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REGIONAL INCOME REDISTRIBUTION AND RISK-SHARING: LESSONS FROM ARGENTINA

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This paper estimates redistribution and risk-sharing across provinces in Argentina during the 1995-2010 period as a result of the national budget. We find that the aggregate national budget (expenditure, transfers and their corresponding revenues) reduces differences in the per capita provincial Gross Geographic Product by 5% in the long term, and stabilizes such differences by 10%. The redistributive tool is national expenditure, while automatic intergovernmental transfers are almost neutral and tax revenues amplify regional disparities. The quantitative effects are somewhat modest in comparison with those achieved in developed countries. Regressive taxation is the key difference with developed countries.

JEL classification codes: H5, H6, H7

Key words: fiscal policy, redistribution, risk sharing

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I. Introduction

During the past 20 years there has been growing interest in understanding whether national fiscal policy redistributes income among provinces and whether it compensates fluctuations in provincial economic activity. However, this analysis has not been extended to developing countries with different institutional arrangements. In this paper we study the case of a developing country, Argentina, characterized by a multi-level government organization with a restricted role of social expenditures at the national level, a complex tax system, high macroeconomic volatility and structural changes in its fiscal policy.

The case of Argentina is different from the extensive literature that analyzes the redistributive and stabilizer role of the national budget across provinces in developed countries for four reasons. First, macroeconomic instability and frequency of crises is greater in developing countries, where the volatility of fiscal policy and its pro-cyclicality makes things worse (Gavin et al. 1996). Countries that are more volatile have greater variability in tax collection and expenditures and, as a consequence, the central government is less likely to correct long term territorial disparities and provide insurance against idiosyncratic shocks within the country (Martner and Aldunate 2006). Argentina is an exemplary case of a large developing country with high output volatility and fiscal procyclicality, going from hyperinflationary episodes to sovereign default crisis and depression. Second, macroeconomic instability has this negative effect through its links with diverse forms of uncertainty, not only economic but political and policy-related (Loayza et al. 2007). At the same time, economic instability can generate an enthusiastic inclination for reform leading to political instability. The institutional structure of Argentina is *de facto* different from similar federal systems in developed countries, in that weak checks and balances among Executive, Legislative and Judicial powers result in political instability.¹ Bercoff and Meloni (2009) characterized the political period under analysis of Argentina as an emerging democracy, where the Executive branch of the government has a predominant policy-making role in the country, and the Congress has a weak role. This hyper-presidentialism is particularly important in the programming and execution of

¹ According to the new institutional view (Acemoglu et al. 2003), distortionary macroeconomic policies are not the causal effect that lead to macro volatility and crises. Rather, weak institutions that do not constrain politicians lead to ineffective enforcement of property rights and high degrees of political instability, being the underlying causes of economic instability.

the national budget.^{2,3} Macroeconomic and political instability have played a role in the configuration of a complex tax system, with reforms and counter-reforms that have prevented central and sub-national governments from building institutions to regulate revenue sharing with redistributive and stabilizing criteria (Tommasi et al. 2001). Third, the degree of disparity in terms of population, incomes, development, production and consumption between regions is considerable greater in developing countries (here, Argentina) than in the developed countries analyzed in the past, with the exception of Italy, studied and highlighted by Arachi et al. (2010).⁴ Therefore, these territorial and income inequalities have consequences on tax collection and expenditure allocation that can be playing a role in the mechanism by which the central government affects the gross regional product of provinces in the long and short term.⁵ Fourth, the design of federalism, and which tier of government bears the responsibility of different type of expenditures, can weaken the role of central government in its capacity to correct long-term regional disparities and smooth local cycles. In contrast to developed countries, where central government is in charge of the execution of redistributive social expenditure (e.g., education and health), in Argentina sub-national government are responsible for these social expenditures (education and health expenditures are also provided at the local level in the US). These four heterogeneities relative

² The roles of Congress and the President in the budget are endogenous and fluctuate over time, depending in particular on whether the government is unified or divided, on macroeconomic conditions (in particular, low inflation in the 1990s was a natural constraint for the president to manipulate the budget, while high inflation in the 2000s may have allowed the Executive to take advantage of the budget process) and political conditions (for example, Peronism is characterized by a strong and vertical structure). Therefore, the discretionary power of the Executive over the budget is a dynamic result of the executive-legislative bargaining game, being context-specific on economic and political configurations (Saporiti and Streb 2008).

³ The difference between original budgets approved by the Congress each year and the final execution of such budgets by the Executive (after changes occurred during the year) is an indicator of the discretionary power of the Executive. This indicator has been growing in time: in the 90's the deviation between original and executed budgets was always below 10% and in almost all years did not exceed 5%. In the 2000s, the difference went up to more than 20%, with a maximum of 31% in 2007.

⁴ These disparities are the reason why we decided to group Argentinean provinces based on economic and social indicators into Advanced, Intermediate, Low Density and Lagged groups, following Nuñez Miñana (1972). See footnotes 16 and 26 and Table A1 in the Appendix.

⁵ For example, in the case of Germany, reunification increased the disparities in several dimensions between sub-national governments (old big rich west states vs. new small poor east states), and the stabilization function of the federal government was reduced significantly from 47% to 19%, reflecting that regional disparities are a relevant factor for the insurance function. A new federal fiscal framework was negotiated between the states and the federal government because a simple integration of new states into the existing policy would have turned all west states into net contributors, a situation that would have harmed old net recipients in west German states (Hepp and Von Hagen 2012).

to developed countries, where the literature has been concentrated in the past, make Argentina an interesting case study with policy and institutional design implications for federal systems in developing countries.

In Argentina, the national government collects about 85% of the total tax revenues of the three levels of government (national, provincial and municipal). Taxes have different geographic incidence depending on, among other things, provincial production and consumption structures. National revenues finance national government spending (about 75% in 2010, including debt interest) and transfers to the provinces (about 25% in 2010, having represented a maximum of 33% in 2004). Finally, provinces engage in provincial expenditures financed with transfers from the national government and provincial taxes. Therefore, budget decisions by the national government are key to the provinces' economic situation.⁶

To facilitate comparison with the results for other countries in the literature, we apply the methodological approach of earlier studies to Argentina during the 1995-2010 period. This paper estimates the long-term effects of national fiscal policy –national expenditures, except debt interest, plus transfers to provinces, with the corresponding taxes– on differences in the per capita income among provinces (“redistribution effect”), together with short-term effects of such policy on local shocks (“stabilization effect”). The main results are that the national budget redistributes income slightly, reducing regional differences by 5%, and compensates-stabilizes fluctuations in the provincial economic activity by 10%. National expenditure is the most redistributive and stabilizing tool; transfers are neutral or have little power; while taxes tend to amplify long-term disparities and local cycles (but with a smaller magnitude).

