Social capital, labour precariousness and the economic performance. An empirical assessment of the strength of weak ties in Italy[*]

Fabio Sabatini[**]

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Abstract

This paper carries out an assessment of the influence that different kinds of social ties exert on labour precariousness, on the state of health of urban environments and on the economic performance in Italy. Overall, the empirical evidence shows that weak ties connecting members of voluntary organizations positively affect the economic performance and the quality of urban ecosystems, differently from strong ties connecting family members and close friends, which, on the other side, are proved to reduce labour precariousness.

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[**] University of Rome La Sapienza, Department of Public Economics, University of Cassino, Department of Economics. Address: University of Rome La Sapienza, Department of Public Economics, Via del Castro Laurenziano 9, 00161 Rome, Italy. Email: Fabio.Sabatini@uniroma1.it. Useful materials for the study of social capital are available on *Social Capital Gateway*, web site providing resources for social sciences edited by the author of this article, at the address www.socialcapitalgateway.org (see Sabatini, 2005a).

1. Introduction

"It's not *what* you know, it's *who* you know." This common aphorism summarizes much of the conventional wisdom regarding social capital and comes out from widespread experience that close competitions for jobs and contracts generally require the "right contacts" in the "right places". At the same time, when we fall upon hard times, we know it is our friends and family who constitute the final "safety net". For these reasons, strong ties among family members and close friends constitute an indispensable asset in improving people's well-being. However, they may operate also as a means to the pursuit of narrow interests and thus as a factor hampering knowledge spill-overs and development processes. On the contrary, weak ties are generally referred to as bridges connecting people from different socioeconomic backgrounds, therefore fostering the diffusion of information and trust, and benefiting the economic performance.

This paper carries out an empirical assessment of the influence that different types of social ties exert on labour precariousness, on the state of health of urban ecosystems and on the economic performance in Italy. Since the early work of Banfield (1958) and the publication of the famous research carried out by Putnam, Leonardi and Nanetti (1993) on the Italian regions, Italy is in fact one of the most popular case studies in the literature on sociocultural factors of the institutional and economic performance.

Starting from the acknowledgement of the very multidimensionality of the concept of social capital, the analysis focuses exclusively on its "structural" components, identified with social networks. Following Fukuyama (1999), and differently from great part of the empirical literature, this paper considers trust as an epiphenomenon, which, as suggested by Granovetter (1973, 1985) *may* arise only from the existence of certain types of social ties. The analysis accounts for three main kinds of social networks, each one shaping a particular dimension of the multifaceted concept of social capital: strong family ties, which are generally referred to as *bonding social capital* by the literature in the field, weak ties connecting friends and acquaintances (i.e. *bridging social capital*) and more formal ties connecting members of voluntary organizations (i.e. *linking social capital*). The investigation is based on a dataset collected by the author including about 200 indicators measuring different dimensions of the multifaceted concepts of social capital and economic development. Each social capital's dimension is evaluated by a single, synthetic measure, built by means of a principal component analysis performed on a subset of data including multiple variables. The economic performance is measured by a dimensional index representing per capita income, the state of health of urban ecosystems is assessed through a synthetic indicator built drawing on data provided by the Italian environmental NGO *Legambiente*, and the degree of labour precariousness is represented by an index accounting for the number of workers with provisional contracts and the number of people

looking for a job. Attempts are made also to evaluate the causal nexus connecting the latter three variables with global social capital endowments - as measured by a synthetic index built by means of a multiple factor analysis performed on a wide subset of data – and with the physical capital-labour ratio.

Causal relationships between variables are assessed through the use of structural equations models (SEMs). This technique has grown up in psychometrics at the beginning of the 70s and, although its application is a novelty for economic studies, it proves to be particularly suitable for the investigation of multidimensional phenomena like social capital and economic development. Structural equation modelling (SEM) grows out of and serves purposes similar to multiple regression, but in a more powerful way which takes into account the modelling of interactions between independent variables, influences by unknown "environmental" factors, and correlations among error terms. Other relevant advantages related to the use of SEMs are the possibility to pose more flexible assumptions and to test overall models rather than individual coefficients.

The main findings of the paper can be summarized as follows: linking social capital positively affects income, while bonding and bridging social capital exert a negative influence on the economic performance. Income positively affects bridging social capital and, to a lesser extent, linking social capital. Bonding social capital positively affects bridging social capital. Its negative influence on income is thus twofold: there is a direct effect, moving straight to income, and an indirect effect, passing through bridging social capital. The linking social capital of voluntary organizations is proved to exert a positive influence on the state of health of urban ecosystems. The model shows also that bonding social capital reduces labour precariousness. This finding may add some insights to the interesting debate on the role of social networks in the labour market, which has been recently nourished by the OECD through the recommendation of active labour market policies based on the establishment or the improvement of workers' personal networks (OECD, 2001).

Interesting results can be obtained by replacing bridging, linking and bonding social capital with a synthetic measure of global social capital endowments developed in Sabatini (2005b), and including into the analysis also the rate of high school attendance as a proxy for human capital. The model shows that considering all together the different dimensions of social capital makes every effect on economic outcomes simply disappear. This umpteenth confirmation of social capital's multidimensionality stresses the need for empirical investigations to adopt multiple indicators representing different dimensions of the concept. Overall, the empirical evidence in this paper corroborates both the widespread idea that weak ties may be a factor of economic development and

the common knowledge according to which the work status mainly depends on *who*, and not on *what*, people knows.

The outline of the paper is as follows: section 2 presents a brief overview on the main problems affecting the empirical literature on social capital and economic development. Section 3 is devoted to the description of data and methodology. Sections 4 and 5 present the empirical analysis' results. The survey is closed by some concluding remarks and guidelines for further researches.

2. The problems of measuring social capital and assessing its relationship with development

Despite a long intellectual history in the social sciences, the concept of social capital has gained celebrity only in the 90s, due to Bourdieu's (1980, 1986), Coleman's (1988, 1990) and Putnam's (1993, 1995) seminal studies. In particular, the famous research on the Italian regions carried out by Putnam, Leonardi and Nanetti in 1993 has massively drawn the economists' attention. In this study, the authors find social capital - identified with features of social life-networks, norms, and trust, that enable participants to act together more effectively to pursue shared objectives – to be positively and significantly related to the institutional and economic performance of the Italian regions across a period of 20 years. Subsequently, the last decade has registered an impressive amount of economic studies aiming to test the ability of different aspects of the social structure, often grouped under the common umbrella label of social capital, to exert a positive influence on the economic performance (Heliwell, 1996, Knack and Keefer, 1997, Temple and Johnson, 1998, Temple, 1998, 2001, Zak and Knack, 2001, Guiso, Sapienza and Zingales, 2004). However, the empirical evidence is still unconvincing and sometimes conflicting. We do not want to carry out a survey of this voluminous strand of the literature, which can be found elsewhere (Woolcock, 1998, Fine, 2001, Quibria, 2003, Durlauf and Fafchamps, 2004). The objective of this brief review is rather to point out some critical weaknesses virtually affecting most studies belonging to the field. In particular, we can identify eight main shortcomings:

1. despite the great amount of research on it, the definition of social capital remains substantially elusive. Following Coleman (1988), great part of the literature refers to social capital as all 'the aspects of the social structure that facilitate certain actions of actors within the structure … Making possible the achievement of certain ends that, in its absence, would not be possible' (Coleman, 1988, 98). Such "productive" aspects of the social structure can vary according to different environmental situations and agents' needs: 'A given form of social capital that is valuable in facilitating certain actions may be useless or even harmful for others' (*ibidem*). According to this approach, it seems virtually impossible to provide a single,

universal, definition of what social capital is, and a unique, underlying, method of measurement to be used within the empirical research.

2. The idea that social capital is a multidimensional concept is by now commonly accepted in the debate. This allows each author to focus on a particular aspect of the concept, according to the aims and scope of his own study. Empirical works every time address different dimensions, therefore adopting particular measures, derived from diverse data sources. This makes any general assessment difficult, due to incomparability in sampling designs and question wording (Wuthnow, 1997, Paxton, 1999).

3. Most empirical studies measure social capital through "indirect" indicators, not representing the social capital's key components already identified by the theoretical literature (commonly social networks, trust and social norms). Such indicators are very popular in the economics research, but their use has led to considerable confusion about what social capital *is*, as distinct from its *outcomes*, and what the relationship between social capital and its outcomes *may be*. Research reliant upon an outcome of social capital as an indicator of it will necessarily find social capital to be related to that outcome. Social capital becomes tautologically present whenever an outcome is observed (Portes, 1998, Durlauf, 1999). Of course, from a lexical point of view, it is possible to attribute the "social capital" label to every aspect of the economy's social fabric providing a favourable environment for production and well-being. However, such definition poses a "logic" problem: if social capital is everything can make agents cooperate or markets work better, then any empirical analysis will find that social capital causes cooperation among agents and improves the efficiency of markets. This approach simply "sterilizes" the social capital literature, making it unable to foster the explanatory power of economic studies addressing the socio-cultural factors of growth.

