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Cities, Territories, and Inclusive Growth: Unraveling Urban–Rural Linkages in Chile, Colombia, and Mexico

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Summary. — We explore the effects of the growing urbanization of rural areas in Chile, Colombia, and Mexico and investigate whether the presence of small- and medium-sized cities within rural–urban territories enhances economic growth and reduces poverty and income inequality compared to deep-rural and metropolitan territories. For Chile and Colombia, our results suggest that these urban centers can make a greater contribution to the rate of economic growth and poverty reduction in rural–urban territories compared to deep-rural ones, but in some cases with a rise in income inequality. The mechanisms through which urban centers affect the dynamics of territorial development are country-specific.

Key words — Latin America, Chile, Colombia, Mexico, Territorial Development, rural–urban linkages

1. INTRODUCTION

Latin America is an urbanized region, where more than three quarters of the population live in cities (UN, 2002). Small- and medium-sized cities are gaining importance as hubs of economic growth and are home to a substantial proportion of the total population. Half of the urban dwellers in the region live in cities of less than 100,000 inhabitants (CELADE-CEPAL, 2008; UN, 2002). Moreover, small- and medium-sized cities are more important in terms of both the rate and depth of poverty; only a minority of the poor live in large cities or metropolitan regions, even in countries such as Brazil and Mexico (Ferré, Ferreira, & Lanjouw, 2012).

These small- and medium-sized cities articulate territorial spaces in which there are strong rural–urban economic and social interdependencies (Tacoli, 1998), becoming important factors in territorial development dynamics. However, despite their increasing importance, intermediate cities are still (to paraphrase Christiaensen & Todo, 2013) a "missing middle" and there is lack of quantitative studies that would allow a broader assessment of their importance in terms of development and policy making, regarding their links with rural areas. [1]

In this paper, we consider functional territorial spaces as being of three types: (a) *deep rural territories* that lack even a small urban nucleus; (b) *rural–urban territories* characterized by a small- to medium-sized urban core and a rural hinterland; and (c) *metropolitan territories* formed around large cities.

In developed countries it is a well-established fact that urban centers are engines of regional growth (Partridge, Olfert, & Alasia, 2007; Wu & Gopinath, 2008). Recent studies indicate that countries that have more dispersed urbanization patterns with several urban centers of intermediate size tend to show greater poverty reduction than those with a greater concentration of the population and of economic activity in a few large cities (Christiaensen & Todo, 2013). However, little is known about the type of development dynamics that cities of different sizes may stimulate in the surrounding territories. To identify whether there is a difference in the effects, we study the cases of Chile, Colombia, and Mexico, countries that have exhibited different rates of national economic growth and poverty reduction over the last 20 years. They also have different proportions of rural population, and variation in urban areas in terms of size and distribution.

Latin America is the most unequal region in terms of income in the world (CEPAL, 2010; De Ferranti, Perry, Ferreira, & Walton, 2004; OECD, 2011; United Nations Development Program (UNDP), 2010; World Bank, 2006), hence we first ask, does the presence of intermediate cities in rural–urban territories lead to poverty reduction, income growth, and a better income distribution, compared to deep-rural and metropolitan territories? We then ask, what are the channels through which cities of different sizes influence territorial dynamics? In other words, what are the mechanisms through which changes in income, poverty, and inequality occur? We thus extend the analysis to test the distinct functions cities may play within territories.

In our empirical strategy we model the relationship between changes at the territorial level over approximately one decade [2] regarding: (i) average household income; (ii)

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incidence of poverty; and (iii) existence of income inequality by using a system of equations which considers the interdependencies between these three dimensions of well-being (Bourguignon, 2003; Datt & Ravallion, 1992). A recursive system of equations is used to estimate changes in income, poverty, and income distribution at the scale of commuting labor markets or "functional territories" (Tolbert & Killian-Sizer, 1987). These functional territories aggregate municipal income data generated by the method of small area estimates (Elbers, Lanjouw, & Lanjouw, 2003). The main contribution of this paper is to statistically test for several mechanisms of city-driven socially inclusive territorial growth that had been previously suggested in the literature, but that had only been assessed previously in a qualitative manner through case studies.

The remainder of the paper is organized as follows: the second section describes the problem of cities in territorial development and discusses the channels by which cities may affect development dynamics. The third section presents the methodology used for empirical analysis and the data sources. The fourth section describes the results with respect to the two research questions and the final section concludes with a discussion of some of the implications for rural and territorial development policies.

2. CITIES AND RURAL TERRITORIAL DEVELOPMENT

There are various channels through which cities can affect the development dynamics of the territories in which they are situated. These channels derive from the way in which a city affects the spatial configuration of the economic and social activity and the consequences that this spatial distribution has on growth and development. We will start this section presenting the main concepts from the economic geography literature, part of the urban economics literature related to cities, and then discuss how this will relate into our empirical strategy.

The economic arguments can be traced back to Marshall (1920), who argues in favor of the benefits of agglomeration, such as the proximity to providers of goods and services and to consumers, labor market pooling, and knowledge spillovers. More recent theories have advanced Marshall's work to address the spatial organization of economic activity. One of these theories, which falls under the field of urban economics, focuses on productivity gains derived from inter-sectorial linkages arising from the concentration in cities (Ciccone & Hall, 1996; Fingleton, 2006). Another theory, the new economic geography (Krugman, 1991) conceives economic agglomeration as the result of a circular causality process, driven by pecuniary externalities stemming from increasing returns to scale and transport costs. In this context, market access would be an important cause of variability in the level of per capita income (national, regional, and local) (Redding & Venables, 2004; Scott & Storper, 2003). For rural households, aside from being a place to sell products, a city also offers opportunities for non-rural employment to rural inhabitants and a chance to diversify income generation (Evans, 1990). Non-agricultural rural income is in fact an increasingly important component of the household income structure in Latin America (Reardon, Berdegué, & Escobar, 2001), Africa, and Asia (Reardon, Taylor, Stamoulis, Lanjouw, & Balisacan, 2000). Therefore the distance to urban centers imposes a strong burden on remote populations, as demonstrated by empirical analyses on North America (Partridge, Rickman, Ali, & Olfert, 2008), Germany (Redding & Sturm, 2008), and other countries.

The problem of city sizes have been studied in the urban economics literature as well. Henderson (1974) develops a general equilibrium model to explain the micro-foundations of optimal city sizes, attributing the initial solution to a trade-off between congestion costs and economies of scale, explaining different city sizes through specialization. Similarly, Duranton and Puga (2001) reinforce the notion that specialization and diversification are both important and complement each other according to their life-cycle stage for products and services. Camagni, Capello, and Caragliu (2013) also develop the notion that optimality is not supported by evidence, but many equilibrium sizes exist among European cities, and they are explained by specific costs and advantages they have.

Beyond the opportunities derived from proximity to markets, the dynamics stimulated by the density of urban centers generate pro-growth effects that are consistent with endogenous growth theories. One such effect is the flow of ideas and knowledge. Cities provide a favorable environment for knowledge diffusion (Glaeser, Kallal, Scheinkman, & Shleifer, 1992; Jacobs, 1969) by facilitating interactions among economic agents, which are necessary for innovation (McCann, 2007). Cities are also a source of social diversity (Polèse & Stren, 2000; Wratten, 1995), which is considered an important factor in enhancing territorial development (Audretsch, Dohse, & Niebuhr, 2010; Florida, 2002). Likewise, urban environments offer educational services that can strengthen the human capital of territories, a factor associated with long-term growth (Barro, 2001; Cohen & Soto, 2007). The effect of these mechanisms, related to the diffusion of ideas and knowledge, is not limited to the immediate urban environment; spatial externalities and spillover effects in research and innovation have been demonstrated empirically (Anselin, Varga, & Acs, 1997; Bottazzi & Peri, 2003).

The literature on urban–rural linkages offers another perspective for the understanding of the relationship between urban centers and the development dynamics of territories, based on the functionalities that the city provides to its rural hinterland, and vice versa. Bellet and Llop (2000) identify four services that urban centers offer to their rural surroundings: (i) specialized goods and services; (ii) greater social, economic and cultural interaction; (iii) links to infrastructure networks that connect local communities with regional, national, and international communities; and (iv) public and government administration services through which local demands and needs can be channeled. These concepts essentially motivate the empirical strategy in this paper, where details about the mechanisms that affect development dynamics are discussed.