As regards the previous literature, studies for developed countries (basically Canada, France, Germany, Italy, the United Kingdom and the United States) have shown that national fiscal policy redistributes income among provinces (between 20% and 40%) and stabilizes local cycles (between 10% and 20%).

Research papers that focus on the United States have highlighted that the federal government absorbs between 10% and 15% of a product shock through taxes and transfers (see Table 1 in Méltitz and Zumer 2002) and reduces long-term income disparities by 10% to 20% (Von Hagen 1992; Asdrubali et al. 1996; and Méltitz and Zumer 2002). Other studies focused on personal income rather than regional output

⁶ Provincial budgets do not play a significant role in geographical redistribution and hence they are omitted in this paper. However, it is important to highlight that national transfers represent 60% of provincial budgets (up to 90% in low income provinces).

have shown stabilization effects of greater magnitude, that is, between 20% and 40% (Sala-i-Martin and Sachs 1992; Bayoumi and Masson 1995; and Méltiz and Zumer 2002).

On the other hand, papers that focus on European countries have obtained diverse results. Méltiz and Zumer (2002) applied this test to regions in France and the United Kingdom and found a stabilization effect similar to that found in the United States (around 15%) but a significantly higher redistribution effect (38% and 26%, respectively). Italianer and Pisani-Ferry (1992) studied the stabilization effect and found figures of 37% in France and 42% in Germany vs. 17% in the United States. For Germany, Hepp and Von Hagen (2012, 2013), focusing on personal income and making a distinction before and after the unification, found a redistribution effect of 37% in both periods and a 47% stabilization effect before and 19% after the unification. Decressin (2002) studied both stabilization and redistribution effects in Italy considering a broad measure of the national budget (as the one used in this paper) and found that the national budget absorbed 10%-15% of regional shocks and reduced 25%-35% of long-term disparities. Capó and Xisco (2002) found a stabilization effect of 10% and a redistribution effect of 25% in Spain. Arachi et al. (2010) also analyzed the case of Italy, including regional budgets, and found that the consolidated budget reduced regional disparities by 25% to 35% (as found by Decressin 2002) but amplified local cycles by 30% to 40%.⁷

Most papers try to identify the contribution of different types of expenditures or taxes to total effects. Bayoumi and Masson (1995) disaggregated redistribution and stabilization effects on personal income in the United States and identified the strongest impact from personal transfers (46% of the total effect), followed by federal taxes (30%), intergovernmental transfers (18%) and social security (5%). The authors performed the same factorization exercise in Canada and identified the strongest impact from intergovernmental transfers (56% of the total effect), followed by transfer payments to individuals (39%) and federal taxes (5%). Méltiz and Zumer (2002) confirmed the stabilizing and redistributive effects of tax instruments in these two countries, using personal income and gross geographic product as the measure of income. Decressin (2002) factorized the redistribution effect in Italy among consumer spending (49% of the total effect), investment (11%), subsidies

⁷ Some authors consider that the significant differences in results are due to different accounting methods adopted by the researcher (see Méltiz and Zumer 2002). Méltiz (2004) clarifies the effects of the selection criteria on the results: for example, a narrow (wide) measure of net transfers and a wide (narrow) measure of income will almost surely imply an under- (over-) estimation of results.

(3%), social welfare (22%) and taxes and contributions (15%). Tax revenues consistently contribute to redistribution or stabilization in developed countries. However, in Argentina tax collection not only does not contribute, but weakens the redistribution and stabilization role of national expenditures.

The redistribution and stabilization results for Argentina are relatively low in comparison with those found in the international literature, which applies to developed countries. The national government in these countries has an active role in executing strongly redistributive social expenditure (e.g., education and health). But provincial governments in Argentina are responsible for these social policies, while the national government is relegated to a secondary role through open-ended transfers.⁸ On the other hand, the Argentinean tax system tends to amplify regional disparities in the short and long terms, while in the above mentioned countries they contribute to the redistribution and stabilization effects. Finally, there is a relative specialization among instruments used by the national government: public expenditure both redistributes income and stabilizes provincial shocks; transfers are neutral; and the tax system amplifies both short-term and long-term differences among provincial products.⁹

All in all, this paper produces results in the same direction as found in the literature, but with a smaller magnitude: the “size” of redistribution is 5% and the “size” of stabilization is 10%. There is a sizable positive effect that comes from the execution of national expenditure (about 70% of the compound positive effect), with a small contribution of transfers (about 30% of the compound positive effect), but this is countered by the opposite effect from taxes. This behavior of taxes helps explain why the net effect is smaller in Argentina.

The paper is organized as follows. Section II presents the model and the data that we have used. Results are shown in Section III and Section IV. Section V concludes. Data sources and methodological issues are relegated to the Online Appendix.

⁸ Cont and Porto (2014) study the redistributive effect of the consolidated national-provincial budget on the regional and personal income distribution for year 2004. They find strong effects on personal income distribution at the provincial level. The link to this paper resides, again, in the fact that provinces are responsible for spending on education and health, which have a strong redistributive effect across groups of personal income distribution.

⁹ Considering the possibility that institutional framework and macroeconomic regimes may play an important part in these effects, we performed the redistribution and stabilization tests for two different sub-periods 1995-2001 and 2003-2010: in the first sub-period (characterized by large fiscal deficit) national fiscal policy is neutral in the redistribution dimension but stabilizes regional shocks; in the second sub-period (characterized by fiscal surplus) national fiscal policy redistributes income among provinces but is neutral in the stabilization dimension. Higher redistribution seems to take place in contexts of fiscal abundance. See Online Appendix.

II. Redistribution and stabilization effects

Argentina is a country characterized by strong structural and socioeconomic disparities among regions. To tackle regional disparities, the national government resorted to a wide variety of fiscal policies and institutional changes.¹⁰ At the same time, the objective of stabilization is also present in the federal fiscal policy. Provinces collect their own revenues, which are subject to the fluctuations of their local business cycles, and receive transfers from the national government, which are less exposed to idiosyncratic shocks. Moreover, national expenditure contains several components that are relatively rigid (social security, public employee compensations, national-wide subsidies, etc.). This way, the national budget is expected to smooth provincial incomes.

A. Theoretical framework

Consider a country with two equally populated regions (population normalized to one) and different per capita income. A central government collects income tax to finance a uniform per capita public spending g in both regions. The tax rate is t and the per capita national budget is given by

$$g = t y_N, \quad (1)$$

where y_N is the national per capita income and equals $(y_R + y_P)/2$; y_R and y_P are the per capita incomes before the fiscal policy in the rich and poor regions, respectively; and $y_R > y_N > y_P$. The *ex post* per capita income (y^*) in each province is

$$y_R^* = y_R + t (y_N - y_R), \quad (2)$$

$$y_P^* = y_P + t (y_N - y_P). \quad (3)$$

It is straightforward from (2) and (3) that the national budget automatically redistributes income from the rich region ($y_R^* < y_R$) to the poor region ($y_P^* > y_P$).