4. Great part of existing cross-national studies on the economic outcomes of social capital is based on measures of trust drawn from the *World Values Survey* (WVS). Trust measured through surveys is a "micro" and "cognitive" concept, in that it represents the individuals' perception of their social environment, related to the particular position that interviewed people occupy in the social structure. The aggregation of such data, however, creates a measure of what can be called "macro" or "social" trust which looses its linkage with the social and historical circumstances in which trust and social capital are located. As pointed

out by Foley and Edwards (1999), empirical studies based on cross-country comparisons of trust may be a "cul de sac", because of their inability to address macro outcomes, in view of the absence of the broader context within which attitudes are created and determined. Fine (2001) argues that 'if social capital is context-dependent – and context is highly variable by how, when and whom, then any conclusion are themselves illegitimate as the basis for generalisation to other circumstances' (Fine, 2001, 105).

5. Also studies focusing on social networks instead of social trust generally do not take into the appropriate account the multidimensional, context-dependent and dynamic nature of social capital. They usually analyze just one kind of network (for example voluntary organizations), which is considered as representative of the social capital concept as a whole, through a single measure. However, a simple descriptive analysis of available data allows us to point out that, even if they constitute just one aspect of the multifaceted concept of social capital, social networks are themselves a multidimensional phenomenon. They are characterized by different aspects, which can be described by a composite set of multiple indicators. This paper clearly shows that it is possible to take into account the different qualitative aspects characterizing each kind of network through the building of synthetic indicators by means of factorial analyses. Such indicators contain almost as much information as there is in the original variables describing social networks, and can be used as new raw data in further empirical analyses.

6. Following Putnam's (1993) hints, most studies focus on voluntary organization as a proxy for measuring social capital. The claim is that in areas with stronger, dense, horizontal, and more cross-cutting networks, there is a spillover from membership in organizations to the cooperative values and norms that citizens develop. In areas where networks with such characteristics do not develop, there are fewer opportunities to learn civic virtues and democratic attitudes, resulting in a lack of trust. However, there are several reasons to doubt of the efficacy of social capital measures simply based on the density of voluntary organizations. Firstly, even though individuals who join groups and who interact with others regularly show attitudinal and behavioural differences compared to nonjoiners, the possibility exists that people self-select into association groups, depending on their original levels of generalized trust and reciprocity. Secondly, the group experiences might be more pronounced in their impact when members are diverse and from different backgrounds. Until now the literature has not provided a micro theory explaining trust's transmission mechanism from

groups to the entire society, and the logic underlying the connection between social ties and generalized trust has never been clearly developed (Rosenblum, 1998, Uslaner, 2002). Thus, every finding on the correlation and/or the causal nexus connecting membership in civic associations to supposed social capital's economic outcomes must be handled with extreme caution.

7. The role of strong family ties is generally neglected by empirical investigations on the role of social capital in economic development. Besides the early intuition of Banfield (1958), who identified "amoral familism" as one of the main causes of Southern Italy's underdevelopment, until now quantitative economic studies have not accounted for the effects of family social capital on growth and development.

8. Even when a significant relationship between social capital and economic development is proved, doubts remain on the form and direction of the causal nexus connecting variables. Of course, it can be argued that higher levels of economic development determine the accumulation of positive endowments of social capital, and not vice versa. For example, Southern Italy's underdevelopment could be seen as a main cause for the growth of amoral familism.

3. Data sources and methodological issues: structural equations models as a suitable tool for the analysis of multidimensional phenomena[1]

The analysis in this paper is based on a dataset collected by the author, including about 200 indicators representing the "structural" dimensions of social capital and different aspects of the quality of economic development. An operational definition of social capital as formal and informal networks of agents sharing definite interests is provided, thus excluding from the measurement toolbox the concept of trust and all indirect indicators popularized by the empirical literature. This constitutes an attempt to overcome shortcomings underlined in points 1, 3 and 4 of the previous section. Social networks are acknowledged in their multidimensionality, since three main kinds of networks are considered within the analysis and each one is described by a subset of multiple indicators representing different dimensions for each subdimension, thus addressing the problems pointed out in points 5, 6 and 7. Rough data on social capital are drawn by a set of multipurpose surveys carried out by the Italian National Bureau of Statistics (Istat) on a sample of 20.000

[1] The methodological framework for the building of social capital's synthetic indicators is described in detail in Sabatini (2005b).

households between 1998 and 2002 (see Istat, 2000, 2001, 2002a, 2002b, 2002c, 2002d, 2003, 2004a, 2004b, cited in bibliography). Such data catch people's effective behaviour and their use allows to overcome problems reported in points 4 and 5 of section 2. Principal component analyses (PCAs) are performed on three subsets of multiple variables with the aim to build synthetic, latent, measures of strong family ties (i.e. bonding social capital), weak informal ties among friends, neighbours and acquaintances (i.e. bridging social capital) and weak ties connecting members of voluntary organizations (i.e. linking social capital). Basic variables are reported in tables A1, A2 and A3, annex A. The economic outcomes considered in the empirical analysis The economic performance is measured by a dimensional index representing per capita income elaborated by the Italian NGO *Lunaria*; the state of health of urban ecosystems is assessed through a synthetic indicator built drawing on data provided by the Italian environmental NGO *Legambiente*, and the degree of labour precariousness is represented by an index accounting for the number of workers with provisional contracts and the number of people looking for a job. Attempts are made also to evaluate the causal nexus connecting the latter three variables with global social capital endowments - as measured by a synthetic index built by means of a multiple factor analysis performed on a wide subset of data – and with the physical capital-labour ratio.

Relationships connecting all these variables are then investigated by means of structural equations models (SEMs). A SEM is 'A stochastic model where each equation represents a causal linkage, rather than a simple empirical association' (Goldberger, 1972, 979). SEMs are composed by regression equations, which are included in the model only so far as it is possible to interpret them as causal relationships, theoretically justifiable and not falsified by data. The use of structural models instead of regression models implies a complete revision of the parameters' estimation mechanism. In the regression model, parameters can be estimated through the ordinary least squares (OLS) method. In a model including two or more structural equations, where the same variables are independent within an equation and dependent in all the others, the estimation process is remarkably more complicated. Instead of equations estimates, we have to compute "system estimates", and it is not possible anymore to adopt the OLS method. Another peculiarity of SEMs is the possibility to account for other parameters in addition to structural *b* linking endogenous and exogenous variables. More in particular, it is possible to account for variances and covariances among exogenous variables - which, however, are neglected in the analyses performed in this paper, to the seek of simplicity – and for variances and covariances among errors *e*, which, on the contrary, play a fundamental role in defining the models built within the empirical investigations carried out in this thesis. The matrix Ψ of covariances among errors ζ is carefully defined in each model,

allowing to account for variables which, although not explicitly considered within the model, may play a role in the real scenario described by observed data.

When a model is perfectly specified, i.e. it includes all the variables effectively interacting in the real world, and correctly accounts for their dynamics, then each equation's stochastic error component is just a negligible detail. However, generally, this component includes all those factors that in the real world affect the model's dependent variable, but that we have not accounted for in the model's design because they are unknown or not measurable. If one of these unknown variables affects two of the model's endogenous variables at the same time, for example social capital and labour precariousness, and if we do not explicitly consider this possibility within the model, then the empirical investigation will necessarily find a spurious correlation between social capital and labour precariousness, which could be without precedent in the real world. On the contrary, if we explicitly consider a correlation between the errors respectively related to social capital and human development, then the effect of the unknown variable will be included in the model, making the spurious correlation disappear. In the light of the arguments summarized in this section, SEM appears to be a particularly suitable technique for the analysis of the relationship between multidimensional concepts like social capital and economic development and may constitute a possible response to the causality problems underlined in point 8 of the previous section.

4. The strength of weak ties. Social capital, the economic performance and the environment

Models are tested using SEM goodness of fit tests to determine if the pattern of variances and covariances in the data is consistent with structural (path) models theoretically specified. In this paper, only models with the best goodness of fit are presented. However, it must be remembered that, as other unexamined models may fit the data as well or better, an accepted model is only a not-disconfirmed model. Variables considered in the analysis are as follows:

- bonding social capital, shaped by strong ties connecting family members. This variable is measured by the first factor obtained from a principal component analysis (PCA) performed on a dataset of variables measuring the intensity and quality of family relationships, spatial proximity among members, and the relevance of other relatives besides the family unit. Basic indicators adopted within the PCA are described in table A1, annex 1.

- Bridging social capital, shaped by weak informal ties connecting friends and acquaintances. This variable is measured by the first factor obtained from a PCA performed on a dataset of

variables representing people social engagement or, in other terms, what can be referred to as "relational goods". Basic indicators are described in table A2.

- Linking social capital, shaped by weak formal ties connecting people from different socioeconomic backgrounds within the boundaries of voluntary organizations. This measure is given by the first factor resulting from a PCA performed on a set of indicators representing different dimensions of associational participation. Adopted variables are described in table A3.