Satterthwaite and Tacoli (2006) propose four functions through which small- and medium-sized cities can contribute to the development of the rural territories with which they are closely related: (a) as markets of agricultural products; (b) as production and distribution centers of goods and services; (c) as centers for non-agricultural rural job growth and its consolidation; and (d) as attraction centers for rural migrants. According to these authors, the contribution of these functions to socially inclusive growth depends on the existing social and economic structures, both in the urban core and in the rural surroundings, on the power relationship between them, and on development strategies at a national level.

Gender systems, the structure of gender relations, stand out as a good example of the importance of existing social structures and of the channels by which they may change over time. Other elements of social structure not considered directly in this study, such as ethnicity may also play an important role

in some countries (Deininger & Okidi, 2003). Gender systems are understood as a set of beliefs and practices which organize and give meaning to all actors, institutions, and assets present in a territory (Paulson, 2011). By structuring the relations between men and women, gender systems restrict or sometimes promote the agency capacity of men and women in a potentially differential way, thus affecting the potential for growth and its distribution within territories (Shatkin, 2004). We argue that the flow of ideas, and the structure of networks and relations derived from the social diversity of cities, can contribute to ruptures in traditional gender structures, and therefore these flows may promote spaces of greater and more equal economic and social participation for women. This idea is consistent with evidence that shows the important role that urban social movements focused on gender relations play in contemporary economic and social restructuring (Lind, 1997).

In short, in light of the foregoing it can be argued that the presence of a city within a territory can favor growth dynamics that allow greater social inclusion.

In the next section we develop an empirical strategy to test this hypothesis and some of the mechanisms mentioned above.

3. EMPIRICAL STRATEGY

To answer our research questions we first test whether the size of a city has an influence on growth, poverty reduction and, improving income distribution within a territory. Having identified the existence of this influence, we then analyze the mechanisms through which it occurs.

Following Bourguignon (2003) poverty reduction within a territory may be due to a rise in average per capita income without any change in the distribution of income ("growth effect"), or to a change in the distribution of income in favor of the poor without any increase in the average per capita income ("distribution effect"), or to simultaneous changes in both the average income and income distribution in a direction such that a higher percentage of the population moves above the poverty line. The method we employ herein allows us to jointly analyze these three factors (poverty, income, and inequality). We wish to ascertain whether there is a relationship between the size of the city in a given territory and growth, and in particular inclusive growth where increments of average income per capita occur alongside a reduction in the incidence of poverty and of income inequality.

Similarly, in order to understand the channels through which different city sizes may exert influence on territorial well-being, we identify a set of variables that proxy each of them. We then statistically test for a relationship between the existence of cities of different sizes and the observed levels of these variables (for example, as the city size grows, is there also an increase in social diversity?). When the relation between the channel and the city size is established, we identify the type of effect on average income, the incidence of poverty, and the distribution of income. The choice of an open-ended approach for the empirical strategy, rather than the structural models proposed by other authors (Camagni *et al.*, 2013; Duranton & Puga, 2001; Henderson, 1974) is justified by the kind of externalities our work tries to explain and the limitations these urban economics models have into explaining the broad influences of the city in the whole territory.

(a) *Changes in income, poverty, and inequality*

Datt and Ravallion (1992) and Bourguignon (2003) show that there is a relationship between changes in poverty and variations in average income and its dispersion. Following Bourguignon (2003), the incidence of poverty in moment $t(H_t)$ can be described as an accumulated distribution of incomes up to the point defined by the poverty line (z):

$$H_t = F_t(z) \tag{1}$$

Its change over time can be represented as the change in this distribution between periods $t-(t-1)$:

$$\Delta H_t = F_t(Z) - F_{t-1}(z) \tag{2}$$

Expressing the poverty line in terms relative to average income $(z/\bar{y}_t)$, the change in poverty can be expressed as a simplification of the specification proposed by Bourguignon (2003):

$$\Delta H_t = \Delta\text{Income}(z|y_t) + \Delta\text{Distribution}(z|y_t) \tag{3}$$

The first term in brackets on the right hand side of Eqn. (3) represents the growth effect or a lateral shift maintaining the initial shape of the income distribution while the second term in brackets represents the distribution effect given by a flattening of income growth without a lateral shift of the initial distribution.

In short, poverty can be reduced because distribution improves without growth, or because there is an improvement in growth, but not in distribution. Ideally, a combination of growth and distribution improvements would have the greatest impact on poverty reduction.

This framework recognizes the interdependency between changes in poverty and changes in income and inequality, and it has been used by Bourguignon (2003), Klassen and Misselhorn (2006) and Bentancor, Modrego, and Berdegué (2008), among others. Bourguignon (2003) also shows that the supposed assumption of log-normality of the distribution of incomes fits his data well, allowing the representation of the distribution effect through changes in the standard deviation of incomes. Given that for log-normal distributions there is a proportional relationship between the standard deviation and the Gini coefficient (Bourguignon, 2003; Klassen & Misselhorn, 2006); we follow Bentancor *et al.* (2008), who propose a recursive system of equations to identify the interdependency between these three dimensions of well-being.

(b) *The effect of the presence of cities in territories*

First we estimate a system of three equations that take Bourguignon's relationship (3) as an equation of poverty change in territory r as a function of the changes in average income and distribution of income in the same territory. The other two equations in the system include the change in income and inequality[3] as a function of a series of controls including binary variables that define different city sizes.

$$\begin{aligned}
\Delta\text{Poverty}_{t-(t-1),r} &= \alpha + \beta_1 \Delta\text{Income}_{t-(t-1),r} + \beta_2 \Delta\text{Inequality}_{t-(t-1),r} \\
&\quad + \sum_j \sigma_{(t-1)j,r} + \sum_i \varphi_i \text{City}_{ir} + \varepsilon_{1,r} \\
\Delta\text{Income}_{t-(t-1),r} &= \delta + \phi_l Y_{(t-1)l,r} + \sum_t \lambda_t \text{City}_{ir} + \varepsilon_{2,r} \\
\Delta\text{Inequality}_{t-(t-1),r} &= \omega + \tau_m Z_{(t-1)m,r} + \sum_t \gamma_i \text{City}_{i,r} + \varepsilon_{3,r} \\
E(\varepsilon\varepsilon') &= \sum
\end{aligned} \tag{4}$$

where $P_{(t-1)j,r}$, $Y_{(t-1)j,r}$, $Z_{(t-1)m,r}$ are the vectors of control variables of the initial conditions that have an effect on the equations of poverty, income, and inequality, respectively (also included as initial levels in the year 1992 for Chile, 1990 for Mexico, and 1993 for Colombia). In order to control for the

relative importance of the city size over the general changes in the territory, these vectors include, in all three equations, the proportion of total population of the territory (as a percentage) living in the city at the beginning of the period under study. We also control for nonlinear convergence effects by including the initial value of the variable whose change is estimated and its initial value squared.

The justification for the proposed model specification, consisting essentially of a recursive system of reduced-form equations is twofold; on the one hand, it takes into account the variables indirectly influencing poverty reduction through income and inequality effects in the first stage and then calculates their net effects on poverty reduction. On the other hand, it gives enough flexibility to propose the set of categorical variables that we use to identify the influence of a city.

Depending on the availability of data for each country and the economic relevance in each case, the models include other control variables such as the proportion of students enrolled in technical education and the proportion of the population that completes tertiary education (human capital); the area of high-value crops as a percentage of total agricultural land (proxy for land productivity), the proportion of farms with formal land tenure over the total number of farms(institutional proxy), the percentage of the economically active population in the total population, the population size, and the percentage of workers in the primary sector (local economic structure), the population density of the area (urbanization externalities), the distances to national and/or regional capitals (economic geography), the homicide rates (proxy for social conflict), and finally, ethnic diversity, female unemployment rate, the percentage of women in non-agricultural self-employment, and the percentage of women migrants in the territory (socio-demographic and gender systems).

