three previous years. ‡ Occupied per inhabitant, employees of the economic units or indirect workers, reported in the economic census of the circa year. ‡ ‡ Productivity by the total occupied and active economic units in each municipality.

Standard error in parentheses. *** p < .01 ** p < .05 * p < .1

Annex 7. Results from an unweighted model

A. The impact of FAIS on mean income, income distribution, and inequality

	Mean income		*Gini*	
	Unweighted	*Weighted*	*Unweighted*	*Weighted*
FAIS ∞	0.0254**	0.0230*	0.889***	−0.603**
	(0.0110)	(0.0125)	(0.213)	(0.267)
Own revenues ∞	−0.00198	0.0157*	−0.199*	−0.161
	(0.00463)	(0.00882)	(0.107)	(0.200)
Unconditional revenue ∞	0.0262*	−0.00833	0.286	1.107***
	(0.0136)	(0.0194)	(0.262)	(0.398)
Conditional revenue ∞	−0.0324***	−0.0320***	−0.688***	0.0996
	(0.00741)	(0.0110)	(0.201)	(0.248)
Direct workers ‡	0.265	−0.0629	9.087***	−2.996
	(0.180)	(0.178)	(2.899)	(4.268)
Indirect workers ‡	−0.237	−0.963**	3.583	4.470
	(0.272)	(0.430)	(4.748)	(7.566)
Productivity per occupied ‡‡	−0.00719	−0.00628	0.387**	0.701***
	(0.00704)	(0.0108)	(0.166)	(0.243)
Private business assets ‡‡	0.00872	0.00580	−0.117	−0.169
	(0.00569)	(0.00879)	(0.130)	(0.180)
Semiurban	0.0968**	0.0912**	1.870**	2.219**
	(0.0452)	(0.0457)	(0.951)	(1.071)
City	0.114**	0.133***	0.440	0.889
	(0.0471)	(0.0496)	(1.025)	(1.157)
Year 2010	−0.0279***	−0.0641***	−3.894***	−4.360***
	(0.00760)	(0.00992)	(0.136)	(0.232)
Year 2014	0.152***	0.117***	0.452**	0.174
	(0.00882)	(0.0108)	(0.178)	(0.236)
Constant	7.084***	7.713***	34.40***	34.25***
	(0.0915)	(0.131)	(1.793)	(2.987)
N	6,143	6,143	6,143	6,143
R-2	0.250	0.360	0.300	0.496
Municipalities	2,154	2,154	2,154	2,154

Note: Semiurban refers to municipalities with a population between 2,500 and 15,000. City refers to municipalities with more than 15,000 inhabitants. The average income corresponds to the average per capita household income in each municipality in logarithms. The deciles of income correspond to the cut-off points of dividing in each municipality the households into ten equal groups and is expressed in logarithms. All monetary values were in real terms in August 2014. Fixed effects model by year and municipality for the years 2005, 2010, and 2014. Weighted results show the same model adding importance by size of municipal population.

∞ Fiscal revenue items in the logarithm of the average monthly per capita value three previous years. ‡ Occupied per inhabitant, employees of the economic units or indirect workers, reported in the economic census of the circa year. ‡ ‡ Productivity by the total occupied and active economic units in each municipality.

Standard error in parentheses. *** p < .01 ** p < .05 * p < .1.