- An index of labour precariousness (LPI) computed by the Italian association *Lunaria* (2004). It is given by the ratio between three variables representing precariousness and the regional labour force. The three variables are the number of workers with provisional contracts (*lavoratori interinali* and *lavoratori a tempo determinato*)[2], the number of the so-called *co-co-co* (*collaboratori continuati e coordinati*)[3] and the number of people looking for a job:

$$\text{LPI} = \frac{\text{workers with provisional contracts} + \textit{co-co-co}\text{s} + \text{people looking for a job}}{\text{regional labour force}}$$

The index ranges from 1 (highest precariousness) to 0.

- A dimensional index of per capita income, computed as:

$$index = \frac{effective\ \ value - minimum\ \ value}{target\ \ value - minimum\ \ value}$$

where the minimum value is 5.000€ and the target value = 40.000€. The index can thus be expressed as follows:

$$Income = \frac{\log(effective\ value) - \log(5.000)}{\log(40.000) - \log(5.000)}$$

[2] Workers with provisional contracts are measured by *Italia Lavoro*, a joint-stock company owned by the Italian Ministry of Economics and Finance, drawing on Istat's data.

[3] The number of *co-co-co*s is measured by Ires-Cgil (2001) drawing on INPS' data.

- The state of health of urban ecosystems, as measured by an index of urban ecosystems drawn by *Lunaria* (2004) from *Legambiente*'s (2003a) annual report on the quality of urban environments. The index is computed as the weighted average of 20 key indicators including, for example, air monitoring results, pedestrian precincts, the efficiency of public transports services and of water softening systems. Basic variables adopted in building the synthetic indicator are described in Table B1.

In the structural equations model, hypotheses on causal relationships between variables are guided by results from the empirical investigation on social capital and the quality of economic development carried out by means of multivariate analyses in Sabatini (2005c), where evidence is provided of a positive and significant correlation between social capital and various "quantitative" and "qualitative" aspects of economic development. In particular, in this paper it has been shown that bonding social capital is strongly and negatively associated with human development and social well-being, while bridging and linking ties are positively correlated with such outcomes. Two more positive and strong correlations have been found between linking social capital and the quality of urban ecosystems, and between bridging social capital and an index of "social quality" computed as the arithmetic mean of four indicators, among which the labour precariousness index (LPI) was considered.

Let η_1 be bridging social capital, η_2 linking social capital, η_3 income, η_4 labour precariousness, η_5 the state of health of urban ecosystems and ξ_1 bonding social capital. ζ_i, with $i = (1,...,5)$, are the errors related to endogenous variables. In the model with the best goodness of fit, bridging social capital is affected by income, bonding social capital and unknown factors influencing also linking social capital, labour precariousness and the state of health of urban ecosystems.

$$\eta_1 = \beta_{13}\eta \ + \gamma_{11}\xi_1 + \zeta_1 \qquad (1)$$

Linking social capital is influenced by income and unknown factors affecting also bridging social capital, labour precariousness and urban ecosystems:

$$\eta_2 = \beta_{23}\eta_3 + \zeta_2 \qquad (2)$$

Income is affected by the three types of social capital and by unknown variables influencing also urban ecosystems:

$$\eta_3 = \beta_{31}\eta_1 + \beta_{32}\eta_2 + \gamma_{31}\xi_1 + \zeta_3 \qquad (3)$$

The level of labour precariousness is determined by bonding and bridging social capital, by income and unknown factors exerting their influence also on bridging and linking social capital:

$$\eta_4 = \beta_{41}\eta_1 + \beta_{43}\eta_3 + \gamma_{41}\xi_1 + \zeta_4 \qquad (4)$$

The state of health of urban ecosystems is influenced by bridging and linking social capital, and by unknown factors affecting the last two variables and per capita income levels:

$$\eta_5 = \beta_{51}\eta_1 + \beta_{51}\eta_2 + \zeta_5 \qquad (5)$$

In this and in the following models presented in this paper, other assumptions are carried out to the seek of simplicity: independent variables and errors are not correlated in the same equation: $E(\xi\zeta') = 0$; structural equations are not redundant; this condition means that η -equations are independent between them, and each endogenous variable η can not be a linear combination of the others; finally, we have supposed that all variables have been measured without errors, therefore there is a perfect identity between latent and observed variables. This allows us to omit measurement models for endogenous and exogenous variables and to focus exclusively on the structural equations model and on the explanation of the causal relationships linking variables.
Combining equations from (1) to (5) with the errors' covariances matrix, Ψ , the specification of the model is as follows:

$$\begin{bmatrix} \eta_1 \\ \eta_2 \\ \eta_3 \\ \eta_4 \\ \eta_5 \end{bmatrix} = \begin{bmatrix} 0 & 0 & \beta_{13} & 0 & 0 \\ 0 & 0 & \beta_{23} & 0 & 0 \\ \beta_{31} & \beta_{32} & 0 & 0 & 0 \\ \beta_{41} & 0 & \beta_{43} & 0 & 0 \\ \beta_{51} & \beta_{52} & 0 & 0 & 0 \end{bmatrix} \cdot \begin{bmatrix} \eta_1 \\ \eta_2 \\ \eta_3 \\ \eta_4 \\ \eta_5 \end{bmatrix} + \begin{bmatrix} \gamma_{11} \\ 0 \\ \gamma_{31} \\ \gamma_{41} \\ 0 \end{bmatrix} \cdot [\xi_1] + \begin{bmatrix} \zeta_1 \\ \zeta_2 \\ \zeta_3 \\ \zeta_4 \\ \zeta_5 \end{bmatrix} \begin{bmatrix} 1 & & & & \\ \psi_{21} & 1 & & & \\ 0 & 0 & 1 & & \\ \psi_{41} & \psi_{42} & 0 & 1 & \\ \psi_{51} & \psi_{52} & \psi_{53} & 0 & 1 \end{bmatrix} \qquad (6)$$

The graphic representation of structural equations models follows the path analysis symbology. It reports the variables, their errors and the linkages connecting variables. Such connections are represented both graphically, by arrows, and numerically, by regression coefficients. In the Lisrel

(LInear Structural RELationships) praxis, the graphic representation is based on the following criteria: latent variables are inscribed in an ellipse, while observed variables in a rectangle. In models presented in this chapter, all variables are inscribed in ellipses, due to the hypothesis that variables have been measured without errors. The causal nexus between two variables is represented by a straight arrow moving from the independent variable to the dependent variable. The association (covariation or correlation) between two variables is represented by a bidirectional curved arrow connecting them. The absence of arrows means the absence of linkages between variables. The strength of relationships is indicated reporting the regression (or the correlation) coefficient near the arrow. Figure 1 provides a graphic representation of the model:

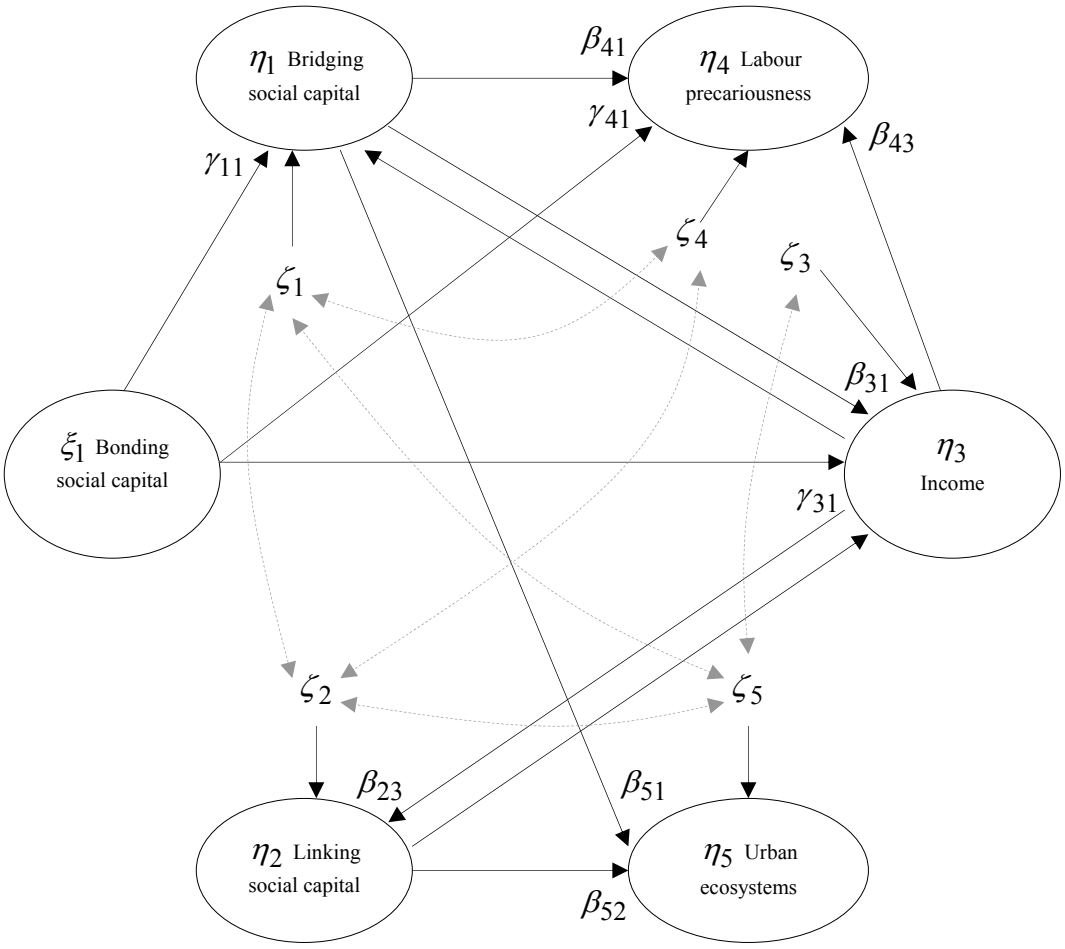

Figure 1. Graphic representation of model (6)

