Overcoming urban-rural imbalances: the role of cooperatives and social enterprises

Salustri, Andrea and Mosca, Michele and Viganò, Federica

Fondazione Economia Università Tor Vergata, Università Federico II Napoli, Libera Univeristà di Bolzano - Free University Bozen - Freie Universität Bozen

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Andrea Salustri
Fondazione Economia-Università Tor Vergata
via Columbia 2, 00133 Roma
E-mail: asalustri@hotmail.com

Michele Mosca
Universitá Federico II Napoli
Via Rodinó 22, 80138 Napoli
E-mail: michele.mosca@unina.it

Federica Viganò (corresponding author)
Libera Universitá di Bolzano- Free University Bozen- Freie Universität Bozen
Regensburger Allee 16 - viale Ratisbona, 16, 39042 Brixen-Bressanone Italy
E-mail: federica.vigano@unibz.it

Abstract

The paper introduces a theoretical model to show how in a spatial framework characterized by urban-rural imbalances, the production of goods and services decreases moving from urban to rural areas. Specifically in rural and peripheral areas, the market and the public sector might supply an insufficient level of goods and services due to higher distance costs and lack of financial resources. Cooperatives and nonprofit organizations, i.e. social enterprises, are able to overcome distance costs and therefore spatial inequalities, by developing a productive and distributive function in marginalized areas, ensuring a fair and equal treatment among residents. Moreover, cooperatives and nonprofit organizations endorse the inclusiveness of the labor market, and raise peoples' intrinsic motivation.

Keywords: cooperative economics; nonprofit institutions and social enterprises; urban-rural development; size and spatial distributions of regional economic activity.
JEL Classification: J54; L 34; R11; R12.

1. Introduction

Cities are important drivers of political change and social innovation, as they attract investments and provide infrastructural services that foster growth and development across a wide portion of territory. Nevertheless, the urban environment has also been addressed as the major cause of several problems affecting rural areas. Indeed, cities polarize the space activating processes of marginalization, and this happens particularly in times of recession, when the action of the institutions (firms, public administrations, financial intermediaries…) is limited to what it can be considered "financially accountable". Marginalized areas become empty places, where "economic emptiness" can be measured in terms of insufficient welfare, lack of resources, and stagnation of the economic activities. As a reaction, in these not necessarily scarcely populated places, there is room for residents to activate alternative solutions to overcome the lack of development and to generate a subsidiary welfare supply.

Due to their governance and aims pursued, non-profit organizations are the most appropriate social aggregations to rise peoples' intrinsic motivation, while cooperatives and social enterprises represent the most suitable institutions to connect the social motivation to the economic one, narrowing the gap between productivity and wages. Following this idea, in marginalized areas, residents are incentivized to found members-owned organizations by virtue of an economic rationale, which motivates members to focus on achievements rather than on monetary compensations. Finally, cooperatives and social enterprises can foster the connection between for profit and non-profit activities, turning the self-production attitude of the latter into a broader vision coherent with a mutualistic approach and a social attitude.

In the next two paragraphs, we present a literature overview (paragraph 2) and an economic model (paragraph 3) illustrating how the behavior of private and public institutions is affected by

distance costs, and why cooperatives and the non-profit sector are incentivized to compensate the emerging spatial imbalances. In the last paragraph, we briefly discuss the results of the theoretical analysis and we elaborate a set of policy recommendations.

2. Literature review

Limao and Venables (1999) in their seminal work envisage the relevance of transport and distance costs as determinants for enhancing participation of territorial areas to the economic production networks. We follow their approach, but, rather than on trade, we focus on the exposure of rural areas to processes of marginalization. Specifically, several authors evidence that rural markets are characterized by low levels of competition, thus resulting less attractive for profit-oriented companies (Kodrzycki 1994; Warner 2009; Bel et al. 2010; Warner and Hefetz 2003, Warner and Hefetz 2008). Indeed, the lack of market discipline discourages efficiency gains, therefore transaction costs tend to rise and governments are forced to exercise a greater oversight. Moreover, high transaction costs are often associated with contracting out (Kirkpatrick et al. 2006; Bel et al., 2010) and with processes of internal reform aimed at improving the efficiency in the production of publicly delivered services (Bel and Costas, 2006; Dijkgraaf and Gradus, 2007; Bel and Mur, 2009). Finally, in scarcely competitive environments, transaction costs increase also for services beneficiaries (i.e. citizens living in marginalized areas). The literature on the urban-rural dichotomy offers a significant evidence of a turning point in the debate, that evolves toward urban-rural linkages (Champion and Hugo 2004), and specifically on the re-urbanization of rural areas. However, even when the linkages between rural and urban areas are intense, due to socioeconomic marginalization and physical remoteness, peripheral

areas risk to be served neither from the public, nor from the private sector (Martin 2015, Caffyn and Dahlstrom 2005, Dijkgraaf & Gradus 2003; Levin & Tadelis 2012).

Thirdly, we briefly summarize the wide intellectual and empirical research on social capital. Specifically, we recall the seminal studies of Putnam (1993, 1995) and Coleman (1988, 1990), and we stress how the process of social capital accumulation can evolve either towards positive outcomes or toward the "dark sides" and exclusive processes of growth (Putnam 2000). By referring to this argument, we formulate the hypothesis that, in times of recession, rural areas must choose between two processes of social capital accumulation. The first process reflects a positive relation among the actors involved, leading to collaborative and strong social ties and facilitating the achievement of community based solutions for compensating the inefficient supply of public and market goods (Putnam 2000). As a by-product, community-based solutions reduce also distance costs for the public sector and for profit-oriented firms, fostering a way out of the economic crisis. The second pattern unleashes the dark side of social capital: when the supply of collective services does not meet the needs of residents, and/or the latter perceive that local resources have been subtracted through a mix of taxes and inefficient public policies, illegal and criminal activities benefit of a fertile environment to proliferate.