The parameters to be estimated are α, β_i, σ_j,δ, ϕ_l, λ_i, ω, τ_m, γ_i, φ_i. The growth and distribution effects correspond to a negative β_1 and a positive β_2, respectively. The statistical significance of parameters φ_i, λ_i yγ_i is indicative of differential effects according to the scale of the main city in the territory. The term ε in every equation represents errors with an expected value of zero, but we have allowed correlation between equations $E(\varepsilon\varepsilon)' = \Sigma$) (Greene, 2011). Therefore, the system is estimated by three stage least squares (3SLS). [4]

The structure of the model allows the direct calculation of the effects associated with different sizes of cities on poverty (φ_i), on incomes, (λ_i) and on inequality (γ_i). By substituting the second and third equations in the first, after the estimation, we can calculate the total net effect of cities on poverty. For a city of size "*i*", this will be given by the sum of the direct effects φ_i and of indirect effects through changes in income and/or inequality, λ_i and γ_i, respectively (see Eqn. (5) below). This sum represents the average difference in the rate of change in poverty between territories with a city of size "*i*" and the benchmark (territories without a city):

$$\xi_i = \beta_1\varphi_i + \beta_2\lambda_i + \beta_3\gamma_i \tag{5}$$

(c) *The rural–urban linkages through which cities influence territorial dynamics*

The literature proposes several channels through which cities may affect territorial development. Here we test eight of those channels. In order to reduce potential endogeneity biases, all of them are measured at the initial period (the year 1992 for Chile, 1993 for Colombia, and 1990 for Mexico):

1. *Access to a larger number of services.* Following Fingleton (2006), this channel is approximated by the proportion of those employed in highly skilled sectors. [5,6] A greater concentration of skilled services is a characteristic of urban centers (Egan & Bendyck, 1986; Sassen, 1990). We expect this factor to make a positive contribution to growth, due to "strategic complementarities" which favor competitiveness and are enabled by these services (Fajnzylber, 1990). In terms of inequality, a priori the access to specialized services as an ambiguous effect, because the final outcome depends essentially on the re-localization of less-specialized jobs to non-urban centers (Autor & Dorn, 2013).
2. *Physical and virtual connectivity.* [7] This variable is approximated by access to landline telephones. Investment in information communication technology tends to be decided on the basis of cost-benefit criteria (Van de Walle, 1997). This has contributed to urban–rural gaps in terms of both physical (Gannon & Liu, 1997) and virtual (Galperin, 2004; Sarocco, 2002) connectivity. The presence of a city within an otherwise rural territory may provide a critical mass of population that is able to reach the necessary levels of private and social returns. Connectivity improvement has been highlighted as a factor that contributes greatly to growth and development (Jalan & Ravallion, 2002; Madon, 2000). Access to information and connectivity could be a factor that could reduce inequality by closing information gaps and by increasing social and market opportunities.
3. *Diversified economy.* This variable is approximated by the Herfindahl–Hirschmann index of sectorial employment diversification. [8] Cities stimulate economic diversification (Tacoli, 1998). Also, Glaeser *et al.* (1992) show that knowledge spillovers tend to exist more between industries, rather than within an industry. However, there is mixed evidence with respect to the relationship between economic diversification and growth: Al-Murhabi (2000) indicates a positive relation, while Weinhold & Rauch (1997) a negative one. Therefore, there are no a priori expectations regarding this variable. The determination of its effect on territories in the countries studies is a matter of empirical analysis. Regarding equity, Singh, Gaur, and Schmid (2010) point out that a more diversified economy provides better opportunities for participation in the economy by small- and medium-sized local enterprises, and thus this type of economy has a potential pro-equity effect.
4. *Greater public investment in the rural environment.* This variable is approximated by the urban–rural gap in access to sewerage or electricity and it is measured as the difference between the percentage of urban and rural houses with access to these services. [9] While some literature points to the existence of urban biases in public investment decisions (Berdegue *et al.*, 2011; Bezemer & Headey, 2008; Eastwood & Lipton, 2000), others (Satterthwaite & Tacoli, 2006) point out that in situations of mutual interdependence between a city and its rural hinterland, urban actors have an incentive to attract investments which benefit the rest of the territory. Therefore, the relationship between the presence of cities in the territory and urban–rural public investment gaps at a territorial level is not clear a priori. In any case, public investment should stimulate territorial growth dynamics (Barro, 1991; Devarajan, Swaroop & Zou, 1996) and when it prioritizes the provision of public goods, it can also reduce poverty (López & Galinato, 2007).

5. *Greater social diversity.* As with sectorial diversity, cities offer greater opportunities for social diversification in comparison with strictly rural environments (Egan & Bendyck, 1986). We approach this variable by the Herfindahl–Hirschmann index of diversification of occupations within the employed workforce (e.g., employers, managers, engineers and technicians, unskilled workers). Greater social diversity can stimulate the generation and circulation of ideas, which in turn stimulate entrepreneurship (Ottaviano & Peri, 2006; Audretsch, Dohse, & Niebuhr, 2010), as suggested in the literature on the creative class (e.g., Florida, 2003). Social diversity can also be a source of social entrepreneurship and of new social coalitions that have new development discourses which defy agrarian elites (Alvord, Brown, & Letts, 2004; Berdegue *et al.*, 2011). However, it can also lead to social fragmentation (Anderson & Paskeviciute, 2006; Newton & Delhey, 2005) with a consequent negative effect on growth (Alesina, Baqir, & Easterly, 1999; Costa & Kahn, 2003). In sum, the impacts of social diversity on growth and inequality are ambiguous.
6. *More human capital.* This variable is approximated by the average years of education of the population aged 15 years old and over in the territory, or by the population with a university education, or by the presence of professionals and technicians, depending on the country. Urban–rural differences in the levels of accomplishment and the quality of education are well documented (Programa de Promoción de la Reforma Educativa en América Latina y el Caribe (PREAL), 2001). At a territorial level, intermediate cities can help close education gaps by increasing the access of rural children to secondary schools and to vocational training centers (Satterthwaite & Tacoli, 2006). Under the endogenous growth theory (Lucas, 1988; Romer, 1986), human capital has been recognized as an essential condition for sustained economic growth; empirical evidence confirms this assertion (Barro, 1991; Cohen & Soto, 2007). Education is a tool of social mobility and equity (Lam, 1999; Londoño, 1996), although inequality could increase at the beginning of the transition to higher average levels of schooling in the population (Bourguignon, Ferreira, & Lustig, 2004). Also, a more educated and qualified labor force can migrate to areas where better jobs are offered, thus breaking the relationship between education and local development (Florida, 2005); the so-called "brain drain" is a well-documented phenomenon and one of the great challenges faced by rural communities (Artz, 2003; OECD/World Bank, 2010).
7. *Gender systems within the territory.* We do not have a single variable that captures the complexity of gender systems, but some approximations are possible. One consequence of preexistent gender structures and institutions is the participation of women in the formal economy (Forsythe, Korzeniewicz, & Durrant, 2000; O'Connor, Orloff, & Shaver, 1999). Therefore, we take the male–female employment gap as a proxy for gender systems. This variable is calculated as the difference between the percentage of employed men and women in the labor force. We expect that the breaking of traditional social structures that limit the economic and social participation of women is more likely in urban environments. There is a body of evidence that shows how gender gaps tend to be lower in the urban space compared to the rural (Baker, 2006; Deere & Leon, 2003). However, evidence regarding gaps in labor participation based on gender and growth are mixed, because there are both positive (Seguino, 2000) and negative associations (Klassen, 1999). Regarding inequality, common sense would indicate that smaller gender gaps would be associated to greater economic equity. However, in contexts of high wage discrimination against women, such as those that exist in Latin America, it is possible that greater female participation exacerbates wage discrimination in the labor market (Seguino, 2000). Thus, the variable used here may have an ambiguous effect by interacting with other economic structures and institutions.
8. *Political competition.* [10] Pavletic (2010) argues that political choices mitigate social conflicts and can increase society's desire for cooperation. Political competition within a democratic institutional environment mitigates agency and collective action problems, and it may influence successful economic reforms that positively impact economic performance. Political competition enables citizens to organize and express their demands. In the absence of political competition, individuals may be restricted in their ability to lobby for pro-growth or pro-distribution economic reforms. Pavletic (2010) mentions that comparative studies in Bulgaria, Romania, Albania, and Bosnia have established a positive relation between political competition, economic reforms, and economic performance.
9. *Access to financial services.* [11] This variable is approximated as the percentage of the population with access to credit. According to the OECD (2007), there is a positive impact of improving access to financial services as a tool for overcoming poverty in developing countries.