The model satisfactorily fits the data. Measures of the model's goodness of fit are in fact a function of the residual, i.e. the difference between the empirical variance-covariance matrix and the model-

created variance-covariance matrix. It is possible to show (Bonnet and Bentler, 1983), that, if the model is correct, the fitting statistic follows a χ^2 with *df* degrees of freedom, where $df = \frac{1}{2}(p+q)(p+q+1) - t$, p is the number of endogenous variables, q is the number of exogenous variables, and *t* is the number of estimated parameters.

In order to evaluate the goodness of fit the residual function for the model must be compared with critical values reported in χ^2 distribution tables with a probability $P = 0.100$. Since the value for this model is significantly lower than the critical value for a χ^2 with three degrees of freedom ($\chi^2 = 2.89 < 6.25139$), we can state that the difference between the two variance-covariance matrixes is stochastic in nature, and is not due to the inappropriateness of the theoretical model. All the other goodness of fit indexes exhibit satisfactory values. The root mean square residual (RMR) is equal to 0.087, the goodness of fit index (GFI) is equal to 0.94, thus indicating a good fit, and the adjusted goodness of fit index (AGFI) is equal to 0.61, thus indicating a satisfactory fit (goodness of fit measures are briefly described in annex C). The correlation matrix is reported in table 1:

Table 1. Correlation matrix of variables of model (6)

	Bridging social capital	Linking social capital	Income	LPI	Urban ecosystems	Bonding social capital
Bridging social capital	1					
Linking social capital	0.827	1				
Income	0.793	0.646	1			
Labour precariousness	-0.596	-0.447	-0.770	1		
Urban ecosystems	0.611	0.622	0.668	-0.765	1	
Bonding social capital	-0.638	-0.480	-0.883	0.693	-0.479	1

Linking social capital positively affect income, while bonding and bridging social capital exert a negative influence. Income positively affects bridging social capital and, to a lesser extent, linking social capital. Bonding social capital positively affects bridging social capital. Its negative influence on income is thus twofold: there is a direct effect, moving straight to income, and an indirect effect, passing through bridging social capital. The linking social capital of voluntary organizations is proved to foster the state of health of urban ecosystems.

Interestingly, the model shows that bonding social capital is able to exert a positive effect on labour precariousness. This finding may add some insights to the interesting debate on the role of social networks in the labour market. Since the lack of social capital of some groups induces inequalities in employment opportunities, some active labour market policies try to encourage the establishment or the improvement of personal networks (McClure, 2000, OECD, 2001). For example, the *Australians Working Together* program aims to give workers incentives to stay involved with their communities even if they are economically disadvantaged (OECD, 2003). As argued in Granovetter's (1973) seminal study, great part of employed workers hear about or obtain jobs through friends and relatives (Rees, 1966, Granovetter, 1995, Holzer, 1988, Montgomery, 1991, Topa, 2000, Gregg and Wadsworth, 1996). Moreover, to a large extent, employers also use social networks. For example, Holzer (1987) reports that 36 percent of interviewed firms filled their last opening with referred applicants.

However, many authors suggest that an extended role of networks could imply an increase of the distance between insiders and outsiders in the labour market. Disadvantaged people with few social contacts may have fewer employment opportunities than others. For example, Fontaine (2004) shows that an increase in the number of workers embedded in the social networks can increase the unemployment rate and decrease workers welfare.

My analysis on the Italian data shows that, even if there is the possibility for social networks to "close" the labour market, thus increasing the contractual strength of insiders, hampering matching processes' efficiency and sharpening unemployment, weak ties are likely to play a positive role in determining job satisfaction of employed workers. In the Italian regions, weak ties within social networks of friends and acquaintances seem to increase job's quality through a reduction of workers' precariousness.

However, it is possible to question about the efficiency of a talents' allocation partially driven by social networks, with particular regard for its effects on the process of development. On this regard it is noteworthy that a further empirical analysis shows that, in regions where strong family ties play a relevant role in determining people's occupational choices and significantly influence job-matching processes, there is a positive and significant relationship between income levels and the stability of people's work status. The model is described in section C1, annex C and, besides confirming all the above-described relationships between variables, it clearly shows that not only higher levels of income mitigate labour precariousness, but also that the latter worsens the economic performance. Of course this is not a general proof in favour of a social networks-driven workers allocation process. Such relationship should rather be interpreted with a careful regard to Italian contextual peculiarities. In Italy, short tenure jobs are generally related to situations of

socioeconomic disadvantage of workers and, often, to structural weaknesses of employers. Thus, in the Italian context, a higher incidence of labour precariousness may be seen also as a symptom of economic fragility and underdevelopment. Parameters' estimates are reported in table 2.

Table 2. Maximum likelihood estimates for model (6)

Variables η and ξ	Bridging social capital	Linking social capital	Income	Labour precariousness	Urban ecosystems	Bonding social capital
Bridging social capital			2.44 (0.46) 5.27			1.54 3.22 (0.48)
Linking social capital			0.46 (0.25) 1.81			
Income	-1.66 (0.34) -4.89	1.27 (0.33) 3.83				-1.33 (0.27) -4.91
Labour precariousness	0.74 (0.22) 3.38		-2.67 -4.68 (0.57)			-1.20 (0.53) -2.25
Urban ecosystems	0.10 0.13 (0.76)	0.98 (0.64) 1.53				

Interesting results can be obtained by replacing bridging, linking and bonding social capital with a synthetic measure of global social capital endowments developed in Sabatini (2005b), and including into the analysis also the high school attendance rate as a proxy for human capital. The measure of developmental social capital is a synthetic indicator representing high levels of all those characteristics of the social structure which the *theoretical* literature generally associates with positive economic outcomes and, often, with economic growth. It is built by means of a principal component analysis performed on a wide dataset collected by the author drawing on Istat's data.

The model shows that considering all together all the different social capital dimensions makes social capital's effect on economic outcomes simply disappear. This is the umpteenth confirm of the multidimensionality of the social capital concept, thus stressing the need for empirical investigations to adopt multiple indicators representing different dimensions.

Let η_1 be developmental social capital, η_2 income, η_3 labour precariousness, η_4 the state of health of urban ecosystems and ξ_1 the rate of high school attendance, ζ_i, with $i = (1,...,4)$, are the errors related to endogenous variables. In the model with the best goodness of fit, developmental social capital is influenced just by income (models accounting for a human capital effect on social capital unsatisfactorily fit the data) and by unknown factors affecting also income and the quality of urban ecosystems:

$$\eta_1 = \beta_{12}\eta_2 + \zeta_1 \qquad (7)$$

Income is affected by developmental social capital, by the rate of schooling and by the already cited unknown variables:

$$\eta_2 = \beta_{21}\eta_1 + \gamma_{21}\xi_1 + \zeta_2 \qquad (8)$$

Labour precariousness is influenced by social capital, schooling and income:

$$\eta_3 = \beta_{31}\eta_1 + \beta_{32}\eta_2 + \gamma_{31}\xi_1 + \zeta_3 \qquad (9)$$

The quality of urban ecosystems is affected by social capital, income and unknown factors:

$$\eta_4 = \beta_{41}\eta_1 + \beta_{42}\eta_2 + \zeta_4 \qquad (10)$$

Figure 14 provides a graphic representation of the model. Combining equations (7), (8), (9) and (10) with the errors' covariances matrix, Ψ, the specification of the model is as follows:

$$\begin{bmatrix} \eta_1 \\ \eta_2 \\ \eta_3 \\ \eta_4 \end{bmatrix} = \begin{bmatrix} 0 & \beta_{12} & 0 & 0 \\ \beta_{21} & 0 & 0 & 0 \\ \beta_{31} & \beta_{32} & 0 & 0 \\ \beta_{41} & \beta_{42} & 0 & 0 \end{bmatrix} \cdot \begin{bmatrix} \eta_1 \\ \eta_2 \\ \eta_3 \\ \eta_4 \end{bmatrix} + \begin{bmatrix} 0 \\ \gamma_{21} \\ \gamma_{31} \\ 0 \end{bmatrix} \cdot [\xi_1] + \begin{bmatrix} \zeta_1 \\ \zeta_2 \\ \zeta_3 \\ \zeta_4 \end{bmatrix} \qquad \begin{bmatrix} 1 & & & \\ \psi_{21} & 1 & & \\ 0 & \psi_{32} & 1 & \\ \psi_{41} & 0 & 0 & 1 \end{bmatrix} \qquad (11)$$

Figure 2 provides a graphic representation of the model.