The national budget also compensates regional asymmetric shocks. Suppose the poor region faces a negative shock in per capita income of size Δy_P . The national income decreases by $\Delta y_P/2$, and (given a constant tax rate) the per capita public spending decreases by $\Delta g = t\Delta y_P/2$ in both regions. The change in the *ex post* incomes is

¹⁰ Regional redistribution was initially accepted by the richest provinces to achieve national unification, and was strengthened by the over representation of poor and under-populated provinces in the National Congress.

$$\Delta y_R^* = t\Delta y_P/2 < 0, \quad (4)$$

$$\Delta y_P^* = (1 - t/2) \Delta y_P < 0, \text{ but } > \Delta y_P. \quad (5)$$

The rich region pays the same taxes but receives lower spending ($t\Delta y_P/2$). The reduction in *ex post* income in the poor region, $(1-t)\Delta y_P$, is partially compensated by the proportionally smaller reduction in public spending, $t\Delta y_P/2$. Therefore, the national budget partially compensates an adverse shock by passing it through to other regions.

B. The model

In the literature on public finance, the redistribution effect includes public policies aimed at correcting income differentials among jurisdictions in the long term (equations 2-3) while the stabilization effect focuses on the correcting role of these policies on short-term shocks (equations 4-5). Some authors consider that these two effects are part of a similar short term-long term effect (Obstfeld and Peri 1998; Decressin 2002; Arachi et al. 2010, among others). In this sense, this paper uses the same terminology as in those papers.

Let X_{it} be the per capita Gross Geographic Product (GGP) of province i during year t before the execution of fiscal policy (X_{pt} is the *ex ante* per capita national GGP), and Y_{it} the per capita GGP of province i in year t after fiscal policy is executed (Y_{pt} is the *ex post* per capita national GGP). The difference $X_{it} - Y_{it}$ measures the impact of national fiscal policy on jurisdiction i 's per capita product. All provincial variables are defined in relation to the corresponding national variable as follows:

$$x_{it} = \frac{X_{it}}{X_{pt}}; \quad y_{it} = \frac{Y_{it}}{Y_{pt}}.$$

The redistribution effect of the national budget on the geographic product is estimated following two approaches (see Von Hagen 1992, modified by Arachi et al. 2010). The first approach corresponds to the following equation:

$$\bar{y}_i = \alpha + \beta \bar{x}_i + \eta_i, \quad (6)$$

where the bar represents the time average of the variable. The subscript i corresponds to the 24 jurisdictions. The second approach is deduced from the following equation

$$\tilde{y}_{it} = \alpha + \beta \tilde{x}_{it} + \eta_{it}, \quad (7)$$

where regional averages (\bar{x} and \bar{y}) are replaced by regional trends (defined as \tilde{x} and \tilde{y}), which are calculated through the Hodrick-Prescott filter (notice that regional trends in a province are series rather than numbers).¹¹ In a country with high volatility as Argentina averages could be a misleading point of comparison, making averages and trends across the entire period contrast strongly.¹²

The stabilization effect of the national budget is approached through three different equations:

$$\Delta y_{it} = \theta_i + \gamma \Delta x_{it} + \varepsilon_{it}, \quad (8)$$

$$\Delta \bar{y}_{it} = \theta_i + \gamma \Delta \bar{x}_{it} + \varepsilon_{it}, \quad (9)$$

$$\Delta \tilde{y}_{it} = \theta_i + \gamma \Delta \tilde{x}_{it} + \varepsilon_{it}, \quad (10)$$

where the term Δ is the difference of the (ex ante or ex post) per capita GGP with respect to the corresponding previous period (i.e., time difference) in equation (8), the sample average (i.e., average difference) in equation (9), or the trend value (i.e., trend difference) in equation (10).

The coefficient $1 - \beta$ captures the redistribution effect. For example, a coefficient $\beta = 0.8$ indicates that 80% of the *ex ante* difference in per capita GGP remains after taking into account the fiscal policy. This means that the federal government redistributes 20 cents of the difference among richer and poorer regions. A coefficient $\beta = 1$ means no redistribution, while $\beta > 1$ implies that fiscal policy amplifies income disparities. Similarly, the coefficient $1 - \gamma$ captures the stabilization effect.¹³

C. Data

This paper analyses the execution of the national budget across provinces in Argentina. In order to be consistent between the policy and income variables and avoid overestimation or underestimation of fiscal policy on income, the paper adopts a broad measure of redistribution and stabilization, and consequently a broad measure

¹¹ The redistribution and stabilization equations are estimated using the trend values rather than the raw series.

¹² Because of limited space, we don't show here the figures of Neuquén and CABA, where averages and trends diverge downward and upward, respectively. They are available upon request.

¹³ Mélitz and Zumer (2002) state that if $\theta_i = 0$ in equation (9), then equations (9) and (6) are subsumed into the equation $y_{it} = \alpha + \beta \bar{x}_i + \gamma_2 (x_{it} - \bar{x}_i) + \xi_{it}$, where $1 - \beta$ still captures the redistribution effect, while $1 - \gamma_2$ captures the stabilization effect. This paper estimates the three alternative versions of the stabilization effect, i.e., equations (8) to (10), without imposing constraints on coefficients (i.e., adding province fixed effect that controls for local heterogeneities).

of “income” that is provincial per capita GGP (Mélitz and Zumer 2002, Deccassin 2002).¹⁴ All current values are converted to constant values (2010 pesos) using provincial GGP deflators.

GGP includes goods (and revenues) produced within the provincial territory, as well as payments made by the national government to public employees in a given jurisdiction (as the financial retribution for the real contribution by productive factors). We assume that those factors would migrate to other activities if they were not employed by the national government.

Besides the direct effect on GGP, national expenditure produces additional consumption to households: for example, a teacher earns a wage for her activity (included in the GGP) but also benefits students who go to class (additional benefit); the budget allocated to a hospital located in a province corresponds to factor payments (included in the GGP) but also benefits users of the public health system, possibly located in another jurisdiction; expenditures on national defense in a jurisdiction may benefit all population. Moreover, elder population benefits from social security, which is not included as GGP. Therefore, national expenditure is allocated among provinces following a benefit principle (as usual in the literature, we eliminate public debt interests paid by the national government, given its complex allocation mechanism among provinces). On the other hand, we add all (“automatic”) transfers to provinces, which are used by them to finance provincial expenditures (education, health, etc.).¹⁵ Finally, since provincial GGP is gross of taxes, we proceed to subtract all taxes that affect provincial product, following a geographic incidence principle.