The variables that were tested in each country, according to the availability of data, are summarized in Table 1.

In light of the foregoing, the size of intermediate cities is expected to have both direct and indirect effects on changes in poverty levels. As indicated in Eqn. (5), the indirect effects come from the impact on poverty of changes in inequality and in average per capita income. If a channel is pro-growth (anti) and pro-equity (anti), the theory allows us to expect a negative (positive) indirect effect on changes in poverty. The net effect would arise from the sum of the direct and indirect effects of the different channels operating simultaneously in the same territory.

Based on the literature reviewed, our strategy is to use ordinary least squares to estimate first the relationship between the city and the level of each one of the nine channels mentioned above:

$$\text{Channel}_{i,r} = \alpha_{1,i} + \beta_{n,i,r} X_{i,n,r} + \beta_{c,i,r} \text{City}_{c,i,r} + \varepsilon_{i,r} \tag{6}$$

Then we estimate a system similar to the system of equations (4) by 3SLS, where each channel is replaced by its predicted value obtained in the first-step estimation:

$$\Delta\text{Poverty}_{t-(t-1),r} = \alpha + \beta_1 \Delta\text{Income}_{t-(t-1),r} + \beta_2 \Delta\text{Inequality}_{t-(t-1),r} + \sum_j \sigma_j P_{(t-1)j,r} + \sum_i \varphi_i \widehat{\text{Channel}}_{(t-1)i,r} + \varepsilon_{1,r}$$

$$\Delta\text{Income}_{t-(t-1),r} = \delta + \phi_l Y_{(t-1)l,r} + \sum_t \lambda_i \widehat{\text{Channel}}_{(t-1)i,r} + \varepsilon_{2,r}$$

$$\Delta\text{Inequality}_{t-(t-1),r} = \omega + \tau_m Z_{(t-1)m,r} + \sum_t \gamma_i \widehat{\text{Channel}}_{(t-1)i,r} + \varepsilon_{3,r}$$

$$E(\varepsilon\varepsilon') = \sum \tag{7}$$

Table 1. *Variables used as channels for each country*

Channels	Chile variables	Colombia	Mexico
Human capital	Average schooling	Percentage of population with higher education	Average years of schooling Percentage of college students in the population Percentage of professionals and technicians in the population
Connectivity	Households with fixed telephones		
Social diversity	Diversity of employees by type of occupation	Labor force participation rate	Diversity of employees
Productive diversification	Diversity of employees by economic sector	Diversity of employees by economic sector	Diversity of employees by economic sector
Gender systems	Male–female employment gap	Male–female employment gap	Male–female employment gap
Public investment	Urban–rural gap in sewerage coverage	Urban–rural gap in electricity coverage	Percentage of houses with access to electricity
Specialized services	Proportion of economically active population in specialized services		
Political competition		Percentage of votes obtained by the winning candidate for majority	
Financial services			Percentage of population with access to credit

where $\widehat{\text{Channel}}_{1992i,r}$ is the predicted value for the channel for region r obtained from Eqn. (6). The net effect of the channel on poverty is obtained as in Eqn. (5).

(d) *The territories*

The comparison of the dynamics of change in average income, poverty, and income inequality between territories with and without an urban center, requires a definition of the unit of analysis that we call a "territory". Schejtman and Berdegué (2003) define a territory as a socially constructed space. We operationalize this concept through the identification of "functional territories", which are defined as spaces that contain a high frequency of economic and social interactions between their inhabitants, organizations, and firms. We use commuting flow data between pairs of municipalities to identify "relatively self-contained spaces where people live and work" (Tolbert & Killian-Sizer, 1987, p.10). [12] The methodology essentially aggregates municipalities using cluster analysis of commuting flow matrices derived from Census data in each country, grouping them in regions that resemble actual labor markets containing cities and their rural areas altogether. This method produced 103 functional territories in Chile, [13] 438 in Colombia, [14] and 986 in Mexico. The territories that were used in this study are grouped according to the population size of the main city in the initial period, thus giving rise to the types of territories described in Table 2.

The typology of the functional territories in Table 2 is closer to the idea of rurality gradients (OECD, 1996), which contrasts with the urban–rural dichotomy that prevails in the official definitions of population stratification in Latin America. To identify rural territories we first established a minimum population threshold which corresponds to the availability of certain critical services, with the lower bound differing according to the particular circumstances of each country. In the case of Chile, for example, the threshold was determined at 18,000 inhabitants because we found that below this level one could hardly ever find local provision of a wide array of services, such as a local branch of a private bank. In the case of Colombia, the threshold was a population of

Table 2. *Functional territories in Chile, Colombia, and Mexico*

Typology of territory	Number of territories			Percentage of municipalities (%)			Percentage of population (%)			Range of population size in urban centers (thousands of inhabitants)		
Country	CHI	COL	MEX	CHI	COL	MEX	CHI	COL	MEX	CHI	COL	MEX
(a) Deep-rural territories	54	259	554	24	41	27	6	16	7	<18	<10	<2.5
(b.1) Rural–urban territories with a small city[a]	17	66	254	15	15	32	7	8	14	18–40	10–50	2.5–50
(b.2) Rural–urban territories with a medium-sized city	12	27	78	15	10	11	10	9	9	40–80	50–100	50–250
(b.3) Rural–urban territories with a large city	14	25	67	24	25	17	20	21	20	80–250	100–370	250–1 MM
(c) Metropolitan territories	6	17	33	23	10	13	56	46	50	>250	>370	>1 MM

[a] In the case of Mexico, this also includes an additional category of cities containing 2,500–22,500 inhabitants due to the high percentage of rural towns. Furthermore, in this country those territories with a city with over one million inhabitants are defined as "metropolitan". In other countries this limit was not considered because only the capitals fall into this category.

20,000 and in the case of Mexico, 22,500 inhabitants. These limits were established using criteria such as the percentage of the population living outside of the urban areas, the presence of private banks, the population density, the percentage of the population employed in primary sector and the percentage of the total population in higher education (Berdegue *et al.*, 2011). The interpretation of the coefficients estimated out of these categorical variables is an important part of the paper. Since we are already controlling for population size, density, and the proportion of urban–rural inhabitants in the territory, these categories reflect a gradient on how urban agglomerations and their externalities are influencing social inclusion and economic growth in territories. Even though this spatial aggregation encompasses strong interactions, it is not inmune to every possible ommited variable bias, [15] due to unobserved linkages and interactions that go beyond the scope of the territory. [16]

A final precaution that we should consider is spatial autocorrelation. Even though we do not have a strong theoretical argument to properly identify spatially corrected errors or lags in our main econometric model, the processes influencing labor market agglomerations could also be driving the results of income, poverty, and inequality estimations in nearby territories. To ensure that our results are not driven by unobserved spatial processes, we estimated separately each equation using spatially corrected errors, noting that the coefficients do not change significantly compared to a simple OLS specification, with high correlations of predicted values between both of them. [17]

(e) *Data*

The dependent variables for the changes in income, poverty, and inequality, and the initial levels in the two systems of Eqns. (4) and (7), were obtained by aggregating municipality-level statistics that were generated using the small area estimates (SAE) method (Elbers *et al.*, 2003) for each country. The poverty lines are set according to each country's own poverty definition and reflect approximately how much a household needs to afford a basic food supply. Household income-consumption growth is measured in real terms and aggregated at territorial level. Similarly, inequality is measured using the relative Gini index for Chile and Colombia, and the Theil index in Mexico. [18]

The variables in Eqn. (7), as well as those describing the channels, were obtained from census data (the year 1992 for Chile, 1993 for Colombia, and 1990 for Mexico). Other official sources of data (e.g., agricultural censuses) were used to construct the additional control variables that were included in Eqns. (4), (6) and (7). [19]

4. RESULTS

(a) *Descriptive statistics*

Table 3 suggests different trends in the poverty–growth–inequality relationship depending on the type of territory. With respect to poverty reduction, in general, the categories of territories with high levels of average growth in income (or consumption) tend to show greater poverty reduction in Chile and Colombia. In both of these countries metropolitan territories show the largest improvements in poverty rates. However, in the case of inequality, a simple exploratory analysis does not allow us to determine a relationship that is as clear as that for the other two dimensions in any of the three countries.