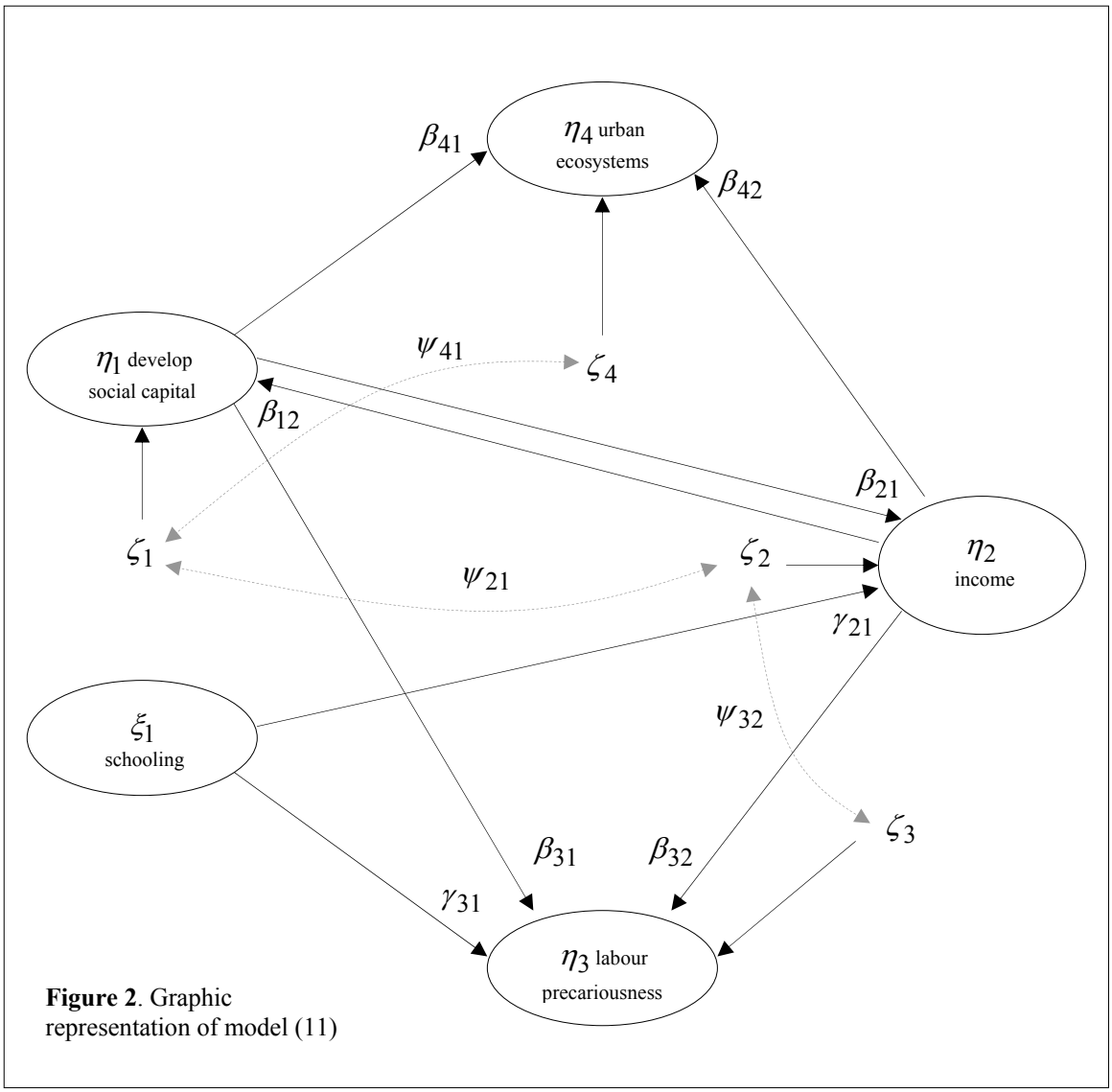

Figure 2. Graphic representation of model (11)

The correlation matrix is reported in table 3. Parameter estimates for model (11) are reported in table 4. Goodness of fit measures are reported in section C2, annex 2. The model exhibits an excellent ability to fit data.

Table 3. Correlation matrix of variables included in model (11)					
	Developmental social capital	Income	Labour precariousness	Urban Ecosystems	Schooling
Developmental social capital	1				
Income	0,948	1			
Labour precariousness	-0,670	-0,770	1		
Urban Ecosystems	0,635	0,668	-0,765	1	
Schooling	0,020	0,092	-0,245	0,162	1

The replacement of bridging and linking social capital with the single measure of "developmental social capital" and the substitution of human development with the index representing per capita income makes social capital's growth effect totally disappear.

The state of health of urban ecosystems shows to be positively affected by the single measure of social capital, which in fact includes also voluntary organizations, but, interestingly, it is also proved to be negatively influenced by income.

This finding seems to be coherent with some interesting insights provided by Antoci and Borghesi's (2002) theoretical study on the relationship between pollution and economic growth. According to the authors, 'Environmental deterioration, in fact, may induce agents to work harder to substitute previously free environmental goods with produced substitute goods. Production of substitute goods may further deplete the environment, which increases in turn production and consumption of substitute goods. Thus, the substitution mechanism of depleted natural resources with private goods might contribute to a self-feeding growth process: economic growth increases environmental degradation which, in turn, generates further growth' (Antoci and Borghesi, 2002, 1-2). However, the double direction of the positive relationship described by the authors is not proved by the Italian data on urban ecosystems. The inclusion in model (11) of the parameter β_{24} measuring the influence of urban ecosystems on economic growth shows that the quality of urban ecosystems exerts a positive and significant influence on income. The model is presented in section C3, annex C, together with parameters estimates and goodness of fit measures. Of course this finding is highly questionable, since data adopted in this analysis refer to the state of health of urban ecosystems, and not to the wider concept of pollution (regarding all environments and not exclusively related to

urban planning issues). Moreover, while the index of urban ecosystems' quality refers only to urban areas, the index of per capita income adopted in this analysis regards both urban and rural areas.
In all models, the rate of high school attendance proves to be quietly irrelevant. This scarce relevance can be easily explained, since enrolment in high schools is a too simple measure, which is not able to represent the concept of human capital at the Italian high stage of development.

Table 4. Maximum likelihood estimates for the model (11)

Variables η and ξ		Developmental social capital	Income	Labour precariousness	Urban Ecosystems	Schooling
Developmental social capital	η_1		0.00 (0.18) 0.02			
Income	η_2	0.00 (0.17 0.01				0.04 (0.07 0.62
Labour precariousness	η_3	2.83 (0.68) 4.19	-3.69 (0.67) -5.53			0.04 (0.24) 0.16
Urban Ecosystems	η_4	1.58 (0.75) 2.09	-0.83 (0.75) -1.09			

5. Social capital vs physical capital: a first explorative analysis

All relationships found in the previous section are confirmed if controlling for physical capital.
The analysis is intended to be a mere exploration, since it suffers from the considerable shortcoming that data on total gross capital stock are available only for the period 1974-1994, while the other data on social capital and well-being generally refer to 2001-2002. The capital-labour indicator is built drawing on CRENos[4] data as the ratio:

$$K/L = \frac{K_{AG} + K_I + K_{MS} + K_{NMS}}{L_{AG} + L_I + L_{MS} + L_{NMS}}$$

where K_{AG}, K_I, K_{MS} and K_{NMS} are the total gross capital stock respectively used in agriculture, industry, market services and non-market services, while L_{AG}, L_I, L_{MS} and L_{NMS} are units of labour employed in the same sectors.

[4] CRENoS (*Centro Ricerche Economiche Nord Sud,* Centre for North South Economic Research) is a section of the inter-universities consortium CIREM, Center on Economic and Mobility Research, in collaboration with CRiMM (Center for Research on Mobility Models, University of Cagliari), and with DiESiL (Center for the Local Systems Economic Dynamics, University of Sassari).

Let ξ_1 be the K/L ratio, η_1 bridging social capital, η_2 linking social capital, η_3 per capita income, η_4 labour precariousness and η_5 urban ecosystems' quality. ζ_i, with $i=(1,...,5)$, are the errors related to endogenous variables.