Figure 1 shows a ranking of the provinces with a double classification: provinces are classified into four groups labeled Advanced, Intermediate, Low Density and Lagged (as shown in Table A1);¹⁶ then they are ordered according to the per capita

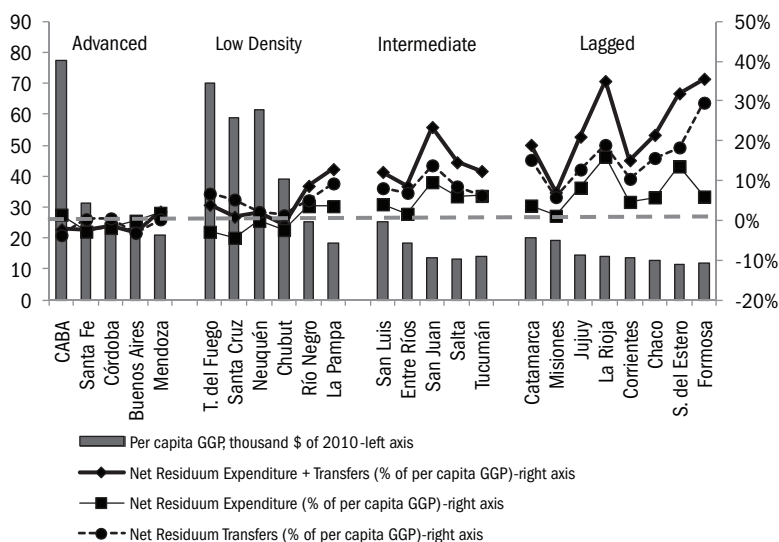
¹⁴ A second issue to be raised has to do with the concept of income vs. product. A share of the product in a province may correspond to income from people living in other provinces, while some personal income of a household living in a province may be computed as the product produced in another province. A major problem in Argentina has to do with the product and the income generated in the city of Buenos Aires vs. the province of Buenos Aires, and also in other provinces. Since we do not know a definite sign for possible bias, we choose the product variable.

¹⁵ Automatic transfers to provinces are currently conformed by resources from revenue-sharing regimes (co-participation, education fund, services transfers, and a regional compensating fund); resources to fund social security systems (a percentage of VAT and personal assets); road, electricity infrastructure and housing funds (collected from taxes on liquid combustibles); a percentage of income tax destined to social works and the Conurbano Fund; specific funds (collected from taxes on personal assets and the *monotributo*); and electricity fund.

¹⁶ These groups are composed of provinces with similar economic and social development according to the methodology of Núñez Miñana (1972). The City of Buenos Aires and the provinces of Buenos Aires, Córdoba, Mendoza and Santa Fe belong to the group of Advanced Jurisdictions. Entre Ríos, Salta, San Juan, San Luis and Tucumán belong to the

GDP within each group. Figure 1 also shows the relationship between the per capita provincial GGP and the net residuum.¹⁷ The net balance (fiscal residuum), which is the difference between the expenditures allocated to a province under the benefit principle and taxes collected from a province under the incidence principle, is added to the *ex ante* per capita GGP to obtain the *ex post* (or *extended*) per capita GGP and hence assess the redistribution and the stabilization effects of the national budget. Figure 1 shows that, in the execution of the full national budget (expenditures and transfers), three jurisdictions with above-average product are net beneficiaries (Tierra del Fuego, Santa Cruz and Neuquén), while the other three are net contributors

Figure 1. Per capita GGP and net residuum



Note: the figure shows three definitions of net residuum: national budget (thick solid line), expenditure (thin solid line) and transfers (dotted line). Indicators averaged over 1995-2010.

group of Intermediate Jurisdictions. Chubut, La Pampa, Neuquén, Río Negro, Santa Cruz and Tierra del Fuego belong to the group of Low Density Jurisdictions. Catamarca, Chaco, Corrientes, Formosa, Jujuy, La Rioja, Misiones and Santiago del Estero belong to the group of Lagged Jurisdictions. This classification was used in the Revenue Sharing Law 20.221 of year 1973 and has been in operation ever since, with slightly modifications, to determine horizontal redistribution among provinces. See also footnote 26.

¹⁷ We present three measures of fiscal residua, depending on the execution of the national budget (thick solid line), expenditure (thin solid line) or transfers (dotted line). The dashed line corresponds to the average net fiscal residuum for the whole period (0.8% of GDP per capita in the case of the national budget), which practically coincides with the line of per capita national GGP (2010 \$ 27,392). See details in the Online Appendix.

(Santa Fe, Chubut and CABA). Two jurisdictions belonging to the Advanced group but with below-average incomes (Buenos Aires and Córdoba) are also net contributors. All Intermediate and Low Density provinces, are net beneficiaries.

Considering only the expenditure dimension, we find that CABA and Mendoza (Advanced), Río Negro and La Pampa (Low Density), together with all Intermediate and Lagged provinces, are net beneficiaries, financed by the rest of the provinces. Finally, the execution of transfers –*coparticipation* and others– has implied redistribution from CABA and Buenos Aires to other provinces.

This preliminary exploration allows us to cast doubts on the direction, or at least magnitude, of the redistribution effect by either the budget or its components (expenditures or transfers).

III. Results

We assess the redistribution and stabilization effects of national fiscal policy on regional distribution of income for the period 1995-2010 by running the following exercises, based on different definitions of expenditure-revenues:

- Exercise 1: National budget (national expenditure, transfers to provinces and corresponding revenues, excluding debt services).
- Exercise 2: National expenditure (with corresponding revenues).
 - Exercise 2.a: Expenditure on social services (total revenues to finance national expenditures are adjusted proportionally).
 - Exercise 2.b: Expenditure on social and economic services (total revenues to finance national expenditures are adjusted proportionally).
- Exercise 3: Automatic national transfers (with corresponding revenues).¹⁸

Regression results are presented in Table 1.¹⁹ The left panel shows estimations corresponding to the redistribution effect. The column that presents the results of

¹⁸ A referee suggested that we run the exercise including discretionary transfers. Searching other data bases, specifically provincial budgets (which is not the subject of analysis of this paper), we found that there have been significant discretionary transfers that finance provincial budgets during the last decade (including the last five years of our sample). Besides the complications of merging data bases (national and provincial), we made certain assumptions on the taxes that finance them, which are similar to those that finance national expenditures. The main result is that the nature of these transfers is different from the other expenditures considered in the paper, at least in the redistributive dimension: discretionary transfers, as they are commonly defined, do not reduce the provincial GGP heterogeneities (on the contrary, they seem to slightly increase local disparities by 1%) and they neither reduce nor amplify the impact of idiosyncratic shocks to provinces (i.e., they do not stabilize shocks). Full results are available upon request.