A remedial action of policy makers at this regard is crucial. Specifically, we claim that policies aimed at fostering the development of the cooperative sector in "middle zones" [see par.2] incentivize also the accumulation of the pure social capital in marginalized areas by activating mechanisms which induce citizens to prefer the legal to the illegal community-based actions. Indeed, in the inframarginal areas characterized by "shifting motivations" (i.e. a mixture of monetary and non-monetary incentives), the demand of goods and services can be satisfied by cooperatives and social enterprises, as by their nature they are "not for profit institutions", i.e. a

blend of peoples' non-profit attitude and institutional concerns for capacity building and growth. Specifically, cooperatives are able to internalize costs by paying lower monetary wages and dividends compared to for-profit firms (Becchetti at alii 2012, Narcy 2011, Weisbrod 1983, Leete 2000, Frey 1997, Preston 1989). Specifically, in places where distance costs are unsustainable for profit oriented firms, nonprofit organizations instead are able to recruit intrinsically motivated workers, i.e. workers who decide to participate in the production process accepting lower or even null wages, as their compensation is first of all of non-monetary nature (but anyway coherent with their individual interests). The development of non-profit organizations in marginalized areas facilitates the consolidation of the cooperative movement in inframarginal areas. Finally, a well-developed cooperative sector fosters the competitiveness of for profit businesses, abating the costs and rising the productivity of the inputs employed in the production processes.

3. A model for evaluating distance costs between urban and rural areas

The theoretical framework illustrates how land matters in determining the localization and the degree of development of the market and of the public sector along a continuous that goes from urban to rural areas. The economic analysis, instead, focuses on how distance costs influence the supply of goods and services, making the organizational features of the economic institutions relevant in selecting the most effective and efficient actors.

The logical framework, as reported in figure 1 in appendix, is made of three vertexes ("Urban", "Rural" and "Institutions"), and three sides ("People", "Resources" and "Land"). On an orthogonal axis with respect to the "triangle" proposed, it accounts also for the scale of measure adopted to discuss the phenomenon under inquiry. We focus our analysis on the linkages among

the institutional organization of a territory and landscape, as we suspect that landscape is not neutral in determining the socioeconomic development of a community. By adopting an institutional perspective, "Land" is out of the analysis, as everything is perceived in terms of "People" (labour), and "Resources" (capital). We try to reintroduce "Land" through a place-based economic model that lies its rationale on the concept of distance costs.

Specifically, we assume that land (L) is a continuum that goes from Urban (U) to Rural (R) areas. Land is characterized by a heterogeneous level of distance costs, population density and per capita income. At institutional level, we distinguish four classes of actors (profit-oriented firms, the public sector, cooperatives and social enterprises, non-profit institutions). Finally, we assume that institutions supply residents (people living in a specific place L_0) with a generic output Y, and that Y's production costs do not depend on land, so that at territorial level the only costs that matter are "distance costs". Specifically, distance costs increase as far as one moves from U toward R due to several reasons (transport costs, scarce availability of infrastructures, transaction costs, etc.). On the other hand, as far as one moves from U to R, population density and per capita income decrease, therefore the aggregate demand drops.

3.1 Market equilibria and profit maximization choices

We now explain how the market equilibrium (the outcome of the exchange process between institutions and residents) changes moving across land. Due to the assumptions made, the aggregate demand is a decreasing function of land (where $L = 0$ indicates the central place), as population density decreases and households have lower incomes. On the other hand, the supply function is an increasing function of L, as moving from U to R distance costs tend to increase. Therefore, profit oriented firms have a convenience to serve only a specific share of land,

generating spatial inequalities. Moreover, in order to make extra-profits, they have an incentive to serve a place as much as it is closer to *U*. In order to keep the analysis as simple as possible, we provide an example with linear demand and supply curves.

§ An example

Assume that the behavior of the industry of good *Y* can be approximated to the behavior of a single profit oriented firm characterized by a constant returns to scale technology. The industry serves three marketplaces: the market *A,* located in the central place (*U*); the market *B,* located in an inframarginal area, and the market *C,* located in a peripheral area. The three marketplaces are characterized by distance costs that are:

- increasing in the level of output *Y* (in market *A* distance costs are zero);
- increasing in the distance from *U* for a given level of *Y* ($0 < ADC_B < ADC_C$).

Moreover, each marketplace is characterized by a linear aggregate demand, such that

$$p_A(Y) = a - bY_A, \quad p_B(Y) = a' - b'Y_B \quad p_C(Y) = a'' - b''Y_C$$

With $a > a' > a''$, and $b < b' < b''$. Finally, we assume that in market *C* average distance costs are higher than the maximum willingness to pay for *Y* ($ADC_C > a''$), and that there is a zero possibility of profitable arbitrage[1].

The results of the analysis are summarized in Figure 1. Notice how the three market equilibria are characterized by a decreasing level of output *Y* and by increasing prices *p*, and how in market *C*, in the absence of public subsidies, the optimal supply is null. Both in *A* and in *B* profits are null, but if firms collude the profit that they can obtain is higher in *A* rather than in *B*.

[1] The absence of profitable arbitrage means that residents face higher distance costs than the industry, therefore it is not convenient for an individual to buy good *Y* in market *A* and resell it in market *B* or *C* creating a secondary market that cannibalizes the demand faced by the industry.

Therefore, people living in place *C* are excluded from the market. Alternatively, they have to move either to place *B*, either to place *A* in order to buy the good *Y*, but in this case the market charges on peripheral residents the distance costs. In both cases, there is evidence of a spatial inequality.