(b) *Do areas with intermediate cities show greater and more inclusive economic growth?*

The estimation derived from the application of system of Eqn. (4) helps us to answer the first question; are rural–urban territories with intermediate cities associated with higher poverty reduction, income growth, and decreasing inequality compared to deep-rural and metropolitan territories? Table 4.1 presents the results of the 3SLS estimation, controlling for the categories of urban center size.

The first equation, where the independent variable is the change in poverty between the start and the end of the periods studied, confirms the growth and distribution effects on poverty suggested by Bourguignon (2003) in each of the three countries. The coefficient of the changes in per capita income (or consumption) is negative and significant in all cases. This coefficient is interpreted as the income elasticity of poverty; an increase of 10% in income leads to a decrease in the poverty index of approximately 9%, 5%, and 6% in Chile, Colombia, and Mexico, respectively. In comparison with rural territories without a city (*deep rural*), the growth in urban–rural and metropolitan territories has a greater effect on poverty reduction, both in Chile and in Colombia.

Table 3. *Descriptive statistics of functional territories by country*

Category of territory	Chile (1992–2002)			Colombia (1993–2005)			Mexico (1990–2005)		
	ΔPoverty	ΔIncome	ΔGini	ΔPoverty	ΔConsumption	ΔGini	ΔPoverty	ΔConsumption	ΔTheil
Rural	−21.5%	23.6%	−0.3%	−1.5%	2.8%	−3.8%	−18.3%	51.3%	33.7%
	(21.88%)	(22.73%)	(9.29%)	(18.10%)	(27.00%)	(8.80%)	(30.50%)	(0.00%)	(0.00%)
Rural–urban with a town							−14.7%	22.2%	3.8%
							(30.40%)	(38.20%)	(39.80%)
Rural–urban with a small city	−29.2%	31.6%	1.5%	−4.4%	3.6%	−6.4%	−15.9%	9.1%	−7.9%
	(16.21%)	(27.33%)	(9.69%)	(19.40%)	(28.50%)	(7.80%)	(29.30%)	(23.10%)	(20.90%)
Rural–urban with a medium-sized city	−35.4%	27.9%	−2.4%	−6.2%	3.1%	−3.9%	−14.0%	4.7%	−9.5%
	(11.57%)	(26.09%)	(7.47%)	(20.70%)	(17.70%)	(8.40%)	(25.20%)	(19.40%)	(19.30%)
Rural–urban with a large city	−32.2%	33.1%	2.6%	−4.0%	9.8%	−6.3%	0.2%	1.3%	−5.4%
	(10.99%)	(18.93%)	(9.61%)	(15.00%)	(43.30%)	(4.90%)	(40.80%)	(16.20%)	(16.40%)
Metropolitan	−42.7%	31.3%	−3.4%	−9.3%	25.8%	−5.9%	2.3%	5.7%	2.9%
	(5.09%)	(9.03%)	(2.71%)	(28.90%)	(81.30%)	(6.00%)	(28.20%)	(7.50%)	(6.60%)
Total	−26.3%	26.9%	0.1%	−2.5%	3.7%	−4.4%	−14.3%	30.4%	14.8%
	(19.31%)	(23.04%)	(9.10%)	(18.50%)	(29.50%)	(8.50%)	(32.70%)	(57.80%)	(67.20%)

Table 4.1. *Results of the estimations of poverty, income and inequality, controlling for urban center size*

Chile	ΔPoverty		ΔPer capita income		ΔGini	
Change in income	−0.89	***				
Change in inequality	1.52	***				
Territories with a small city	−0.02		0.15	***	0.04	**
Territories with a medium-sized city	−0.05	***	0.15	***	0.02	
Territories with a large city	−0.02		0.20	***	0.01	
Territories with a metropolis	−0.06	***	0.33	***	−0.03	
Control variables	(...)		(...)		(...)	
Constant	−0.23	**	1.08	***	1.88	**
Observations	101					

Colombia	ΔPoverty		ΔPer capita consumption		ΔGini	
Change in income	−0.51	***				
Change in inequality	0.46	***				
Territories with a small city	0.02	***	0.05		0.03	**
Territories with a medium-sized city	−0.03		0.24	***	0.03	
Territories with a large city	0.02		0.31	***	0.05	**
Territories with a metropolis	0.01		0.54	***	0.05	*
Control variables	(...)		(...)		(...)	
Constant	0.01		0.91	***	0.35	***
Observations	394					

Mexico	ΔPoverty		ΔPer capita consumption		ΔTheil	
Change in income	−0.61	***				
Change in inequality	0.12	***				
Territories with a town	0.02		−0.03		0.01	
Territories with a small city	−0.11	***	−0.03		−0.08	
Territories with a medium-sized city	−0.16	***	−0.04		−0.14	
Territories with a large city	−0.15	***	−0.05		−0.19	
Territories with a metropolis	−0.30	***	−0.03		−0.34	
Control variables	(...)		(...)		(...)	
Constant	0.43	***	1.08	***	2.75	***
Observations	927					

Net effects on poverty	Chile		Colombia		Mexico	
Territories with a town					0.04	*
Territories with a small city	−0.07		−0.01		−0.10	**
Territories with a medium-sized city	−0.10	**	−0.11	***	−0.16	***
Territories with a large city	−0.17	***	−0.20	***	−0.14	**
Territories with a metropolis	−0.34	***	−0.25	***	−0.32	**

Notes: The baseline is a deep rural territory without an urban core.
The estimation applied is that described in Eqn. (4).
p-Values: *, <10%, **, <5%, ***, <1%.

In the case of Chile, the income change coefficients are not statistically different among the categories of small- to medium-sized cities,[20] or between medium to large cities. There is, however, a substantially larger effect observed for metropolitan territories. The results do not support the hypothesis of a convergence of poverty rates during 1992–2002. The parameters of the initial weight of the city in the total population of the territory are not significant. In the case of Colombia, estimations show that territories with an urban center with a population of more than 50,000 show a larger change in per capita consumption; this effect is statistically significant. We found convergence in the equation of per capita consumption. We also observed that higher initial inequality levels are associated with diminished per capita consumption growth.

Regarding changes in inequality, positive coefficients suggest that inequality dampens the pro-poor effect of growth. Regarding the role of cities, trends among the three countries are less clear. In Chile, the presence of a city is not statistically significant except for the case of territories with small cities (urban centers with 18,000–40,000 inhabitants). The effects of convergence are significant. The initial weight of each city's population as a share of the total population in the territory is significant and positive, suggesting that territorial changes in inequality in Chile are very much influenced by inequality in the main cities of the territory, and also pointing to a long-standing structural inequality (de Ferranti *et al.*, 2004). In Colombia, the inequality equation suggests that initial inequality has a negative effect on its later variation. The initial population in the urban core has a positive correlation with inequality, but these effects are highly significant for city sizes between 10,000 and 50,000 inhabitants and between 100,000 and 370,000. In the Colombian case, there are no statistically significant incremental effects related to the size of the urban center.