In the model with the best goodness of fit, bonding social capital and K/L ratio are considered as exogenous. Bridging social capital is influenced by income, bonding social capital and unknown factors affecting also linking social capital, labour precariousness and the state of health of urban ecosystems:

$$\eta_1 = \beta_{13}\eta_3 + \gamma_{11}\xi_1 + \zeta_1 \qquad (12)$$

Linking social capital is influenced by income and unknown variables affecting also bridging social capital:

$$\eta_2 = \beta_{23}\eta_3 + \zeta_2 \qquad (13)$$

Income is affected by the three types of social capital and, by the physical capital-labour ratio and unknown factors influencing also urban ecosystems:

$$\eta_3 = \beta_{31}\eta_1 + \beta_{32}\eta_2 + \gamma_{31}\xi_1 + \gamma_{32}\xi_2 + \zeta_3 \quad (14)$$

Labour precariousness is affected by bonding and bridging social capital, by income, the K/L ratio and by unknown factors affecting also bridging social capital:

$$\eta_4 = \beta_{41}\eta_1 + \beta_{43}\eta_3 + \gamma_{41}\xi_1 + \gamma_{42}\xi_2 + \zeta_4 \quad (15)$$

The state of health of urban ecosystems is affected by linking social capital and unknown variables affecting also the level of income:

$$\eta_5 = \beta_{52}\eta_2 + \zeta_5 \qquad (16)$$

Adding the errors' covariances matrix, Ψ, to previous equations, the specification of the model is as follows:

$$\begin{bmatrix}\eta_1\\ \eta_2\\ \eta_3\\ \eta_4\\ \eta_5\end{bmatrix}=\begin{bmatrix}0 & 0 & \beta_{13} & 0 & 0\\ 0 & 0 & \beta_{23} & 0 & 0\\ \beta_{31} & \beta_{32} & 0 & 0 & 0\\ \beta_{41} & 0 & \beta_{43} & 0 & 0\\ 0 & \beta_{52} & 0 & 0 & 0\end{bmatrix}\cdot\begin{bmatrix}\eta_1\\ \eta_2\\ \eta_3\\ \eta_4\\ \eta_5\end{bmatrix}+\begin{bmatrix}\gamma_{11} & 0\\ 0 & 0\\ \gamma_{31} & \gamma_{32}\\ \gamma_{41} & \gamma_{42}\\ 0 & 0\end{bmatrix}\cdot\begin{bmatrix}\xi_1\\ \xi_2\end{bmatrix}+\begin{bmatrix}\zeta_1\\ \zeta_2\\ \zeta_3\\ \zeta_4\\ \zeta_5\end{bmatrix}\quad\begin{bmatrix}1 & & & & \\ \psi_{21} & 1 & & & \\ 0 & 0 & 1 & & \\ \psi_{41} & 0 & 0 & 1 & \\ \psi_{51} & 0 & \psi_{53} & 0 & 1\end{bmatrix}\quad(17)$$

Figure 3 provides a graphic representation of the model.

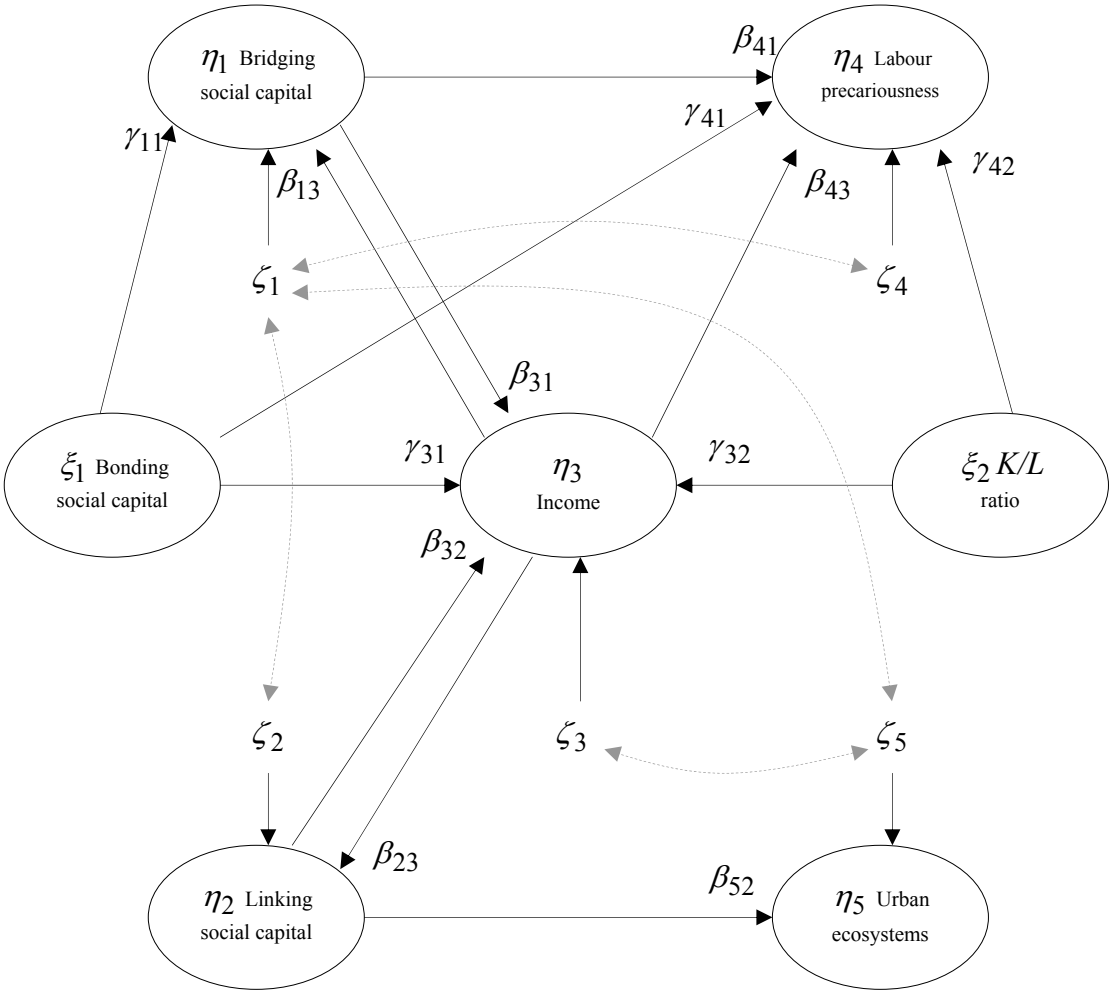

Figure 3. Graphic representation of model (17)

The correlation matrix is reported in table 5.

Table 5. Correlation matrix of variables of model (17)							
	Bridging social capital	Linking social capital	Income	Labour precariousness	Urban ecosystems	Bonding social capital	*K/L* ratio
Bridging social capital	1						
Linking social capital	0.827	1					
Income	0.793	0.646	1				
Labour precariousness	-0.596	-0.447	-0.770	1			
Urban ecosystems	0.611	0.622	0.668	-0.765	1		
Bonding social capital	-0.638	-0.480	-0.883	0.693	-0.479	1	
K/L ratio	0.526	0.340	0.393	-0.104	0.085	-0.445	1

Parameters' estimates are reported in table 6.

Table 6. Maximum likelihood estimates for model (17)							
Variables η and ξ	Bridging social capital	Linking social capital	Income	Labour precariousness	Urban ecosystems	Bonding social capital	*K/L* ratio
Bridging social capital			2.35 (0.41) 5.77			1.34 3.43 (0.39)	
Linking social capital			0.43 (0.27) 1.59				
Income	-1.76 -4.83 (0.36)	1.33 (0.34) 3.94				-1.18 -4.04 (0.29)	0.35 (0.27) 1.27
Labour precariousness	0.56 (0.24) 2.37		-2.61 -5.42 (0.48)			-1.15 (0.43) -2.64	0.24 1.79 (0.14)
Urban ecosystems		0.51 2.37 (0.21)					

The introduction of the K/L ratio in the model does not change the structure of relationships between variables. Bonding and bridging social capital are still proved to exert a negative influence on income. On the contrary, the linking social capital of voluntary organizations positively affects the economic performance. Strong family ties mitigate labour precariousness, as well as higher levels of income. As expected, the K/L ratio tends to worsen labour precariousness, even if in a less significant way.

5. Concluding remarks and guidelines for further researches

Overall, the empirical evidence in this paper shows that strong family ties shaping bonding social capital exert a negative influence on the economic performance. On the contrary, weak ties may act as bridges across different communities, fostering knowledge sharing and the diffusion of trust, and therefore benefiting the process of development.