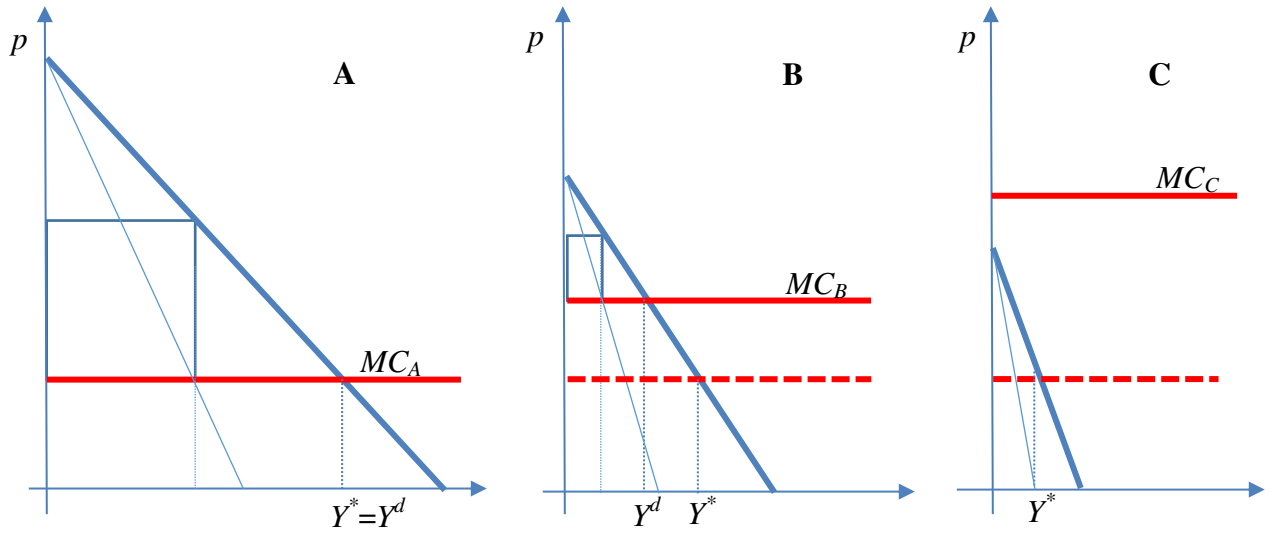

Figure 1 – The exchange process in the (*p*, *Y*) plan.

The same issues can be explained in the (*L*, *Y*) plan, where *Y* denotes the quantity of *Y* exchanged in place L_0. It is worth noticing how the blue lines indicate the quantity of *Y* exchanged in the absence of distance costs, while the red lines indicate the quantity of *Y* exchanged when distance costs occur. On the other hand, the dotted lines indicate the quantity of *Y* exchanged when firms collude. Therefore:

- the continuous blue line indicates the quantity of *Y* exchanged in the absence of distance costs under perfect competition (Y^*);
- the continuous red line indicates the quantity of *Y* exchanged when distance costs occur under perfect competition (Y^d);

- the dotted blue line indicates the quantity of Y exchanged when distance costs occur and firms collude (Y^c);
- the dotted red line indicates the quantity of Y exchanged when distance costs occur and firms collude.

It is easy to recognize that the marketplace A is the more developed and it is not affected by distance costs. Secondly, marketplace B is in the middle, as it serves a lower aggregate demand (less people with lower income), and positive distance costs contribute to rise costs. Finally, the marketplace C is the less developed, and it exists only when distance costs are null. Clearly, a significant abatement of distance costs might contribute to increase the share of land served by the industry of good Y, including also the marketplace C. Specifically, the share of land served by the industry Y is that one corresponding to the segment $\overline{AE}$, where E is the first place in which the demand of Y is null when distance costs occur.

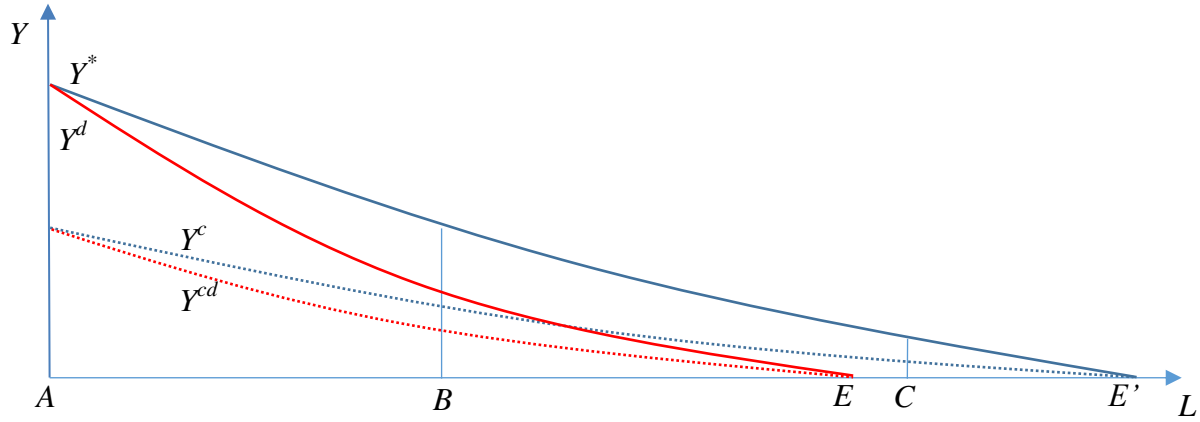

Figure 2 – The exchange process in the (Y, L) plan.