The results are quite different for Mexico. While the direct effect of city size on poverty was found to be negative and statistically significant for cities with more than 22,500 inhabitants, the size of the city does not appear to have an influence on the growth of per capita consumption or on the growth of inequality.[21] This direct effect on poverty has an increasing impact depending on the number of inhabitants in the city.[22]. This could possibly be explained by the very strong increase in consumption per capita in Mexican deep-rural territories (Δ^{+}Income = 51%) in comparison with the Chilean (Δ^{+}Income = 24%) and the Colombian (Δ^{+}Income = 3%) cases (see Table 3). It is likely that the result for Mexico is due to the large conditional cash transfers programs and also by private remittances directed to rural territories with high poverty incidence (World Bank, 2004). Indications of convergence were found in Mexico in the three variables of interest: poverty, per capita consumption, and inequality.

The results of the estimation of net effects (see lower part of Table 4) show negative coefficients for all city sizes in the three countries, indicating a net effect of reduction of poverty for all the categories starting from medium or small-sized cities (40,000 inhabitants in Chile, 50,000 in Colombia, and 22,500 in Mexico). This effect is not statistically significant in the case of territories with the smallest intermediate cities in the case of Chile and Colombia. In the case of Mexico, when compared to rural territories, poverty levels actually increased in territories with very small cities (effect statistically significant at 10% only). For all three countries, there are incremental effects over the net reduction of poverty when the size of the urban center increases. These increments between rural–urban territories with a large city and territories with a metropolis are statistically significant.[23] A summary of the estimation results is presented in Table 4.2.

In sum, the answer to the first question is that urban–rural territories present greater growth dynamics and a greater reduction of poverty in comparison with deep-rural territories for Chile and Colombia. We cannot see a consistent effect on income inequality except in the case of territories with small cities in Chile and in the rural–urban territories of Colombia, where there is evidence of a greater income concentration. In Mexico we did not see direct effects on income and inequality among different categories.

For the three countries, the differences are not linear at the scale of metropolitan territories. In each case, there are minimum size thresholds for the urban centers (intermediate cities in urban–rural territories) for triggering greater growth and reducing territorial poverty. There are also few differences among changes in income, poverty, and inequality between territories with intermediate cities and the ones with large cities, but substantial changes occur as we increase the urban center from large cities to large metropolises in all three countries.[24]

(c) *Channels through which cities exert their influence on territorial development dynamics*

Tables 5.1–5.3 summarize the results of the estimation derived from the application of system of Eqn. (7). First stage results indicate that even in the presence of other controls, the city shows significant differences in all dimensions considered.[25] Detailed results are presented first by country and then compared.

In the case of Chile (Table 5.1), the poverty equation confirms the effects of growth and distribution on poverty with the expected signs and high statistical significance. There are neither observable convergence effects in poverty (not reported in table) nor significant effects of the city's population weight on the total territorial population (not reported in table).

In the income equation, the coefficient for *specialized services* has a very strong, positive, and highly significant effect. *Social diversity* has a similar impact, while there is no significant effect of the *productive diversification* variable. The urban–rural *public investment* gaps, however, are associated with lower aggregated territorial economic growth rates.

Counter-intuitively, the variable representing *gender systems* (male–female employment gap) shows a positive sign and statistically significant in the change of per capita income; this means that a higher participation gap (difference between men and women in the labor force) is associated with a higher territorial per capita income. This latter result could be interpreted in the light of vast evidence indicating gender wage gaps and barriers to the access of women to qualified jobs and management posts in Chilean labor markets. *Connectivity*, *productive diversification,* and *human capital* did not show significant effects on growth.

The inequality equation shows less clear results. Only one of the channels—*specialized services*—helps to explain the variability of the changes in inequality. This effect can probably be explained by the existence of a high proportion of highly paid and specialized jobs that may produce greater income differentiation in the territory. The initial levels of inequality determined the extent of changes, confirming convergence (not reported in table). Overall, the importance of initial inequality would confirm the propositions of Engerman and Sokoloff (1997) and De Ferranti *et al.* (2004) about long-standing structural inequality in Latin America.

The net effects of channels on poverty (Eqn. (5)), reveal that three of the seven channels tested have a significant pro-poor effect, while one channel is significantly anti-poor. The *specialized service*s growth effect favors poverty reduction, and more than compensates its anti-poor distribution effect. In net terms, this channel ends up making a strong and significant contribution to poverty reduction. Social diversity exerts a net effect on poverty reduction, but economic diversity does not. Our measure of the urban–rural public investment gap

Table 4.2. *Summary of the effects in income, poverty, and inequality by city size*

Effect over changes	ΔIncome/expenditure			ΔInequality			ΔPoverty (Net effect)		
Country	Chile	Colombia	México	Chile	Colombia	México	Chile	Colombia	México
Territories with a small city	Positive	Not sig.	Not sig.	Positive	Positive	Not sig.	Not sig.	Not sig.	Positive
Territories with a medium-sized city	Positive	Positive	Not sig.	Positive	Not sig.	Not sig.	Negative	Negative	Negative
Territories with a large city	Positive	Positive	Not sig.	Positive	Positive	Not sig.	Negative	Negative	Negative
Territories with a metropolis	Positive	Positive	Not sig.	Positive	Positive	Not sig.	Negative	Negative	Negative
Increasing effect of city size	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes
Effect of urban/rural proportion of the population	Not sig.	Not sig.	Not sig.	Positive	Not sig.	Not sig.	Not sig.	Not sig.	Positive
Convergence effects	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes

Table 5.1. *Channel estimates: summary of econometric results for Chile*

Model	Cities	Equation system (7)						Net effect (6)		Interpretation
Channels	Coef.	ΔPoverty		ΔINCOME		ΔGINI		ΔPoverty		
Change in income 1992–2002 (%)		−0.962	***							
Change in Gini 1992–2002 (%)		1.539	***							
Est.% pop. in specialized services (Research, consulting, IT)	+***			36.426	***	4.802	*	−27.644	***	Increase in specialized services improves income, increases inequality and reduces poverty
Est. social diversity (Herfindahl). per job category)	+***			5.001	**	−0.514		−5.601	***	Greater job diversity increases income and reduces poverty
Est. rural–urban gap in sewerage coverage	+***			−0.702	**	0.163		0.926	***	Reduction in the gap between urban and rural investment increases income and reduces poverty
Est. male–female employment gap	−***			2.647	*	−0.687		−3.604	**	Reduction of the gap between male and female employment diminishes income and increases poverty
Convergence controls		(...)		(...)		(...)				
Constant		−0.182		−5.496	***	4.591	***			
Observations		101								

Notes: The estimations applied are those described in Eqns. (6) and (7).
p-Values: *, <10%, **, <5%, ***, <1%.

Table 5.2. *Channel estimates: summary of econometric results for Colombia*

Model	Cities	Equation system (7)						Net effect (6)		Interpretation
Channels	Coef.	ΔPoverty		ΔIncome		ΔGini		ΔPoverty		
Change in income 1993–2005 (%)		−0.571	***							
Change in Gini 1993–2005 (%)		1.46	***							
Est. Urban–rural gap in electricity coverage 1993	+***			−1.064		0.616	**	1.507	**	A smaller gap in public services between urban and rural areas reduces inequality and poverty levels
Est. Political competition 1994	+***			1.529*	*	0.831	***	0.339		Greater political competition reduces income and inequality
Est. Male–female employment gap 1993	−***			−1.108*	*	−0.234		0.290		A smaller employment gap between men and women increases income
Convergence controls		(...)		(...)		(...)				
Constant		0.06	***	−0.299	***	−0.654	**			
Number of observations		394								

Notes: The estimations applied are those described in Eqns. (6) and (7).
p-Values: *, <10%, **, <5%, ***, <1%.

has a net effect of increasing territorial poverty. Finally, greater participation of women in the labor market it is not related to poverty reduction, because it has an anti-income growth effect which is probably determined by wage discrimination against women in local labor markets.

In the case of Colombia, only three of the six tested channels are statistically significant. Unlike Chile, the results indicate that a greater male–female employment gap (*gender systems*) has an unfavorable effect on consumption growth, while less *political competitio*n has a positive effect on this variable. The positive coefficient of political competition indicates that as the percentage of votes for the winning candidate increases, which equates to lower political competition, the level of income per capita increases. However, at the same time, we observed that with lower political competition, the level of inequality rises, thus offsetting the net effects on poverty reduction. The urban–rural gap in electricity coverage which approximates *public investment* has an important effect in increasing inequality and poverty; this is the channel that has the highest statistically significant effect on the net reduction of poverty. The remaining channels (*social diversity*, *productive diversification,* and *human capital*) do not have a significant net effect on poverty.