The analysis thus provides a proof, for the Italian context, of theoretical insights coming from the new economic sociology literature. As stated by Granovetter (1973), 'Whatever is to be diffused can reach a larger number of people, and traverse greater social distance, when passed through weak ties rather than strong. If one tells a rumor to all his close friends, and they do likewise, many will hear the rumor a second and third time, since those linked by strong ties tend to share friends' (Granovetter, 1973, 1366). According to author, the problem of trust is closely related: wheter an agent trusts another heavily depends on wheter there exist intermediary personal contacts who can, from their own knowledge, assure him that the other agent is trustworthy. The new hint provided by the analysis in this paper regards which type of weak ties are good for economic development. Bridging and linking social capital are positively affected by income, but only linking social capital exerts a positive reverse effect. On the contrary, bridging social capital negatively influences the economic performance. Weak ties connecting friends and acquaintances are reinforced by bonding social capital, and join to strong family ties in determining the perverse developmental effects that Banfield (1958), just referring to the Italian context, ascribed to the "amoral familism". Models presented in section 4 suggest that, in the Italian regions, strong family ties, besides giving raise to the amoral familism phenomenon, may concur in shaping forms of "amoral friendships". This finding is coherent with one of the most controversial theses standing in the social capital literature, that is Putnam's claim on the positive role of civil society and associational activity. According to Putnam, Leonardi and Nanetti (1993), associations function as "schools of democracy", in which cooperative values and trust are easily socialized. The claim is that in areas with stronger, dense, horizontal, and more cross-cutting networks, there is a spillover from membership in organizations to the cooperative values and norms that citizens develop. In areas where networks with such characteristics do not develop, there are fewer opportunities to learn civic virtues and democratic attitudes, resulting in a lack of trust. Several notable studies, question Putnam's thesis, pointing out a negative relationship between the density of voluntary organizations and economic growth (Keefer and Knack, 1993, Heliwell, 1996, Knack and Keefer, 1997). As effectively explained by Knack and Keefer (1997), cooperation and solidarity connected with the presence of voluntary associations work better at the level of smaller communities. In the authors words: 'If the economic goals of a group conflict with those of other groups or of unorganized interests, the overall effect of

group memberships and activities on economic performance could be negative … Although the ability of groups to articulate their interests is likely to be an important restraint on government, it also provides groups a way to capture private benefits at the expense of society. Consistent with the view that these two effects tend to counteract each other, "interest articulation" proves to be an insignificant predictor of growth when introduced into Barro-type cross-country tests'. (Knack and Keefer, 1997, 1271). The authors' argument is convincing, but it is not necessarily suitable for the Italian context.

In Italy, the density of voluntary organizations is in most cases connected with a deep tradition of civic involvement and social participation. As explained by Putnam, Leonardi and Nanetti (1993), 'Stocks of social capital, such as trust, norms and networks, tend to be self-reinforcing and cumulative. Virtuous circles result in social equilibria with high levels of cooperation, trust, reciprocity, civic engagement, and collective well-being … Defection, distrust, shirking, exploitation, isolation, disorder, and stagnation intensify one another in a suffocating miasma of vicious circles. This argument suggests that there may be at least two broad equilibria toward which all societies that face problems of collective action (that is *all* societies) tend to evolve and which, once attained, tend to be self-reinforcing' (Putnam, Leonardi and Nanetti, 1993, 177). Although this explanation sounds suitable for Italy, there is still something missing, and this is probably the role of politics. The Italian regions exhibiting higher levels of civic participation and civic awareness are those historically administered by centre-left coalition local governments. In these regions, civil society has developed in close contact with the active political participation, and has been largely informed by ideological principles, not directly connected to the pursuit of personal or sectarian advantages. This is not necessarily a proof against the arguments advanced by Knack and Keefer (1997) and by Putnam's critics, but rather a new confirmation of the multidimensional, dynamic and context-dependent nature of social capital. This is the umpteenth proof that the interpretation of results from any empirical investigations carried out in the field of social capital must be based on the following codeword: contextualizing. As sustained by Coleman (1988), 'Social capital is defined by its function … Like physical capital and human capital, social capital is not completely fungible, but may be specific to certain activities. A given form of social capital that is valuable in facilitating certain actions may be useless or even harmful for others' (Coleman, 1988, 98). Since, as argued by Granovetter (1985), the ability of social networks to enhance economic development is strongly related to the problem of trust, a further step in improving our understanding could be to test which kind of social networks is able to foster trust's diffusion. Another interesting finding of this paper is the ability of bonding social capital to mitigate labour precariousness. This result may add some insights to the wide debate on the role of social networks in the labour market. As already

pointed out in section 4, since the lack of social capital of some groups induces inequalities in employment opportunities, some active labour market policies try to encourage the establishment or the improvement of personal networks (McClure, 2000, OECD, 2001). As argued in Granovetter's (1973) seminal study, great part of employed workers hear about or obtain jobs through friends and relatives. Moreover, also employers often rely on social networks to find workers with adequate skills. Many authors question that an extended role of networks could imply an increase of the distance between insiders and outsiders in the labour market. Disadvantaged people with few social contacts may have fewer employment opportunities than others. My analysis on the Italian data shows that, even if there is the possibility for social networks to "close" the labour market, therefore increasing the contractual strength of insiders, hampering matching processes' efficiency, and sharpening unemployment, weak ties are likely to play a positive role in determining job satisfaction of employed workers. In the Italian regions, weak ties within social networks of friends and acquaintances seem to increase job's quality through a reduction of workers' precariousness.

However, it is possible to question about the efficiency of a talents' allocation partially driven by social networks, with particular regard for its effects on the process of development. On this regard it is noteworthy that my empirical analysis also shows that, in regions where strong family ties play a relevant role in determining people's occupational choices and significantly influence job-matching processes, there is a positive and significant relationship between income levels and the stability of people's work status. This result suggests that not only higher levels of income mitigate labour precariousness, but also that the latter worsens the economic performance. Of course this is not a general proof in favour of a social networks-driven workers allocation process. Such relationship should rather be interpreted with a careful regard to Italian contextual peculiarities. In Italy, short tenure jobs are generally related to situations of socioeconomic disadvantage of workers and, often, to structural weaknesses of employers. Thus, in the Italian context, a higher incidence of labour precariousness may be seen also as a symptom of economic fragility and underdevelopment.

Another confirmation of the multidimensionality of the social capital concept is given by the attempt to adopt, within the SEM analysis, the synthetic unique measure of "developmental social capital" built in section 2.4, in spite of separate measures of single social capital dimensions. This substitution makes social capital's effects on its supposed economic outcomes suddenly disappear.

The linking social capital of voluntary organizations is proved to foster the state of health of urban ecosystems, which in turn shows to be positively affected also by the single measure of social capital, but, interestingly, is also proved to be negatively influenced by income. This finding seems to be coherent with some interesting insights provided by Antoci and Borghesi's (2002) theoretical study on the relationship between pollution and economic growth. According to the authors,

'Environmental deterioration, in fact, may induce agents to work harder to substitute previously free environmental goods with produced substitute goods. Production of substitute goods may further deplete the environment, which increases in turn production and consumption of substitute goods. Thus, the substitution mechanism of depleted natural resources with private goods might contribute to a self-feeding growth process: economic growth increases environmental degradation which, in turn, generates further growth' (Antoci and Borghesi, 2002, 1-2). However, the double direction of the positive relationship described by the authors is not proved by the Italian data on urban ecosystems.

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Annex A. Tables on the measurement of social capital in Italy

Table A1. Indicators of family social capital

Label	Description	Year	Source	Mean	St. Dev
CONTPAR	People aged 14 and more particularly caring relatives other than parents, children, grandparents and grandchildren, or counting on them in case of need, for every 100 people of the same area.	1998	Istat (2001)	3,905	1,037
COPFIG	Couples with children, for every 100 families of the same area.	2001/02	Istat (2003)	18,470	4,861
COPNOFIG	Couples without children, for every 100 families of the same area.	2001/02	Istat (2003)	71,500	5,424
FAM5COMP	Families with 5 components and more for every 100 families of the same area.	2001/02	Istat (2003)	10,990	3,995
FAMSINGL	Singles-families for every 100 families of the same area.	2001/02	Istat (2003)	72,790	5,022
FIG16KM	People aged 15 and more with children living 16 kilometres away or more (in Italy or abroad) for every 100 families with children of the same area.	1998	Istat (2001)	10,225	3,958
FIG1KM	People aged 15 and more with children living within 1 kilometre (cohabitants or not) for every 100 families with children of the same area.	1998	Istat (2001)	86,245	3,594
FRATELTG	People meeting their brothers and/or sisters everyday for every 100 people with brothers and/or sisters of the same area.	1998	Istat (2001)	6,955	3,199
GIOBAM2S	People aged 6 and more playing with children once a week or more for every 100 people of the same area.	2000	Istat (2002b)	32,11	2,33
INCPARTG	People aged 6 and more meeting family members or other relatives everyday for every 100 people of the same area.	2000	Istat (2002b)	59,735	5,448
MUM16KM	People up to 69 having their mother living 16 kilometres away or more (in Italy or abroad) for every 100 people with an alive mother of the same area.	1998	Istat (2001)	28,595	5,408
MUM1KM	People up to 69 having their mother living within 1 kilometre (cohabitant or not) for every 100 people with an alive mother of the same area.	1998	Istat (2001)	46,055	9,139
NOGIOBAM	People aged 6 and more never playing with children for every 100 people of the same area.	2000	Istat (2002b)	36,22	4,19
NOINCPA	People aged 6 and more never meeting their family members and other non cohabitant relatives for every 100 people of the same area.	2000	Istat (2000b)	10,790	4,937
NOPARENT	People aged 6 and more having neither a family nor other non cohabitant relatives for every 100 people of the same area.	2000	Istat (2000b)	23,075	4,900
SODDPAR	People aged 14 and more declaring themselves satisfied of relationships with their relatives for every 100 people of the same area.	2002	Istat (2004a)	36,27	6,34
VFIGTG	People meeting their children everyday for every 100 people with non cohabitant children of the same area.	1998	Istat (2001)	43,245	4,176
VMUMTG	People meeting their mother everyday for every 100 people with non cohabitant mother of the same area.	1998	Istat (2001)	17,075	3,253