3.2 Public expenditure

Distance costs might play an important role also in determining the effective level of per capita public expenditure g = (Public Expenditure)/(Population). Specifically, assume that the public

sector fixes a homogeneous level of per capita public expenditure, and that the public infrastructure (consider for example a hospital) is built in the central place. When distance costs are positive and increasing as far as one moves from *U* to *R*, the net level of per capita public expenditure decreases from g^{max} to g^{min}, raising a specific kind of spatial inequality (see Figure 3). Moreover, in certain cases distance costs might determine perverse effects on land: in places where distance costs overcome the level of per capita public expenditure, people obtain a negative contribution to their wellbeing from the public sector. We observe how, while inequality is a necessary cause (but not a sufficient one), a detriment to wellbeing is a sufficient cause, but not a legitimation, for illegal and criminal activities.

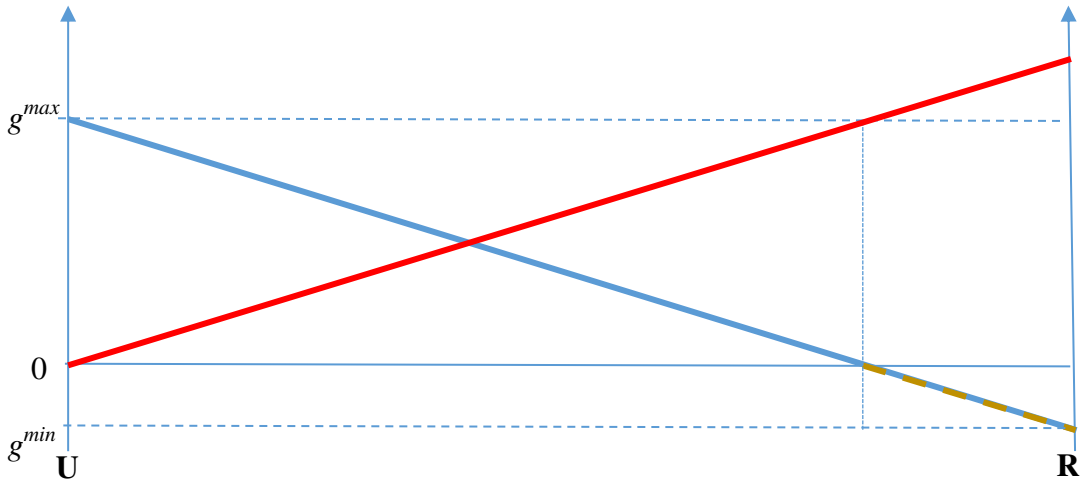

Figure 3 – Net contribution across land of a constant per capita public expenditure.

3.3 Household production and nonprofit activities

Non-profit activities contribute to reduce spatial inequality, as their economic performance is inversely proportional to the level of income that people earn, and consequently to the level of goods and services provided by public and private institutions. Specifically, under certain circumstances, non-profit institutions can reward volunteers and donors with gifts that are more

valuable than the wage offered in the same place by profit-oriented firms and by the public sector.

As an example, consider the case in which residents must buy at least a minimum consumption basket C^{min} in order to live in a given place L_0, where p_0 is the price of C in place L_0. They receive a wage w_0 for each hour worked, and they receive a reward w' for each hour volunteered. Each resident is endowed with the same level of time T. In the absence of non-profit institutions, the solution of the utility maximization problem (see Appendix) does not exist when w is too low, as when $wT < pC^{min}$ people are unable to pay for the minimum living standards. In a static framework, marginalized residents are incentivized to employ in illegal or criminal activities in order to compensate the income-expenditure gap (migration is not allowed in the model as it requires time). When this situation occurs, the non-profit sector can provide a legal and ethical alternative by offering rewards (monetary or non-monetary) in exchange for volunteering, allowing marginalized residents to achieve a decent standard of living. As in the central place a significant share of the demand is satisfied by the market and by the public sector, leading to consumption patterns that overcome the minimum living standards, it is reasonable to expect increasing rewards as far as one moves toward peripheral areas, because where the market supply of goods and services is lower, non-profit institutions are asked to pursue more urgent (and therefore more valuable) needs. We lay on the consideration that the opportunity cost of one hour of volunteering is the wage corresponding to one hour of paid job (w), and that the reward obtained for one hour of volunteering corresponds to the value of its marginal productivity (w'), that is increasing in the distance from the central place. In figure 4 we illustrate why in peripheral areas people are incentivized to participate in non-profit activities, while in central areas instead they are incentivized to participate in the labor market. Specifically, the difference ($w' - w$) is

positive along the segment $\overline{ER}$, while it is negative after *E*. Due to shocks involving the demand and the supply curves on the markets of goods and services and to changes in welfare needs, the difference (*w'* – *w*) can be highly volatile. Therefore the inframarginal areas nearby point *E* are characterized by frequent "motivational shifts", meaning with it that an equilibrium between the income and the expenditure can be pursued by rebalancing the mix of non-profit and for profit activities. In these "middle zones", cooperatives and social enterprises are the most efficient institutions, as by their nature they integrate social motivations with economic interests, avoiding frequent reorganizations that rise costs and determine the inefficiency of the production process. The development of the cooperative sector and the start-up of new social enterprises are important also for other reasons. First, they contribute to raise the price competitiveness and the sustainability of the goods and services exchanged in the markets, as they use technologies that are both efficient and socially responsible. Second, they pursue goals of social interest, therefore they reduce the costs charged to the public sector for achieving a decent level of welfare. Third, they guarantee a stable demand of welfare services produced by non-profit activities, raising the value of the rewards offered to volunteers, screening the non-profit outputs according to their efficiency and their ethical content.