Finally, for Mexico, the analysis of the effects on changes in poverty shows a positive and significant relationship with inequality, but this relationship is not significant for per capita consumption. Three variables show statistically significant parameters in the income equation. Two of these variables are associated with the channel of *human capital* and have different effects; while the average level of schooling has a pro-growth effect, the presence of professionals and technicians in the population has a negative effect on per capita consumption, which is puzzling. Although the average level of schooling has a positive impact on growth, its net effect on poverty is not statistically significant. In turn, the presence of professionals and technicians has an important effect on

Table 5.3. *Channel estimates: summary of econometric results for Mexico*

Model	Cities	Equation system (7)						Net effect (6)		Interpretation
Channels	Coef.	ΔPoverty		ΔIncome		ΔTheil		ΔPoverty		
Change income 1990–2005 (%)		−0.019								
Change Theil 1990–2005 (%)		2.471	***							
Est.% of professionals and technicians in the population	+***			−11.748	*	−23.237	***	−57.200	***	Greater presence of professionals and technicians in the population diminishes income, inequality and poverty
Est.% of homes with access to electricity	+***			0.041		−1.329	**	−3.280	*	Better electricity coverage diminishes inequality and poverty
Est. Average years of schooling	+***			0.090	*	−0.025		−0.060		Greater average schooling increases income
Est.% of university students	+***			−0.133		0.422	***	0.44	**	Greater presence of university students increases inequality and poverty
Est. Male–female employment gap	−***			−3.958	*	−8.035	***	−19.780	***	Fewer employment gaps between men and women increase income, inequality and poverty
Convergence controls		(...)		(...)		(...)				
Constant		−8.513	***	2.128	**	2.701	**			
Observations		927								

Notes: The estimations applied are those described in Eqns. (6) and (7).
p-Values: *, <10%, **, <5%, ***, <1%.

inequality reduction that favors a net impact on reducing poverty. As in Colombia, the reduction in the male–female employment gap (*gender systems*) shows a pro-growth effect. However, its impact on inequality implies a net positive impact on poverty. In addition to the above-mentioned variables, electricity coverage shows a pro-equity effect that reduces poverty. The *public investment* channel is significant in all three countries, as it helps to explain net decreases in poverty consistently. The other channels tested for Mexico (*financial services*, *social diversity*, and *productive diversification*) did not give statistically significant results in any of the three equations of (7).

(d) *Comparisons and discussion of results*

We emphasize that comparisons between countries must be made with caution because the availability of data prevented an analysis being undertaken on exactly the same channels using exactly the same indicators. Table 6 summarizes the results of the channels with statistically significant effects in the three countries studied. The ones excluded from this summary did not have statistically significant effects in any of the dimensions of interest (income, inequality, and net effects on poverty).

From Table 6 we can summarize the following results:

Access to specialized services was analyzed in Chile. This channel had a positive effect on growth and a net reduction of poverty in spite of its positive effect on income inequality. These results confirm the evidence generated by empirical work based on endogenous growth theory and urban economics (Acs & Armington, 2004; Glaeser *et al.*, 1992).

Diversification of the economy, measured through the diversity of the labor market, was evaluated in all three countries, but in none of the cases were there statistically significant results (not reported in table).

Reduction of urban–rural public investment gaps favors growth in Chile and diminishes inequality in Colombia and

Table 6. *Summary of econometric results for Chile, Colombia, and Mexico*

Channels	Variables	Country	Effect on income/consumption	Effect on inequality	Net effect on poverty
Access to specialized services	Population working in consultancy, IT and research services	Chile	Increase	Increase	Reduction
Public investment	Reduction of urban–rural gap in sewerage coverage	Chile	Increase	Not sig.	Reduction
	Reduction of urban–rural gap in electricity coverage	Colombia	Not sig.	Reduction	Reduction
	Percentage of homes with access to electricity	Mexico	Not sig.	Reduction	Reduction
Social diversity	Occupational diversity (Herfindahl)	Chile	Increase	Not sig.	Reduction
Human capital	Average years of schooling	Mexico	Increase	Not sig.	Not sig.
	Percentage of professionals and technicians	Mexico	Reduction	Reduction	Reduction
	University students in the population	Mexico	Not sig.	Increase	Increase
Gender	Reduction of male–female employment gap	Chile	Reduction	Not sig.	Increase
		Mexico	Increase	Increase	Increase
		Colombia	Increase	Not sig.	Not sig.
Political competition	Percentage of votes for the winning candidate	Colombia	Reduction	Reduction	Not sig.

Mexico. The effects of this channel are consistent with results attributed to urban bias in policy making and to rent capture by urban elites (Anriquez, 2007). The effect of the urban–rural gap in electricity coverage could indicate that greater public investment in the rural areas of territories could lead to a greater reduction in poverty levels.

The greater *social diversity* (of labor workers) associated with cities contributes to growth and reduces poverty in Chile. This channel is not statistically significant in the other two countries.

The effect of *human capital* associated with cities was analyzed in all three countries by using different variables. We could only identify a significant effect in the case of Mexico, but we were unable to identify a pattern in terms of the effect on the three dependent variables. While the greater presence of professionals and technicians in the population appears to decrease poverty reduction patterns, the presence of university students is associated with higher poverty through its adverse effect on inequality.

The reduction of the gender gap in terms of participation in the formal job market showed an unexpected result; closing this gap is associated with greater poverty both in Chile and Mexico. In the former, the result is explained by a reduction in per capita income, while in the latter the explanation is that an increase in inequality is not compensated by an increase in income. In Colombia there is an increase in income when this gap becomes smaller, but this increase is not large enough to have a significant net effect on poverty. This result could hypothetically be due to high levels of wage discrimination by gender. Various studies confirm that large salary gaps are to the detriment of women who are often paid less to do the same jobs as men, despite having similar qualifications (Paredes & Riveros, 1994; Ñopo, 2008) and there are also reports in urban environments of absolute income gaps which are greater than in rural areas (Jara, 2007). Overall, the effect of the city in favor of greater participation of women in the labor market is offset by complex interactions of other elements in the gender system such as gaps in salaries or "glass ceilings" that block the access of women to higher positions in private and/or public jobs (Ñopo, 2008). If our explanation is confirmed by other studies, this would indicate that salary discrimination against women is not only negative for them as individuals, but negative for their whole communities.

The channel of greater *political competition* was evaluated in Colombia only. We found that when there is a city there tends to be greater political competition and this in turn favors consumption distribution but reduces growth; unfortunately, this trade-off is not unusual in Latin America. Despite the claim that there are advantages to political competition (Pavletic, 2010), others point out that more democratic societies do not necessarily favor policies of economic growth and reduction of poverty and inequality (Moore & Putzel, 1999; Mulligan & Tsui, 2006).

The interactions between different mechanisms in a territory at a given point in time are extremely complex, and the growth and/or distribution effects derived from one mechanism can be offset by another. Common sense suggests that in different rural–urban territories and in different stages of their development, some channels will have more importance than others. Moreover, there are effects which are not direct, for instance the effect of the entry of women into the labor market discussed above, which may show a positive result in itself but is apparently countervailed by labor-market discrimination. In short, there is no "one-size-fits-all" prescription that would enable policy makers to promote a particular channel or perhaps a set of channels that would lead to the desired effects of growth and social inclusion. Overall, our empirical evidence points at the need for place-based policies that take into account the contextual conditions of the different rural-urban systems. Nevertheless, the findings hereby discussed should be interpreted as significant statistical correlations rather than strictly causal relationships.

5. CONCLUSIONS

We have confirmed the crucial role that urban centers play in territorial development, including rural–urban territories where the economic, social, demographic, and cultural characteristics of rural areas still bear much weight. The presence of a city in a rural–urban territory is associated with more economic growth in Chile and Colombia and to greater reductions of poverty in all three countries. For Mexico, the relationship of poverty and growth was less clear, probably due to cash transfers in the rural sector. We also noted scale effects regarding the size of the city, although they are not linear. Particularly, we observed large differences between territories with different sized-cities within urban–rural territories; the greatest improvements in poverty reduction can be observed in territories with large metropolises.