B. The FAIS impact on poverty

	Food Poverty		*Capabilities poverty*		*Asset poverty*	
	Unweighted	*Weighted*	*Unweighted*	*Weighted*	*Unweighted*	*Weighted*
FAIS ∞	−0.998	−1.560	−0.617	−0.913	0.849	1.210
	(0.921)	(1.162)	(0.918)	(1.332)	(0.824)	(1.521)
Own revenues ∞	−0.339	−0.654*	−0.258	−0.857**	0.0452	−1.090**
	(0.289)	(0.361)	(0.273)	(0.409)	(0.205)	(0.462)
Unconditional revenue ∞	−0.427	0.923	−0.895	0.815	−2.059***	0.162
	(0.803)	(1.054)	(0.801)	(1.214)	(0.710)	(1.342)
Conditional revenue ∞	0.846**	0.738*	0.962**	0.857*	0.981***	1.114**
	(0.410)	(0.423)	(0.415)	(0.463)	(0.378)	(0.566)
Direct workers ‡	−12.67*	−14.16***	−13.78*	−10.64	−10.68	4.684
	(7.116)	(5.261)	(7.757)	(6.756)	(7.875)	(10.66)
Indirect workers ‡	10.10	28.44***	9.447	27.95**	6.082	25.03
	(11.34)	(10.74)	(12.80)	(12.66)	(12.75)	(17.22)
Productivity per occupied ‡‡	0.488	0.715*	0.559	0.719	0.612**	0.620
	(0.354)	(0.375)	(0.353)	(0.439)	(0.303)	(0.530)
Private business assets ‡‡	−0.310	−0.277	−0.331	−0.328	−0.330	−0.320
	(0.294)	(0.283)	(0.292)	(0.329)	(0.248)	(0.421)
Semiurban	−2.824	−2.280	−3.386	−2.828	−3.933**	−3.548*
	(2.244)	(2.328)	(2.241)	(2.338)	(1.919)	(2.054)
City	−4.110*	−4.591*	−4.655*	−5.428**	−4.999**	−6.180***
	(2.433)	(2.540)	(2.440)	(2.567)	(2.107)	(2.281)
Year 2010	0.879***	0.999***	1.444***	2.096***	2.745***	4.804***
	(0.337)	(0.364)	(0.343)	(0.428)	(0.307)	(0.511)
Year 2014	−1.441***	0.422	−1.457***	0.806	−1.349***	0.798
	(0.390)	(0.458)	(0.397)	(0.506)	(0.353)	(0.562)
N	6,107	6,107	6,107	6,107	6,107	6,107
R-2	0.024	0.031	0.033	0.057	0.070	0.204
Municipalities	2,118	2,118	2,118	2,118	2,118	2,118

Note: Semiurban refers to municipalities with a population between 2,500 and 15,000. City refers to municipalities with more than 15,000 inhabitants. The average income corresponds to the average per capita household income in each municipality in logarithms. The deciles of income correspond to the cut-off points of dividing in each municipality the households into ten equal groups and is expressed in logarithms. All monetary values were in real terms in August 2014. Model with fixed effects by the municipality and by year for 2005, 2010, and 2014, also using the FAIS formulated as the instrumental variable. Weighed results show the same model adding importance by the size of the municipal population. ∞ Fiscal revenue items in the logarithm of the average monthly per capita value three previous years. ‡ Occupied per inhabitant, employees of the economic units or indirect workers, reported in the economic census of the circa year. ‡ ‡ Productivity by the total of occupied and active of the economic units of each municipality.
Standard error in parentheses. *** p < .01 ** p < .05 * p < .1