¹⁹ We repeated Exercises 1 through 3 using figures in current value, but do not report them because they do not differ significantly.

equation (6) uses average values of per capita GGP, and corresponds to the methodology followed by Bayoumi and Masson (1995) and Decressin (2002). The column that presents the results of equation (7) uses trends in per capita GGP, and corresponds to the methodology applied by Arachi et al. (2010). In both cases, the redistribution coefficient is less than one for the implementation of the national budget and the expenditure side (including partial scenarios of spending in social and economic services), but it is not statistically different from one in the case of transfers to provinces. This evidence indicates that the concern for redistribution as an objective of fiscal policy works through public expenditures (although the effect of 5% is relatively small) rather than transfers (which have constitutional rank to perform this task).

The right panel shows estimations for the stabilization effect for the 1995-2010 period. The column related to equation (8) is based on the first differences of GGP and the column related to equation (10) is based on trend differences in GGP. Results from equation (9), which is estimated on mean differences in GGP, are less reliable because of the differences between mean values and trends. Nevertheless, they are also presented in Table 1.

The execution of the national budget, as well as its breakdown among various components of expenditure, has a role in stabilizing provincial cycles, with a magnitude of approximately 10%. However, transfers have no statistically significant stabilization effect. Within public expenditures, the social service component accounts for 90% of the aggregate effect while the economic service component can be either stabilizing or destabilizing with a marginal impact.²⁰

In sum, results from Table 1 indicate that the national government uses the expenditure component of the budget to smooth provincial shocks and redistribute revenues among provinces, while the transfer component is a rigid tool to perform these tasks.

Figure 2 shows the change in provincial per capita GGP relative to the country average due to the full execution of the national budget (expenditure plus transfers and their corresponding resources). *Ex post* per capita GGP can be higher (in which case the jurisdiction benefits from redistribution) or lower than *ex ante* per capita

²⁰ Results from equation (9), which are based on mean differences, differ from those presented in equations (8) and (10). The execution of transfers (and its resources) amplifies provincial differences in GGP while public expenditure and its financing are neutral. These contrasting results are already present in Arachi et al. (2010), although their results are opposite to ours. GGP series in Italy have trends, which imply that a mean difference distorts the cyclical effects. In either case, we present the results of equation (9) in Table 1 and highlight the possible bias created by measuring local cycles through mean differences, rather than first differences or trend differences (equations 8 or 10, respectively).

Table 1. Redistribution and stabilization effects of fiscal policy

Measure	Redistribution			Stabilization					
	1995-2010			1995-2010		1999-2010: synchronization (GGP, Total Transfers)			
	Eq. (6)	Eq. (7)	Eq. (8)	Eq. (9)	Eq. (10)	Eq. (8)	Eq. (9)	Eq. (10)	Eq. (10)
1. National Expenditure + Transfers	Coefficient	0.950**	0.952***	0.910*	1.032	0.891**	0.842**	1.045	0.934
	s.e.	(0.020)	(0.006)	(0.051)	(0.021)	(0.038)	(0.076)	(0.076)	(0.092)
	Interaction						0.065	-0.051	-0.055
	s.e.						(0.098)	(0.081)	(0.106)
	N	24	384	360	384	384	288	288	288
Adj. R ²	0.989	0.987	0.84	0.935	0.806	0.889	0.953	0.891	0.891
2. National Expenditure	Coefficient	0.961*	0.963***	0.921**	1.003	0.911**	0.899*	1.083	0.966
	s.e.	(0.020)	(0.006)	(0.039)	(0.021)	(0.028)	(0.060)	(0.058)	(0.051)
	Interaction						0.009	-0.123*	-0.073
	s.e.						(0.079)	(0.064)	(0.063)
	N	24	384	360	384	384	288	288	288
Adj. R ²	0.997	0.996	0.861	0.941	0.824	0.902	0.968	0.921	0.921
2.a. Social Services	Coefficient	0.960**	0.961***	0.925**	0.991	0.922***	0.901**	1.015	0.963
	s.e.	(0.019)	(0.005)	(0.031)	(0.016)	(0.022)	(0.045)	(0.036)	(0.039)
	Interaction						0.015	-0.052	-0.054
	s.e.						(0.059)	(0.041)	(0.047)
	N	24	384	360	384	384	288	288	288
Adj. R ²	0.998	0.997	0.895	0.961	0.866	0.931	0.982	0.947	0.947

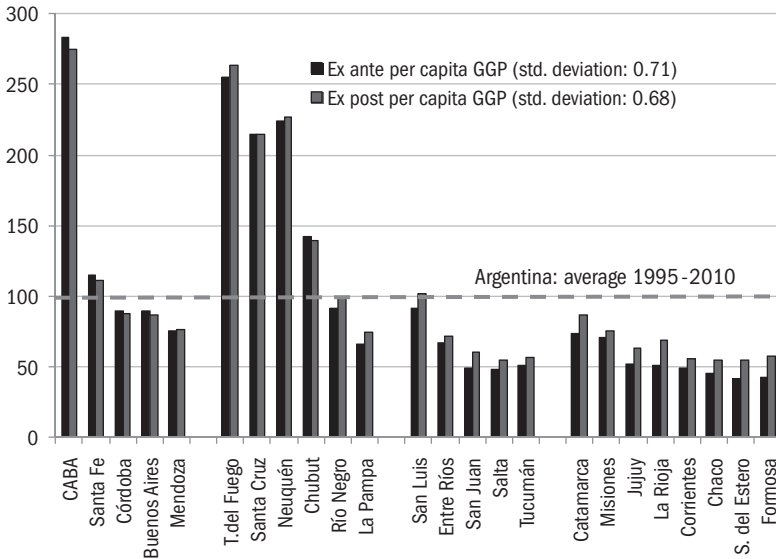
Table 1. (continued) Redistribution and stabilization effects of fiscal policy

Measure	Redistribution			Stabilization					
	1995-2010			1995-2010		1999-2010: synchronization (GGP, Total Transfers)			
	Eq. (6)	Eq. (7)	Eq. (7)	Eq. (8)	Eq. (9)	Eq. (8)	Eq. (9)	Eq. (10)	Eq. (10)
2.b. Social + Economic Services	Coefficient	0.963*	0.965***	0.934**	0.998	0.916**	0.902*	1.063	0.965
	s.e.	(0.018)	(0.005)	(0.035)	(0.018)	(0.025)	(0.052)	(0.052)	(0.045)
	Interaction						0.012	-0.103*	-0.063
	s.e.						(0.068)	(0.057)	(0.054)
	N	24	384	360	384	384	288	288	288
Adj. R ²	0.997	0.997	0.875	0.954	0.859	0.923	0.976	0.939	0.939
3. Transfers	Coefficient	0.988	0.990	0.989	1.031***	0.979	0.933***	0.966	0.965
	s.e.	(0.037)	(0.009)	(0.018)	(0.007)	(0.018)	(0.022)	(0.028)	(0.041)
	Interaction						0.066**	0.070**	0.021
	s.e.						(0.028)	(0.029)	(0.047)
	N	24	384	360	384	384	288	288	288
Adj. R ²	0.992	0.992	0.979	0.991	0.975	0.982	0.990	0.979	0.979

Notes: all panel data cases (stabilization equations) include fixed effect by province, which controls for local heterogeneities. Asterisks accompanying coefficients correspond to the significance of the test β or $\gamma \neq 1$: *** significant at 1%, ** significant at 5%, * significant at 10%. Robust standard errors (s.e.) in parenthesis. The term "interaction" is the product between the independent variable and a dummy variable that measures the synchronization between national and local cycles (taking a value equal to 1 if correlation is positive).