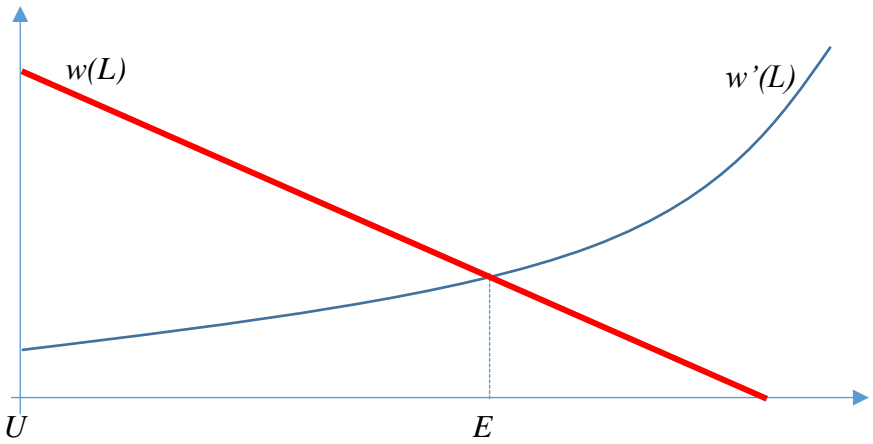

Figure 4 – Incentives for non-profit activities.

3.4 Spatial inequalities and equal opportunities

In this paragraph, we discuss how spatial inequalities raise concerns on the need of achieving equal opportunities among residents in terms of participation in the labor market and in non-profit activities, as, even by allowing residents to move across land in search of the most paid jobs, distance costs affect the individual utility to apply for them. This issue is illustrated in Figure 5, where we compare the wage function w and the reward function w' with the distance costs for residents living in three different places (U, E, R). Specifically, allowing citizens mobility, in the absence of distance costs, the most paid jobs are assigned to the most efficient workers, as in equilibrium, when the ability of each worker is observable, the for profit sector hires all those workers whose productivity is equal or higher of the real wage offered, within the constraint imposed by a finite aggregate demand. In this case, it is possible for a resident living in C to apply for a work in the central place, obtaining a high wage; therefore, there is no reason to suspect a lack of equal opportunities among urban residents and peripheral residents. For the same reason, the most rewarded non-profit activities are assigned to the most motivated and capable volunteers, as, when the non-profit sector exists, it hires all the volunteers whose productivity is higher of the reward offered, within the limits of the constraint imposed by a finite aggregate demand.

When, instead, land is characterized by linear distance costs affecting residents' mobility, the latter must compare the utility of the net wage offered by the industry and public sector (gross wage minus distance costs) with the disutility of the job proposed. Similarly, when residents decide to apply for a volunteering position in the non-profit sector, they must compare the net value of the reward (gross reward minus distance costs) with the disutility of the activity that

they must perform. Clearly, in both cases people face a subjective assessment, depending on their skills and on their attitude to mobility. However, it is possible to highlight some general issues.

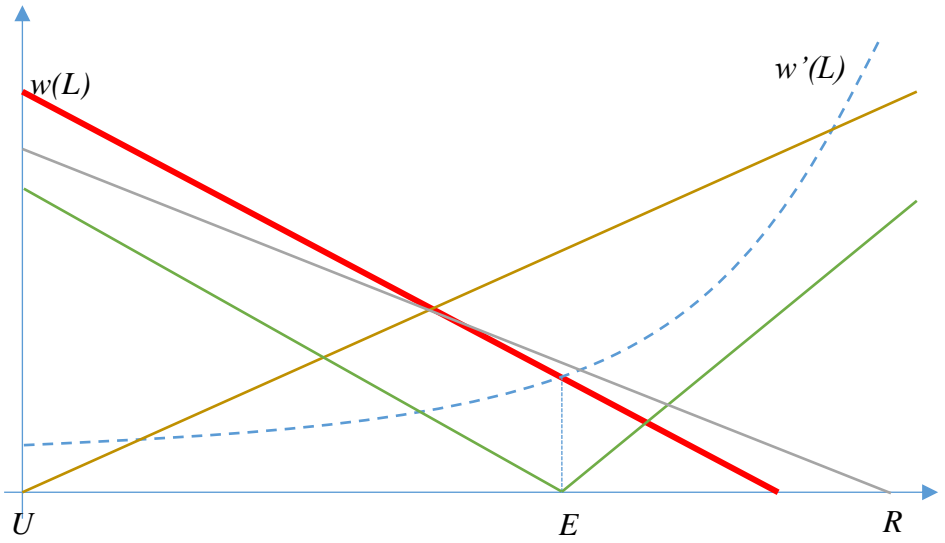

Figure 5 – Wages, rewards and distance costs

Specifically, a resident living in the central place (*U*) can achieve the most paid job positions, but has no access to most non-profit activities (in the example proposed, he has convenience to volunteer either locally or in the most remote places, if the reward is enough to compensate the distance costs). Therefore, residents living in the central place that are employed by neither the public nor the private sector have an incentive either to migrate, either to participate locally in non-profit activities. Similarly, a resident living in *R* can volunteer in the most rewarded non-profit activities, but has access only to high wage job positions (if the wage offered overcomes distance costs), as in middle areas distance costs are higher than the wage offered by the industry. Furthermore, high skilled residents living in *R*, in the absence of rewarded non-profit activities, have an incentive to migrate to the central place, in order to reduce distance costs and

obtain high wages. Finally, residents living in *E* can choose only between jobs and non-profit activities characterized, respectively, by average wages and average rewards, as the most paid positions are accessible only by paying high distance costs.

We conclude this section with three remarks. First, we notice how, due to the assumptions made, the model predicts a scarce presence of migrants in the middle zones, and a multicultural composition of residents in the central place and in peripheral areas. Therefore middle zone are adapt to accumulate bonding social capital, while central and peripheral areas are adapt to accumulate bridging social capital. Second, the model suggests how:

- in the central place the for profit sector offer high wages, while the non- profit sector offers low wages;
- in middle zones both the for profit and the non-profit sector offer average wages;
- in peripheral areas the for profit sector offer low or null wages, while the non-profit sector offer high wages.