C. FAIS impact on nonmonetary dimensions of poverty, part 1

	Electricity		*Sewerage*		*Water*	*Floor*		*Toilet*	
	Unweighted	*Weighted*	*Unweighted*	*Weighted*	*Unweighted*	*Unweighted*	*Weighted*	*Unweighted*	*Weighted*
FAIS ∞	3.107***	2.958***	8.356***	7.575***	9.067***	11.27***	7.400***	0.954	1.845**
	(0.429)	(0.774)	(1.025)	(1.207)	(1.019)	(0.861)	(1.210)	(0.599)	(0.867)
Own revenues ∞	0.0245	−0.147	0.0129	−0.155	0.536*	−1.710***	−0.458	−0.0726	−0.0749
	(0.119)	(0.209)	(0.306)	(0.373)	(0.298)	(0.307)	(0.473)	(0.157)	(0.237)
Unconditional revenue ∞	−1.426***	−0.648	−4.378***	−3.003***	−3.604***	−3.662***	−1.813*	−0.392	0.410
	(0.334)	(0.537)	(0.798)	(0.840)	(0.869)	(0.866)	(0.979)	(0.450)	(0.568)
Conditional revenue ∞	−0.524***	−0.117	−2.178***	−1.467***	−2.092***	−3.632***	−2.233***	−0.245	−0.445
	(0.181)	(0.239)	(0.442)	(0.459)	(0.444)	(0.459)	(0.519)	(0.243)	(0.285)
Direct workers ‡	−3.520**	−0.181	3.259	12.90**	−8.907*	0.367	11.28**	11.17***	8.202**
	(1.729)	(3.370)	(6.241)	(5.327)	(4.747)	(5.737)	(5.618)	(3.238)	(3.543)
Indirect workers ‡	2.532	16.55*	−34.71***	−111.7***	−24.21***	−60.44***	−168.4***	−9.402**	−32.88***
	(3.151)	(9.341)	(8.565)	(17.17)	(7.444)	(14.14)	(19.91)	(4.601)	(9.581)
Productivity per occupied ‡‡	0.104	0.0774	0.197	0.0892	−0.142	−0.197	−1.062***	−0.0359	−0.443*
	(0.143)	(0.167)	(0.345)	(0.309)	(0.351)	(0.355)	(0.375)	(0.171)	(0.242)
Private business assets ‡‡	0.0397	0.116	0.706***	1.183***	0.299	0.961***	1.836***	0.0966	0.658***
	(0.125)	(0.137)	(0.245)	(0.260)	(0.258)	(0.305)	(0.272)	(0.147)	(0.189)
Semiurban	−0.541	−0.927	−0.705	−0.356	2.065	3.553	4.095	−1.127	−1.207
	(0.910)	(1.128)	(2.098)	(2.035)	(1.798)	(2.233)	(2.561)	(1.001)	(1.000)
City	−0.541	−1.233	−0.433	1.975	1.792	3.060	6.710**	−0.579	−0.603
	(0.983)	(1.209)	(2.268)	(2.243)	(2.059)	(2.500)	(2.805)	(1.182)	(1.207)
Year 2010	2.868***	3.710***	5.689***	3.895***	−0.218	10.28***	5.705***	5.184***	5.202***
	(0.104)	(0.163)	(0.315)	(0.260)	(0.311)	(0.361)	(0.371)	(0.138)	(0.174)
Year 2014	4.910***	4.827***	12.07***	8.679***	10.97***	15.40***	10.61***	8.364***	7.687***
	(0.157)	(0.242)	(0.379)	(0.407)	(0.402)	(0.412)	(0.498)	(0.195)	(0.268)
N	6,107	6,107	6,107	6,107	6,107	6,107	6,107	6,107	6,107
R-2	0.407	0.608	0.360	0.375	0.346	0.474	0.398	0.500	0.651
Municipalities	2,118	2,118	2,118	2,118	2,118	2,118	2,118	2,118	2,118

Note: Semiurban refers to municipalities with a population between 2,500 and 15,000. City refers to municipalities with more than 15,000 inhabitants. The average income corresponds to the average per capita household income in each municipality in logarithms. The deciles of income correspond to the cut-off points of dividing in each municipality the households into ten equal groups and is expressed in logarithms. All monetary values were in real terms in August 2014. Model with fixed effects by the municipality and by year for 2005, 2010, and 2014, also using the FAIS formulated as the instrumental variable. The nonmonetary dimensions are expressed in 0–100, understanding 100 as 100% of coverage. Weighed results show the same model adding importance by the size of the municipal population.
∞ Fiscal revenue items in the logarithm of the average monthly per capita value three previous years. ‡ Occupied per inhabitant, employees of the economic units or indirect workers, reported in the economic census of the circa year. ‡ ‡ Productivity by the total of occupied and active of the economic units of each municipality.
Standard error in parentheses. *** p < .01 ** p < .05 * p < .1