GDP (in which case the jurisdiction contributes to redistribution). All provinces but Mendoza within the Advanced group are net contributors; all provinces but Chubut within the Low Density group are net beneficiaries; and all Intermediate and Lagged jurisdictions are clearly net beneficiaries. In the aggregate, the standard deviation of provincial per capita GDP decreases from 0.71 to 0.68. This makes clear the reason for a small redistributive effect of the national budget: resources flow from Advanced jurisdictions –many of them with per capita GDP below the national average– to Intermediate and Lagged provinces (fulfilling the redistribution goal) but also to Low Density ones –many of them with income fairly over the national average.²¹

Figure 2. Index of ex ante and ex post per capita GDP



Note: index of GDP per capita is relative to country average = 100.

²¹ Some authors worry about the blurred lines between the city of Buenos Aires and the province of Buenos Aires (Convenio 1996, 2001, Mueller and De Raco 2010) because separating them might induce bias in results. The justification lies in the fact that many workers commute within the Greater Buenos Aires (which concentrates more than 60% of population in the province) and the capital city. In this context, the allocation of incomes, taxes and expenditures between these two jurisdictions may have so unclear effects that it may be wiser to merge them into one provincial unit. We repeat the redistribution exercise in 23 jurisdictions. However, following this path does not add significant results to this paper. Tables are available upon request.

There may be a concern regarding a possible heterogeneity in the smoothing of national budget across provinces (winners and losers). In order to tackle this concern, we study whether stabilization is larger in provinces with less synchronization between their local business cycle and the national business cycle (i.e., cycles are correlated negatively). We followed the methodology used in Vegh and Vuletin (2015) to construct a correlation measure that captures the synchronization between own provincial sources of revenue (proxied by provincial GGP) and external ones (proxied by unconditional automatic transfers).²² We use a 5-year rolling window to get time-varying correlation across provinces between the cyclical components of provincial GGP (local cycle) and fiscal transfers (external cycle). Once we have a measure for synchronization, we construct a dummy that equals 1 if the correlation between own and external cycles is positive and 0 otherwise.²³ We find that the ability of national budget to smooth local cycles is larger in provinces with less synchronized cycles, but coefficients are only significant for transfers (as we may expect, by the construction of the correlation measure). Equations (8) and (10) in Table 1 (period 1999-2010, including Synchronization) show that the stabilization effect of national transfers is between 4% and 7% if the correlation is negative and almost null if the correlation is positive. La Pampa, Catamarca, Santiago del Estero and CABA are the provinces with less-synchronized cycles; they benefit the most from the stabilization point of view of transfers. On the other hand, the stabilization function of transfers is weak in Buenos Aires, Tierra del Fuego, Formosa and San Juan (they are the provinces with highest synchronization). Notice also a somewhat counterbalance effect from national expenditure: the 10% stabilization effect found in the paper becomes a 4%-10% effect, depending on the configuration of the data (i.e., equation 8 or 10), in provinces with negatively correlated cycles. Table 1 (full period excluding synchronization) shows that expenditures smooth local cycles while transfers do not smooth them at the aggregate effect. Therefore, not considering different realities in relative local cycles has a consequence in hiding a stabilization effect from transfers, albeit partially compensated by a lower stabilization effect from expenditures in provinces with less synchronized cycles (result not measured by Vegh and Vuletin 2015).

²² As our focus here is on stabilization, synchronization is defined as the correlation between the cyclical component of GGP and fiscal transfer. We thank an anonymous referee for the suggestion to extend the analysis of winners and losers to the stabilization function.

²³ Because of the rolling window, we lose data for 1995-1998. Therefore, we replicated Table 1 for the sub-period 1999-2010 and found that results are very similar to those for the period 1995-2010 (tables are available upon request).

IV. Disentangling the role of national expenditures, taxes and intergovernmental transfers

The exercises performed in the previous section correspond to the implementation of the national budget on an accrual basis. This section presents two simulation exercises to help us identify the role of expenditure and transfers *vis-à-vis* tax resources on redistribution and stabilization effects.

The first exercise simulates two alternatives for expenditures and transfers while allocating taxes according to the budget:

- Exercise 4a: neutral allocation of expenditures and transfers. Expenditures plus transfers are allocated among jurisdictions depending on their share of GGP.
- Exercise 4b: per capita allocation of expenditures and transfers.²⁴

The second exercise simulates two alternatives for taxes while allocating expenditures and transfers according to the budget:

- Exercise 5a: neutral allocation of taxes, i.e., depending on their share on GGP.
- Exercise 5b: per capita allocation of taxes.

Table 2 summarizes the results. Assuming a neutral allocation of expenditures and transfers (as percentage of GGP), fiscal policy amplifies long-term differences in GGP and also tends to destabilize local cycles. Both effects are estimated at 10%. Instead, assuming a per capita allocation of expenditures and transfers, which implicitly imposes a regional redistributive pattern that depends on the differences between population and per capita GGP, fiscal policy redistributes income and stabilizes cycles, with estimated effects of 10%. The actual execution of the fiscal budget provides intermediate effects between these two.

Assuming a neutral tax system (as percentage of GGP), fiscal policy shows a stronger effect on both redistribution (15%) and stabilization (20%). Instead, assuming a per capita tax system, which implicitly imposes a regional redistributive pattern that depends on the differences between population and per capita GGP, fiscal policy amplifies regional differences but stabilizes (rather weakly) local cycles. Again, the actual execution of the fiscal budget provides intermediate results.

Taking both simulations together, we can assess the individual contribution of the revenue side and expenditure sides (see Table 3). The redistribution effect of the national budget (estimated at 5%) is the result of a strong effect from expenditure

²⁴ Not only there are theoretical motivations for this second exercise of per capita allocation of expenditures but also practical ones: Decressin (2002) states that the Italian government exerts transfers to ensure a relatively uniform per capita expenditure.