Therefore, the central place and the peripheral areas are characterized by a higher level of income inequality with respect to the central areas. It might be of interest to investigate if this income gap exists and is justified by a heterogeneous productivity of labor and volunteering activities.

Finally, it is worth noticing how peoples' net utility (wages minus disutility of effort minus distance costs) decreases as far as citizens find a job that is distant from their residence, as distance costs increase. Indeed, people's commuting reduces the individual utility of labor and non-profit activities. The disutility of commuting can be partially reduced by peoples' intrinsic motivation, as it reduces the disutility of effort, but anyway it raises concerns on the opportunity of achieving a broader diffusion of work-from-home activities.

5. Conclusions

The paper focuses on the analysis of the economic determinants of spatial inequality. Specifically, we illustrate why the market and the public sector are sometimes unable to satisfy the needs of peripheral or rural areas. Indeed, profits are more consistent in places characterized by high population density and high per capita incomes, i.e. urban areas, and the impact of fiscal policy can be countered by increasing distance costs, as the latter reduce the efficiency of the measures adopted. Additionally, given a fixed and positive level of per capita expenditure (net of taxes), under certain circumstances distance costs lead to the impoverishment of people living in marginal areas, activating an unsustainable process of economic divergence.

Specifically, distance costs can generate government and market failures: a cost-opportunity analysis shows how distance costs affect firms' activity reducing the share of land supplied by the industry. On the other side, the lower income and population density arising in the peripheral/rural areas are at the basis of the mismatch among the supply and demand that generates the absence of market activities.

Distance costs affect also the optimal level of the public expenditure generating a perverse effect on residents receiving a negative contribution in terms of net public expenditure. The latter create incentives for residents to act illegally, especially when public policies pretend to provide a positive contribution to welfare, while indeed they are detracting local resources.

Subsequently, we illustrate how cooperatives and non-profit organizations can compensate the lack of private and public supply, fostering a fair and equal treatment among residents. The decreasing opportunity cost for free time of workers living in peripheral/rural areas explains from a rational point of view the emergence of cooperatives and nonprofit organizations. In fact, the opportunity costs of free time are lower in peripheral areas, as wages are null or lower than in

urban areas, while peoples' needs can be satisfied mainly or only through household production and the constitution of member-owned organizations (Le Vay 1983). Therefore, people living in marginalized areas are incentivized to take part in the informal economy, while they have limited access to the formal economy (Salamon et alii 2011).

Finally, we discuss how spatial inequalities raise concerns on the need of achieving equal opportunities among residents in terms of participation in the labor market and in non-profit activities, as, even by allowing residents to move across land in search of better paid jobs, distance costs affect their individual utility to apply for them.

Laying on these issues, we elaborate the following set of policy recommendations:

- the public sector must manage carefully the implementation of public policies in remote places and marginalized areas, as the existence of distance costs determine counterintuitive effects, i.e. territorial imbalances and the impoverishment of marginalized areas; the gross per capita public expenditure, therefore, should increase proportionally to the rise of the distance costs;
- policy makers interested in landscape development should pay particular attention to incentivize the non-profit sector in peripheral areas, in order to endow marginalized residents with an alternative source of income, that becomes the only one in places where the market and the public sector are absent;
- moreover, policy makers should foster the development of the cooperative sector and of social enterprises in the inframarginal areas characterized by "shifting motivations", in order to build new connections between the for profit and the non-profit side of the economy, raising at the same time profit-oriented firms' competitiveness and social inclusion;

- financial institutions and public administrations should manage to abate distance costs through ad hoc infrastructural policies aimed at improving both the material and the immaterial networks at economic and at individual level, as distance costs generate unequal opportunities among residents, income inequality, and a scarce effectiveness of labor and volunteering activities.

As regards the non-profit sector, we have observed how people living in marginalized areas have a "structural" propensity to be involved in informal activities, but the concept of "informal activities" includes both non-profit ones, and illegal or criminal ones. Therefore, marginalized residents face a choice between two alternatives. The first one discovers the dark side of social capital and leads to the development of an illegal economy, which inexorably undermines the chances of social development and economic growth of citizens and firms. The second one leads to reinforce social capital boundaries and networks. In this hypothesis, cooperatives and the non-profit sector provide an autonomous supply of goods and services at lower costs, repolarizing marginalized spaces according to people's needs. Cooperatives and nonprofit organizations in fact, contribute to break the twofold vicious cycle, which goes from the social and cultural impoverishment to the increase of the social insecurity, and from the latter to the spread of distrust among citizens and the legal institutions. Indeed, the creation and intensification of an adequate process of accumulation of "pure" social capital may contrast organized crime in the areas where its presence is massive, distorting the rules of functioning of markets and jeopardizing the social and economic development.

Specifically, social capital represents a productive resource just as financial, environmental, or human capital, therefore requires investments and generates returns in the form of cooperative behaviors, better communication and coordination between members and opportunity to meet

their needs (Valentinov 2004). Cooperatives and the nonprofit organizations in this perspective are seen as potential tools for economic development because they can guarantee what for-profit organizations and people operating individually do not: they can build stock of social capital, give members a "voice" to advocate change in government policies, promote local ownership and control of capital, create jobs, and fight organized crime. At economic level, they are able to reduce spatial inequality relying on different incentives structures, and to unleash the potential of the informal economy in times of recession by recruiting workers available to accept lower wages in return of the production of goods and services that better guarantee the satisfaction of their basic needs.