D. FAIS impact on nonmonetary dimensions of poverty, part 2

	Health		*Incomplete elementary*		*Illiteracy 15+*		*Illiteracy 6–14*	
	Unweighted	*Weighted*	*Unweighted*	*Weighted*	*Unweighted*	*Weighted*	*Unweighted*	*Weighted*
FAIS ∞	18.36***	11.78***	0.333	−0.0519	−1.956***	−1.683***	−0.830***	−0.899***
	(1.475)	(2.482)	(0.328)	(0.599)	(0.208)	(0.329)	(0.163)	(0.215)
Own revenues ∞	−1.149**	−0.477	−0.264***	−0.528***	0.0794	−0.00401	0.0701*	0.119*
	(0.461)	(0.884)	(0.0553)	(0.156)	(0.0680)	(0.118)	(0.0397)	(0.0614)
Unconditional revenue ∞	−7.925***	−1.390	0.411**	1.106***	1.001***	0.510**	0.217	0.244
	(1.475)	(1.936)	(0.197)	(0.401)	(0.188)	(0.254)	(0.134)	(0.172)
Conditional revenue ∞	−6.336***	−3.995***	−0.320***	−0.120	0.548***	0.518***	0.165**	0.173**
	(0.706)	(0.890)	(0.112)	(0.201)	(0.0991)	(0.119)	(0.0729)	(0.0817)
Direct workers ‡	39.28***	47.05***	8.058***	3.237	−2.440*	−5.848***	−0.711	−2.158*
	(11.40)	(12.39)	(2.880)	(3.738)	(1.272)	(1.408)	(1.152)	(1.150)
Indirect workers ‡	−119.2***	−430.0***	7.646	44.96***	13.18***	47.64***	4.258**	20.49***
	(31.71)	(47.67)	(5.206)	(9.333)	(3.740)	(5.538)	(2.076)	(2.912)
Productivity per occupied ‡‡	−0.239	−2.766***	−0.0824	0.120	0.0747	0.234***	0.0178	0.151**
	(0.572)	(0.790)	(0.0760)	(0.151)	(0.0741)	(0.0862)	(0.0550)	(0.0620)
Private business assets ‡‡	1.273***	4.152***	−0.180**	−0.642***	−0.258***	−0.503***	−0.0251	−0.182***
	(0.426)	(0.552)	(0.0722)	(0.128)	(0.0598)	(0.0676)	(0.0442)	(0.0482)
Semiurban	−1.482	0.306	−1.039*	−0.608	−1.106**	−1.114*	0.492*	0.541
	(2.602)	(3.864)	(0.555)	(0.583)	(0.512)	(0.570)	(0.298)	(0.330)
City	−4.945*	5.157	−1.620**	−1.845***	−1.370**	−2.001***	0.657**	0.464
	(2.977)	(4.215)	(0.642)	(0.672)	(0.553)	(0.615)	(0.324)	(0.359)
Year 2010	28.85***	19.02***	−6.084***	−5.596***	−2.506***	−1.945***	−0.907***	−0.643***
	(0.556)	(0.799)	(0.0842)	(0.131)	(0.0638)	(0.0882)	(0.0493)	(0.0578)
Year 2014	52.42***	39.89***	−12.76***	−11.55***	−4.842***	−3.886***	−2.443***	−2.112***
	(0.633)	(1.102)	(0.107)	(0.207)	(0.0898)	(0.134)	(0.0663)	(0.0845)
N	6,107	6,107	6,107	6,107	6,107	6,107	6,107	6,107
R-2	0.798	0.777	0.914	0.912	0.674	0.675	0.468	0.552
Municipalities	2,118	2,118	2,118	2,118	2,118	2,118	2,118	2,118

Note: Semiurban refers to municipalities with a population between 2,500 and 15,000. City refers to municipalities with more than 15,000 inhabitants. The average income corresponds to the average per capita household income in each municipality in logarithms. The deciles of income correspond to the cut-off points of dividing in each municipality the households into ten equal groups and is expressed in logarithms. All monetary values were in real terms in August 2014. Model with fixed effects by the municipality and by year for 2005, 2010, and 2014, also using the FAIS formulated as the instrumental variable. The nonmonetary dimensions are expressed in 0–100, understanding 100 as 100% of coverage. Unweighted results match with Annex 5. Weighed results show the same model adding importance by size of municipal population.

∞ Fiscal revenue items in the logarithm of the average monthly per capita value three previous years. ‡ Occupied per inhabitant, employees of the economic units or indirect workers, reported in the economic census of the circa year. ‡ ‡ Productivity by the total of occupied and active of the economic units of each municipality.

Standard error in parentheses. *** p < .01 ** p < .05 * p < .1