Table 2. Redistribution and stabilization: simulations

Measure	Redistribution			Stabilization		
	Eq. (6)	Eq. (7)	Eq. (10)	Eq. (8)	Eq. (9)	Eq. (10)
1. National Expenditure + Transfers	0.950** (0.020)	0.952*** (0.006)	0.891** (0.038)	0.910* (0.051)	1.032 (0.021)	0.891** (0.038)
s.e.						
N	24	384	384	360	384	384
adj. R ²	0.989	0.987	0.806	0.840	0.935	0.806
Real revenues - Simulation of expenditures						
4.a. Simulation: E+T % GGP	1.102*** (0.010)	1.103*** (0.005)	1.099*** (0.020)	1.106*** (0.019)	1.136*** (0.024)	1.099*** (0.020)
s.e.						
N	24	384	384	360	384	384
adj. R ²	0.998	0.997	0.957	0.955	0.954	0.957
4.b. Simulation: E+T per capita	0.896*** (0.009)	0.899*** (0.003)	0.905*** (0.020)	0.911** (0.025)	0.985 (0.016)	0.905*** (0.020)
s.e.						
N	24	384	384	360	384	384
adj. R ²	0.998	0.997	0.947	0.952	0.970	0.947
Real expenditures - Simulation of revenues						
5.a. Simulation: Revenues % GGP	0.848*** (0.026)	0.850*** (0.007)	0.792*** (0.032)	0.804*** (0.047)	0.895*** (0.025)	0.792*** (0.032)
s.e.						
N	24	384	384	360	384	384
adj. R ²	0.982	0.979	0.794	0.823	0.884	0.794

Table 2. (continued) Redistribution and stabilization: simulations

Measure	Redistribution			Stabilization		
	Eq. (6)	Eq. (7)	Eq. (8)	Eq. (9)	Eq. (10)	
Only expenditure						
Coefficient	0.888***	0.889***	0.866***	0.919***	0.861***	
s.e.	(0.012)	(0.004)	(0.035)	(0.020)	(0.022)	
N	24	384	360	384	384	
adj. R ²	0.996	0.995	0.861	0.932	0.826	
Only transfers						
Coefficient	0.959	0.960***	0.936**	0.977**	0.929***	
s.e.	(0.036)	(0.009)	(0.020)	(0.009)	(0.017)	
N	24	384	360	384	384	
adj. R ²	0.992	0.991	0.975	0.984	0.971	
5.b. Simulation:						
Revenues per capita						
Coefficient	1.044*	1.044***	0.947	1.014	0.939*	
s.e.	(0.024)	(0.006)	(0.047)	(0.015)	(0.032)	
N	24	384	360	384	384	
adj. R ²	0.992	0.992	0.874	0.968	0.85	

Notes: all panel data cases (stabilization equations) include fixed effect by province, which controls for local heterogeneities. Asterisks accompanying coefficients correspond to the significance of the test β or γ : 1: *** significant at 1%, ** significant at 5%, * significant at 10%. Robust standard errors (s.e.) in parenthesis.

plus transfers (15%), which more than compensates the amplifying effect of the tax system (-10%). We disentangled the total effect of the redistributive policies in size (incidence) and progressivity. We followed the methodology proposed by Reynolds and Smolensky (1977), taking each province as an income-unit within Argentina. For the averages 1995-2001 y 2003-2010 the results are shown in Table 4: the size effect of expenditures is approximately 2.46-2.45 times the size effect of transfers; but transfers are more progressive (2.76-2.35 times) than expenditures. On the other hand, the size effect of taxes that finance expenditures is 2.07-2.53 times, while the regressive effect is 1.34-1.13 times, the effect of taxes that finance transfers.

The stabilization effect of the national budget (estimated at 10%) is the result of a strong stabilizing effect of expenditure-transfers (20%), which more than compensates the destabilizing effect of the tax system (-10 %).

A distinctive feature of federal fiscal systems is the level of government responsibility for the provision of social expenditure (mainly education and health) because it has direct consequences on the level of regional redistribution that can be captured by the national budget. In countries like Italy, France, the UK and Canada (only health in this case), the provision of most social expenditure is centralized, but in Argentina it is decentralized at the provincial level.²⁵ A significant share of revenues to finance such expenditures, however, corresponds to national transfers. But these funds typically correspond to open-ended coparticipation and general transfers, which usually are spent at the province's discretion.

We found in section III that the spending side (expenditure plus transfers) has strong redistributive (15%) and stabilizing (20%) effects that more than offset the opposite effect of the tax system (-10% each). The redistributive and stabilizing effects of the spending dimension are present in Italy (Decressin 2002) and the US and Canada (Bayoumi and Masson 1995, and Mélitz and Zumer 2002). However, while the tax system also contributes to these effects in the aforementioned countries, it amplifies

Table 3. Decomposition of redistribution and stabilization effects

	Redistribution	Stabilization	Exercise
Accrued budget	5%	10%	1
Accrued expenditure + transfers (revenues as % of GGP)	15%	20%	5a
- Expenditure	11%	14%	5a
- Transfers	4%	6%	
Accrued revenues (expenditure + transfers as % of GGP)	-10%	-10%	4a

²⁵ Education and health expenditures in the US are also provided at the state level.

regional differences and amplifies cycles in Argentina. Then, the regressive tax system is the most important factor to explain the quantitative differences in national redistribution and stabilization between Argentina and developed countries.

The explanation for the weak redistributive effect found in this study lies on the way fiscal federalism works in Argentina. Due to historical institutions and negotiations, nowadays it is the case that provinces with high per capita GGP are net beneficiaries while others with per capita GGP below the national average are net contributors (see Figure 2).²⁶ The absence of horizontal redistribution (from regions with the highest per capita GGP to regions with lower per capita GGP) comes from the redistribution mechanism (coparticipation) in effect in Argentina,

Table 4. Progressivity and size of expenditures, transfers and taxes

	1995-2001	2003-2010	% change
Gini ex ante	0.259	0.256	-1%
Kg(G)	0.160	0.186	16%
g(G)	0.140	0.157	12%
Kg(T)	0.441	0.440	0%
g(T)	0.057	0.064	12%
Kt(IG)	-0.134	-0.128	-5%
t(IG)	0.116	0.162	40%
Kt(IT)	-0.100	-0.113	12%
t(IT)	0.056	0.064	15%
Gini ep (G+T)	0.233	0.227	-3%
RS (G+T)	-0.026	-0.029	11%

Definitions: "Gini ex ante" measures the inequality of regional income when the country is divided into 24 provincial jurisdictions Kg(G) measures progressivity of expenditure g(G) measures expenditure size (or incidence) Kg(T) measures progressivity of transfers g(T) measures transfers size (or incidence) Kt(IG) measures progressivity of taxes that finance expenditures t(IG) measures size of taxes that finance expenditures Kt(IT) measures progressivity of taxes that finance transfers t(IT) measures size of taxes that finance transfers Gini ep (G+T) measures ex post inequality of regional income after the execution of fiscal policy. RS (G+T) is the Reynolds Smolensky coefficient corresponding to the budget execution (without considering reranking).