We also analyzed a set of characteristics of urban centers and their relation to the rural hinterland in functional territories. We found strong differences in their effects on changes in income, poverty, and inequality in the territories as a whole. This means that the "city effect" is a combined result of different channels, some of them pro- and others anti-growth, poverty, or inequality. A city enhances the growth of a territory, mainly through mechanisms linked to endogenous growth processes, by favoring a diversity of ideas, flows of information and knowledge, and by providing access to services of greater specialization. At the same time, it seems to be a place where public consumption concentrates to the detriment of the surrounding rural environment. At least, a city allows this investment to stay in the urban part of the territories, encouraging aggregated territorial growth as a result.

At a country level, while being cautious about projecting future effects on the basis of this analysis of past tendencies, we can observe the following effects:

- In Chile, encouraging the development of specialized services in intermediate cities, fostering amenable environments supporting social diversity, and increasing investment in the rural surroundings to reduce the gap with the respective urban center appear to have a potential for poverty reduction.
- In Colombia, the only channel which allows improvement of poverty, income, and inequality is a reduction in the rural–urban public investment gap. The other channels involve a trade-off between different objectives, and therefore, policy decisions would have to be made taking into consideration the relative magnitudes and the social distribution of gains and losses. However, given the marked changes which are happening in this country, it is probable that these relations will change in coming years.
- In Mexico, investment in research and development and in human capital together with a reduction of the urban–rural public investment gap would allow gains in income, poverty, or inequality individually.
- If we look at all three countries, a good level of public investment in rural–urban territories is the only one of the nine channels that we analyzed that strengthens positive effects of cities on territorial development without increasing adverse effects. We also see in Chile and

Mexico that encouraging participation of women in the labor market has an evident social benefit, but at the cost of greater inequality in the distribution of income; therefore, women's labor participation policies would have to be accompanied by anti-discrimination measures in terms of salary and in career development expectations.
- Human capital, connectivity, social diversity, productive diversification, specialized services, political competition, and gender systems are all country-specific and require a case-by-case analysis of their costs and benefits and of how these are distributed among the population.

There are important questions that should be addressed in future research. The first one refers to the distribution of the effects (on income, poverty, and income distribution) between the urban center and its rural environment within a single rural–urban territory. This is important because while a rural–urban territory in net or aggregated terms could be "winning" (experiencing greater income, less poverty, and a better distribution of income), this does not mean that the inhabitants of the rural areas of the territory would benefit to the same extent as those living in the urban center.

A second topic for further research is to compare territories with different types of city. For example, it is possible that a territory with a city that is agro-industrial would have different dynamics than one whose urban center is a dormitory-city, or one in which the economic dynamics are mainly driven by tourism or mining activities. Potentially, this work could dispel some of the inconclusive results of our analysis on the effects of different channels. Finally, the institutional framework is also an unexplored path in this paper that could be disentangled as appropriate data sources become available.

The results of this work reveal the importance of small- and medium-sized cities as facilitators of rural development. However, the portfolio of rural development policies almost never includes objectives, instruments, and resources for the development of small- and medium-sized cities and for the strengthening their linkages with their rural surroundings. It is important to correct this "deep rural bias" especially in countries such as those studied here, because we have seen that rural and territorial development largely depends on what happens (or does not happen) in these urban centers that lie at the core of urban–rural territories.

We also suggest that it is appropriate to acknowledge in public policy programs the role of small- and medium-sized cities that act as pivots for rural–urban areas in these countries. For example, an investment in a bus station or a wholesale market or in a technical institute does not have the same effect in a municipality in the hinterland as in the urban locality that is the center of the territory and offers services to all the surroundings. This pivotal effect can be enhanced through special programs in support of these cities, or simply through targeting mechanisms of existing programs and public funds. Moreover, it is possible to use this framework of functional territories to consider the spatial dimension of different policies and sectorial strategies.

Lastly, our results also warn that greater economic growth, stimulated by the presence of a city in a territory, is not necessarily accompanied by greater social inclusion and, especially, by a lower level of income inequality. The deeply rooted structures and institutions of inequality in Latin America remain resistant to virtuous cycles of growth and social inclusion.

NOTES

1. Furthermore, the role of these small- and medium-sized cities in territorial development is also hidden by the "metropolitan bias" of poverty reduction policies (Ferré *et al.*, 2012).

2. The specific time-span of this work varies among countries, due to differences of census data availability. For Chile, the period is 1992–2002, for Colombia is 1993–2005 and for Mexico is 1990–2005.

3. For the case of Mexico, the indicator of inequality is the change in the Theil index. For Chile and Colombia is the relative Gini index.

4. Robustness checks were also performed using a 2SLS estimation, obtaining the same results, available upon request.

5. An anonymous reviewer points out correctly that the supply of specialized services could be heterogeneous across cities as well.

6. Research and development, consultation services, and information technologies were used for the case of Chile.

7. Only for the case of Chile.

8. The diversity categories were defined using labor occupation classifications, at one-digit ISIC.

9. In the case of Mexico, measured as the electricity coverage in each territory.

10. This channel was only tested in Colombia.

11. Only tested in Mexico.

12. In fact, according to census data, between 65% and 90% of the population in Chile, Mexico, and Colombia, not only live and work in these places, but were born there too.

13. In Chile, we have excluded the territories of Cape Horn (due to lack of information at a municipal level) and Antarctica (because its settlement is mainly linked to geopolitical reasons).

14. In Colombia we have identified 438 territories. For the statistical analysis, we have excluded 44 territories corresponding to the old national territories because we did not have complete statistical information.

15. Another possible ommited variable bias that could be affecting our estimation besides the unobserved linkages and spillovers could be the measurement error and institutional quality of the territories. We do not have enough data to correct for the latter and discuss it as future research possibilities in the conclusions. The measurement error is addressed as a robustness check accounting for simulation errors.

16. Probably the strongest effect will be in the metropolises, whose interactions are broader and even global. As a robustness check, we take them out of the sample and results stay similar. These results are available upon request.

17. These results, as well as the Moran I coefficients are available upon request. The system of equations is still corrected with clustered standard errors to reduce potential spatial biases.

18. Robustness checks were performed using Theil index in Chile as well, not affecting the results. Data restrictions did not allow to use the same Inequality measurements for all the countries at the same time. Since the objective of this work is not inequality itself, we find appropriate to use these measurements that focus on the middle part of the income distribution. These results are available upon request.

19. Among the additional control variables included in the estimation as additional right-hand side coefficients, most notable cases include distances to administrative capitals, school attendance rates, water access, and ethnic diversity. In Mexico, we included state fixed effects to account for specific unobserved characteristics in southern and northern states. In Chile we also tried a non-parsimonious specification including even more right-hand side control variables, such as self-employment, women labor force participation, etc. In both cases, the coefficients of interest do not change significantly, for details on these estimations, complete tables are available upon request.

20. *p*-Values related to total effect significance tests are available upon request.

21. The dummies of fixed regional effect used in the case of Mexico for the states of Oaxaca, Chiapas, Puebla, and Veracruz and for the states of the North, were mostly significant and positive for the increase in poverty and negative for the increase in consumption per capita and inequality (except for the North which resulted in a positive coefficient in both cases).

22. We also included in the model a city-size category from 2,500 to 15,000 inhabitants and from 15,000 to 50,000. The same negative effects were found for cities that had more than 15,000 inhabitants and there was a positive impact for cities of between 2,500 and 15,000 inhabitants, although this was statistically significant only at 10%.

23. Population of more than 250 thousand inhabitants in Chile, 370 thousand in Colombia and one million in Mexico.

24. As a robustness check, we substituted the categories of city size in the system of equations by a continuous variable representing the city population and its squared value, obtaining similar results which are available upon request.

25. To calculate these dimensions, geographic and demographic indicators such as distance to capital, population density etc., were used in addition to the category of city.

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