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Mathematical appendix

We begin by providing the following definitions:

- $Y \in [0, +\infty)$ is the output produced by the local industry;

- $L \in [0, +\infty)$ the distance from the central place, where $L = 0$ represents the central place (the urban area);

- $m(L) = m_0 - m_1 L = m_0 [1 - (m_1/ m_0)L] = m_0 (1 - \mu_m L)$, where $m(L) \geq 0$, is households' nominal income (we assume that it is decreasing as far as a household lives from the central place);

- $n(L) = n_0 - n_1 L = n_0 [1 - (n_1/ n_0)L] = n_0 (1 - \mu_n L)$, where $n(L) \geq 0$, indicates population living in place L (we assume that it is decreasing as far as one moves toward rural areas).

We use these variables to build the aggregate demand function. Specifically, consider the following household's utility maximization problem, where R indicates free time, and T is the disposable time:

[1] $$\max U(Y,R) = Y^{\alpha}R^{\beta} \quad s.t. \quad pY + wR = m(L)$$

For a given *L*, the optimal demands of Y and R are

[2] $$Y^* = \frac{\alpha}{\alpha+\beta}\frac{m(\bar{L})}{p} = \frac{M_Y(\bar{L})}{p} \quad R^* = \frac{\beta}{\alpha+\beta}\frac{m(\bar{L})}{w} = \frac{M_R(\bar{L})}{w}.$$

It is worth noticing how the optimal demand of good Y is a non-linear decreasing function both of p and L. Rather than log-linearizing, in order to avoid null marginal revenues, we approximate the optimal demand function to a linear specification as

$$Y = aM_Y(\bar{L}) - bp$$

therefore we obtain the aggregate demand for place L by summing up the individual demands of the $n(L)$ identical residents

$$Y^d = \sum_{n(\bar{L})}(aM_Y(\bar{L}) - bp) = n(\bar{L})aM_Y(\bar{L}) - n(\bar{L})bp.$$

It follows that the inverse aggregate demand of good Y is equal to

[3] $$p = \frac{aM_Y(\bar{L})}{b} - \frac{Y}{n(\bar{L})b} = \frac{\frac{\alpha}{\alpha+\beta}am_0n_0(1-\mu_mL)(1-\mu_nL)-Y}{bn_0(1-\mu_nL)} = A(\bar{L}) - B(\bar{L})Y$$

with $\partial A/\partial L < 0, \partial B/\partial L > 0$.

Now, assume that the industry of good Y is composed of a multitude of small firms localized in the central place and characterized by a constant returns to scale Cobb-Douglas technology. Industry Y's behaviour therefore can be approximated to that one of a single profit maximizing firm characterized by the same technology solving the following profit maximization algorithm

[PM1] $$\max p(Y)Y - wL - rK \quad s.t. \quad Y = L^{\gamma}K^{1-\gamma}$$

Under perfect competition, the equilibrium between the aggregate demand and the aggregate supply is found for $p^* = AC^{min}$. Due to the assumption of constant returns to scale, the total cost function is linear in Y, therefore $AC(Y) = MC(Y) = c$. The level of output Y^* is found by simply replacing p^* in the aggregate demand function. If firms collude, the optimal solution is instead $MR(Y) = MC(Y) = c$, or alternatively, $p^c = [1 + \mu_r]MC(Y) = c[1 + \mu_r]$. It is worth noticing how, in order to serve the place L_0, we assume that the industry faces linear distance costs that are increasing both in L and Y. Specifically, the profit maximization algorithm, after having solved the cost minimization problem, can be rewritten as

$$\max \pi = p(Y)Y - cY - d\bar{L}Y$$

Where $d\bar{L}Y$ are the distance costs. Indeed,

$$cY + d\bar{L}Y = c\left(1 + \frac{d}{c}\bar{L}\right)Y = c(1 + \mu_d\bar{L})Y = c[1 + \mu_d(\bar{L})]Y,$$

where $\mu_d(L)$ is a linear function in Y. Therefore, the profit maximization algorithm can be rewritten as

[PM2] $$\max \pi = p(Y)Y - c[1 + \mu_d(\bar{L})]Y,$$

and under a regime of perfect competition and in case collusion solution are respectively

[4] $$p^{*d} = c[1 + \mu_d(\bar{L})], \quad p^{cd} = c[1 + \mu_r][1 + \mu_d(\bar{L})]$$

The four alternative results of the profit maximization algorithm are illustrated in Figure 1 for three places characterized by $L_A = 0$, $L_B \prec L_C$. It is worth noticing how an important result is that the market equilibrium is affected by two sources of inefficiency: one depends on firms' market power, and one depends on the existence of distance costs. In the example provided, the existence of distance costs determines the absence of the market in place *C*.

Specifically,

$$p = \frac{\frac{\alpha}{\alpha + \beta}\, am_0 n_0 (1 - \mu_m \bar{L})(1 - \mu_n \bar{L}) - Y}{bn_0 (1 - \mu_n \bar{L})} = c[1 + \mu_r][1 + \mu_d \bar{L}]$$

It follows that

[5] $$Y = n_0 \left(1 - \mu_n \bar{L}\right) \left\{ \frac{\alpha}{\alpha+\beta}\, am_0 \left(1 - \mu_m \bar{L}\right) - cb[1 + \mu_r][1 + \mu_d \bar{L}] \right\}$$

Equation [5] can be written also as

$$MR(Y) = A(\bar{L}) - 2B(\bar{L})Y = \frac{\frac{\alpha}{\alpha+\beta}\, am_0 n_0(1 - \mu_m L)(1 - \mu_n L) - 2Y}{bn_0(1 - \mu_n L)} = c[1 + \mu_d \bar{L}] = MC(Y)$$

It follows that

$$Y = 0{,}5 n_0(1 - \mu_n L)\left(\frac{\alpha}{\alpha+\beta}\, am_0(1 - \mu_m L) - cb[1 + \mu_d \bar{L}]\right)$$