²⁶ For example, when Law 20.221/73 of Revenue Sharing was enacted, resources were distributed among provinces according to three weights: population (65%), development gaps (25%) and population dispersion (10%). The development gap was calculated with data from years 1960 and 1970 covering indicators related to household quality, automobiles and education of human resources. An index was built in which the most developed regions (CABA and Buenos Aires) received a 100, and other provinces received an index below 100, reflecting the gap in the selected indicators. When this index was recalculated in 1980 and 1991 censuses, Buenos Aires was no longer the most developed province, being overcome by La Pampa, Córdoba and Santa Fe in 1991. Moreover, the only province with slight or null growth in the development index was Buenos Aires, while other jurisdictions improved significantly. However, Buenos Aires continued being considered as one of the most developed jurisdictions for co-participation purposes.

which transfers resources from some “advanced” jurisdictions (mainly the provinces of Buenos Aires, Córdoba and Santa Fe, which do not necessarily have the highest GDP per capita) to other jurisdictions, including the low-density, high-per capita GGP ones.

V. Conclusions

This paper analyses the redistribution and stabilization effects of national fiscal policy on provincial economic activity. We follow a regional benefit principle for national expenditure (excluding interest on national debt) and a regional tax incidence principle for national taxes.

The main result is that national fiscal policy reduces asymmetries in the provincial per capita GGP by 5% and reduces provincial cycles by 10%. We conclude that there is a relative specialization among the instruments used by the national government: public expenditure both redistributes income and stabilizes provincial shocks; transfers are neutral (which have constitutional rank to perform this task); and the tax system amplifies both short-term and long-term differences among provinces. Furthermore, the small magnitude of the redistribution effect is due to the mechanism of regional transfers, which heavily focuses on the provinces as net financiers that have an income per capita below the country average, even though they lost their “rich-province” status a long time ago, while at the same time it benefits high-income low-density provinces. However, a modification in the source of funds that is based on GGP may not have a redistributive impact as switching low-density jurisdictions to net beneficiaries will not contribute a significant amount of resources. Instead, changes in the destination of funds, especially by way of national expenditure and with special care on the geographic destination, could have greater redistributive impact. On the stabilization side, the effect is heterogeneous across provinces due to different synchronization between national and provincial cycles; specifically, the ability of national budget to smooth local products is stronger in provinces with negatively correlated cycles.

The redistribution and stabilization results for Argentina are relatively low in comparison with those found in the international literature, which applies to developed countries (mainly Italy, France, the US, UK and Canada). The Argentinean tax system tends to amplify regional disparities in the short and long terms, while in the above mentioned countries they contribute to the redistribution and stabilization effects. Regressive tax system is the most important component to explain the quantitative difference between Argentina and developed countries. The national

government in developed countries has an active role in executing strongly redistributive social expenditure (e.g., education and health). But provincial governments in Argentina are responsible for these social policies, while the national government is relegated to a secondary role through open-ended transfers. Even with this difference in the institutional design, the spending dimension of the budget has strong redistributive and stabilizer effects in Argentina just as in developed countries.

Appendix

Table A1. Argentina: regional indicators, year 2010

Jurisdiction	Surface (sq km)	Population ('000)	Population density (pop./sq km)	GGP (million USD)	Per capita GGP ('000 USD)	HDI [2011]	UBN
A Buenos Aires	307,571	15,316	49.8	130,332	8,510	0.84	8%
A City Bs As (CABA)	200	3,058	15,291.50	84,128	27,508	0.89	6%
A Córdoba	165,321	3,397	20.5	26,671	7,852	0.86	6%
A Mendoza	148,827	1,766	11.9	12,282	6,956	0.85	8%
A Santa Fe	133,007	3,285	24.7	32,966	10,035	0.85	6%
A Advanced	754,926	26,822	35.5	286,379	10,677	0.85	7%
I Entre Ríos	78,781	1,282	16.3	7,861	6,132	0.84	8%
I Salta	155,488	1,267	8.2	5,006	3,950	0.83	19%
I San Juan	89,651	715	8	3,293	4,605	0.83	10%
I San Luis	76,748	457	6	3,020	6,611	0.83	8%
I Tucumán	22,524	1,512	67.1	6,615	4,377	0.84	13%
I Intermediate	423,192	5,233	12.4	25,794	4,929	0.84	12%
LD Chubut	224,686	471	2.1	5,854	12,436	0.85	8%
LD La Pampa	143,440	341	2.4	1,823	5,338	0.86	4%
LD Neuquén	94,078	565	6	7,780	13,764	0.86	10%
LD Río Negro	203,013	604	3	4,790	7,933	0.85	9%
LD Santa Cruz	243,943	234	1	3,767	16,092	0.87	8%
LD Tierra del Fuego	21,571	134	6.2	2,551	19,081	0.88	14%
LD Low Density	930,731	2,349	2.5	26,565	11,309	0.86	9%
L Catamarca	102,602	404	3.9	3,253	8,047	0.84	11%

Table A1. (continued) Argentina: regional indicators, year 2010

Jurisdiction	Surface (sq km)	Population ('000)	Population density (pop./sq km)	GGP (million USD)	Per capita GGP ('000 USD)	HDI [2011]	UBN
L Chaco	99,633	1,071	10.8	4,117	3,844	0.81	18%
L Corrientes	88,199	1,036	11.7	4,259	4,112	0.83	15%
L Formosa	72,066	556	7.7	1,919	3,453	0.81	20%
L Jujuy	53,219	698	13.1	3,089	4,422	0.83	15%
L La Rioja	89,680	355	4	1,526	4,294	0.83	12%
L Misiones	29,801	1,111	37.3	7,402	6,660	0.82	16%
L Santiago del Estero	136,351	884	6.5	3,340	3,781	0.81	18%
L Lagged	671,551	6,116	9.1	28,905	4,726	0.82	16%
Argentina (std. deviation)	2,780,400	40,519	14.6	367,643	9,073	0.85	9%
					0.64	0.03	0.51

Source: own elaboration based on INDEC Argentina (surface, population and Unsatisfied Basic Needs – UBN) and United Nations (Human Development Index – HDI). See details on Gross Geographical Product (GGP) in the Online Appendix. Note: A: Advanced I; Intermediate I; Low Density I; Lagged.

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