As μ_m and μ_n exist by construction, we focus the analysis on how the level of *Y* changes due to: i) a positive mark-up imposed by the industry (collusion), and ii) a positive mark-up due to distance costs. Specifically, there are four possible equilibria:

- perfect competition and absence of distance costs:

$$Y^* = n_0(1 - \mu_n L)\left\{\frac{\alpha}{\alpha+\beta}\, am_0(1 - \mu_m L) - cb\right\}$$

- collusion and absence of distance costs;

$$Y^c = 0{,}5\, n_0(1 - \mu_n L)\left\{\frac{\alpha}{\alpha+\beta}\, am_0(1 - \mu_m L) - cb\right\}$$

- perfect competition and positive distance costs;

$$Y^{*d} = n_0(1 - \mu_n L)\left\{\frac{\alpha}{\alpha+\beta}\, am_0(1 - \mu_m L) - cb[1 + \mu_d L]\right\}$$

- collusion and positive distance costs.

$$Y^{cd} = 0{,}5\, n_0(1 - \mu_n L)\left\{\frac{\alpha}{\alpha+\beta}\, am_0(1 - \mu_m L) - cb[1 + \mu_d L]\right\}$$

The same equations can be rewritten as:

$$Y^{*} = n_0 \frac{\alpha}{\alpha+\beta}\, am_0(1 - \mu_m L) - n_0\mu_n L \frac{\alpha}{\alpha+\beta}\, am_0(1 - \mu_m L) - n_0 cb + cb\, n_0\mu_n L =$$

$$= n_0 \frac{\alpha}{\alpha+\beta}\, am_0 - n_0 \frac{\alpha}{\alpha+\beta}\, am_0\mu_m L - \frac{\alpha}{\alpha+\beta}\, am_0 n_0\mu_n L + \frac{\alpha}{\alpha+\beta}\, am_0 n_0\mu_n\mu_m L^2 -$$

$$-n_0 cb + cb\, n_0\mu_n L =$$

$$= n_0\left(\frac{\alpha}{\alpha+\beta}\, am_0 - cb\right) - n_0\left(\frac{\alpha}{\alpha+\beta}\, am_0(\mu_m + \mu_n) + cb\, \mu_n\right)L + n_0 \frac{\alpha}{\alpha+\beta}\, am_0\mu_n\mu_m L^2 =$$

$$= A - BL + CL^2$$

$$Y^{c} = 0{,}5 n_0 \frac{\alpha}{\alpha+\beta}\, am_0(1 - \mu_m L) - 0{,}5 n_0\mu_n L \frac{\alpha}{\alpha+\beta}\, am_0(1 - \mu_m L) - 0{,}5 n_0 cb +$$

$$+0{,}5 cb\, n_0\mu_n L =$$

$$= 0{,}5 n_0\left(\frac{\alpha}{\alpha+\beta}\, am_0 - cb\right) - 0{,}5 n_0\left(\frac{\alpha}{\alpha+\beta}\, am_0(\mu_m + \mu_n) + cb\mu_n\right)L +$$

$$+0{,}5 n_0\left(\frac{\alpha}{\alpha+\beta}\, am_0\mu_n\mu_m\right)L^2 =$$

$$= 0{,}5(A - BL + CL^2)$$

$$Y^{*d} = n_0 \frac{\alpha}{\alpha+\beta}\, am_0(1 - \mu_m L) - n_0\mu_n L \frac{\alpha}{\alpha+\beta}\, am_0(1 - \mu_m L) - n_0 cb + cb\, n_0\mu_n L -$$

$$-n_0 cb\mu_d L + cb\, n_0\mu_n\mu_d L^2 =$$

$$= n_0 \frac{\alpha}{\alpha+\beta}\, am_0 - n_0 cb - n_0 \frac{\alpha}{\alpha+\beta}\, am_0\mu_m L - \frac{\alpha}{\alpha+\beta}\, am_0 n_0\mu_n L + cb\, n_0\mu_n L - n_0 cb\mu_d L$$

$$+\frac{\alpha}{\alpha+\beta}\ am_0 n_0 \mu_n \mu_m L^2 + cb\ n_0 \mu_n \mu_d L^2 =$$

$$= n_0\left(\frac{\alpha}{\alpha+\beta}\ am_0 - cb\right) - n_0\left(\frac{\alpha}{\alpha+\beta}\ am_0(\mu_m+\mu_n) + cb(\mu_n-\mu_d)\right)L +$$

$$+n_0\left(\frac{\alpha}{\alpha+\beta}\ am_0\mu_n\mu_m - cb\ \mu_n\mu_d\right)L^2 =$$

$$= A' - B'L + C'L^2$$

$$Y^{cd} = 0{,}5n_0\frac{\alpha}{\alpha+\beta}\ am_0(1 - \mu_m L) - 0{,}5n_0\mu_n L\frac{\alpha}{\alpha+\beta}\ am_0(1 - \mu_m L) - 0{,}5n_0 cb -$$

$$-0{,}5n_0 cb\mu_d L + 0{,}5n_0 cb\ \mu_n L + 0{,}5n_0 cb\mu_n\mu_d L^2 =$$

$$= 0{,}5n_0\left(\frac{\alpha}{\alpha+\beta}\ am_0 - cb\right) - 0{,}5n_0\left(\frac{\alpha}{\alpha+\beta}\ am_0(\mu_m+\mu_n) - cb(\mu_n-\mu_d)\right)L +$$

$$+0{,}5n_0\left(\frac{\alpha}{\alpha+\beta}\ am_0\mu_n\mu_m + cb\ \mu_n\mu_d\right)L^2 =$$

$$= 0{,}5(A' - B'''L + C'''L^2)$$

Laying on these results, Figure 2 illustrates how the level of output exchanged on the market.

The logical Framework