Table A2. Indicators of the informal networks of friends and neighbours					
Label	Description	Year	Source	Mean	St.dev
ASSPORT	Non profit sport clubs for every 10.000 people of the same area.	2002	Istat (2002d)	11,440	4,829
BAR2S	People aged 6 and more attending bars, pubs, and circles at least once a week for every 100 people of the same area.	2000	Istat (2002b)	21,500	4,076
CENAF2S	People aged 6 and more having dinner outside more than once a week for every 100 people of the same area.	2000	Istat (2002b)	5,045	1,198
INCAMI2S	People aged 6 and more meeting friends more than once a week for every 100 people of the same area.	2002	Istat (2004)	28,735	1,485
MUBAR	People aged 14 and more attending pubs and bars to listen to music concerts for every 100 people of the same area.	2000	Istat (2002b)	18,620	2,411
NOBAR	People aged 6 and more never attending bars, pubs and circles for every 100 people of the same area.	2000	Istat (2002b)	47,865	6,513
NOCENF	People aged 6 and more never having dinner outside for every 100 people of the same area.	2000	Istat (2002b)	17,265	4,954
NOPARLCO	People aged 6 and more never talking with others for every 100 people of the same area.	2000	Istat (2002b)	8,510	1,269
NOPARVIC	People aged 6 and more never talking with neighbours for every 100 people of the same area.	2000	Istat (2002b)	25,585	3,314
PARCON2S	People aged 6 and more talking with others once a week or more for every 100 people of the same area.	2000	Istat (2002b)	46,965	6,074
PARVIC2S	People aged 6 and more talking with neighbours once a week or more for every 100 people of the same area.	2000	Istat (2002b)	22,940	3,328

Table A3. Indicators of social capital as voluntary organizations					
Name	Description	Year	Source	Mean	St. Dev.
AIUTOVOL	People aged 14 and more who have helped strangers in the context of a voluntary organization's activity, for every 100 people of the same area.	1998	Istat (2001)	5,080	1,407
AMIVOL	People aged 6 and more who, when meeting friends, carry out voluntary activities for every 100 people meeting friends of the same area.	2002	Istat (2004a)	3,920	1,287
ORGANIZ	Voluntary organizations for every 10.000 people	2001	Istat (2004b)	4,195	3,284
RIUASCU	People aged 14 and more who have joined meetings in cultural circles and similar ones at least once a year for every 100 people of the same area.	2002	Istat (2004)	8,485	3,862
RIUASEC	People aged 14 and more who have joined meetings in ecological associations and similar ones at least once a year for every 100 people of the same area.	2002	Istat (2004)	1,755	0,458
SOLDASS	People aged 14 and more who have given money to an association at least once a year for every 100 people of the same area.	2002	Istat (2004)	15,635	6,250

Annex B. The measurement of the state of health of urban ecosystems

Table B.2: Basic indicators of urban ecosystems' state of health

1) **Air monitoring**. Number and type of surveying centres (according to DM 20/5/91, DM 25/11/94). Data provided by municipalities, 2002.
2) **NO2**, annual average value (µg/mc). Municipalities, 2002.
3) **PM10**, annual average value (µg/mc). Municipalities, 2002.
4) **Water consumption**, per capita water consumption in respect to the civil supplying (l/res/days). Municipalities, 2002.
5) **Nitrates**, average contents (mg/l) in the drinkable water. Municipalities, 2002.
6) **Water softening** percentage of civil supplying softening. Municipalities, 2002.
7) **Urban waste**. Per capita urban waste production (kg/res/year). Municipalities, 2002
8) **Differentiated waste raising**. Percentage on the total amount of waste. Municipalities, 2002.
9) **Public transport** trips/res/year. Municipalities, 2002.
10) **Circulating cars** cars/100 res. Data provided by the ACI (*Automobile Club Italia*), 2001.
11) **Pedestrian areas** sm/res. Municipalities, 2002.
12) **Controlled traffic areas** (ZTL, *Zone a traffico limitato*), sm/res. Municipalities, 2002.
13) **Cycle tracks**. m/res. Municipalities, 2002.
14) **Public parks and gardens**. sm/res of enjoyable parks and gardens. Municipalites, 2002.
15) **Green open spaces**. Green areas surface (including urban public parks and natural reserves) in respect to the total urban surface (sm/ha). Municipalities, 2002.
16) **Domestic electrical consumption**. Consumo elettrico domestico pro capite (kWh/ab/anno) GRTN, dati 2001 provinciali
17) **Fuels**. Per capita consumption of fuels (kep/ab/anno). Data drawn by the MICA Oil Bulletin, 2001.
18) **ISO 14001 certified firms**. Number of certificates for every billion of added value. Data provided by the Istat, 2000.
19) **Unauthorized buildings**. Number of unauthorized buildings for every 1000 households. Data provided by Cresme Legambiente at the provincial level, 2002.
20) **Eco management.** Latent indicator synthesizing: public administration purchase procedures of "ecolabel" products, use of biological foods in public refectories, use of recycled paper in public offices, public transport means exerting a low environmental impact. Data provided by Municipalities, 2002

Source: *Legambiente* (2003a)

Annex C. Goodness of fit measures and refinements of structural equations models

C1. Goodness of fit measures for model (6) of section 4

The model (18) has 3 degrees of freedom. $\chi^2 = 2.89 < 6.25139$, thus the model is not falsified by data.

The Goodness of Fit Index (*GFI*):

$$GFI = 1 - \frac{T}{\max(T_i)}$$

is equal to 0.94. This means a good fit.

The Adjusted Goodness of Fit Index (*AGFI*) takes into account also the model's number of degrees of freedom, i.e. its parsimoniousness:

$$AGFI = 1 - \left(\frac{k}{df} \right)(1 - GFI)$$

where *df* are degrees of freedom, and *k* is the number of variances-covariances in input; *k* is given by:

$$k = \frac{1}{2}(p + q)(p + q + 1)$$

The *AGFI* is equal to 0.61, thus indicating a satisfactory fit.
The Root mean squared residuals (*RMR*) is:

$$RMR = \sqrt{\frac{1}{k}\Sigma(s_{ij} - \sigma_{ij})^2}$$

is equal to 0 when the theoretical model-generated variance-covariance matrix fits the empirical matrix, and infinitely grows when the model's goodness of fit worsens.
The RMR of model (11) is equal to 0.087, thus indicating a good fit.

C2. Labour precariousness and income. A variation in model (6)

Let η_1 be bridging social capital, η_2 linking social capital, η_3 income, η_4 labour precariousness, η_5 the state of health of urban ecosystems and ξ_1 bonding social capital. ζ_i, with $i = (1,...,5)$, are the errors related to endogenous variables. The model with the best goodness of fit is specified exactly as model (18) described section 4.4, with the only exception given by inclusion of the parameter β_{34}, representing labour precariousness' influence on per capita income. This parameter has not been directly included in the model presented in chapter four because it causes a slight worsening of goodness of fit measures.

$$\begin{bmatrix}\eta_1\\ \eta_2\\ \eta_3\\ \eta_4\\ \eta_5\end{bmatrix}=\begin{bmatrix}0 & 0 & \beta_{13} & 0 & 0\\ 0 & 0 & \beta_{23} & 0 & 0\\ \beta_{31} & \beta_{32} & 0 & \beta_{34} & 0\\ \beta_{41} & 0 & \beta_{43} & 0 & 0\\ \beta_{51} & \beta_{52} & 0 & 0 & 0\end{bmatrix}\cdot\begin{bmatrix}\eta_1\\ \eta_2\\ \eta_3\\ \eta_4\\ \eta_5\end{bmatrix}+\begin{bmatrix}\gamma_{11}\\ 0\\ \gamma_{31}\\ \gamma_{41}\\ 0\end{bmatrix}\cdot[\xi_1]+\begin{bmatrix}\zeta_1\\ \zeta_2\\ \zeta_3\\ \zeta_4\\ \zeta_5\end{bmatrix}\quad\begin{bmatrix}1 & & & & \\ \psi_{21} & 1 & & & \\ 0 & 0 & 1 & & \\ \psi_{41} & \psi_{42} & 0 & 1 & \\ \psi_{51} & \psi_{52} & \psi_{53} & 0 & 1\end{bmatrix}$$

Parameters' estimates are reported in table C1.

Table C1. Maximum likelihood estimates for the model's (18) refinement

Variables η and ξ	Bridging social capital	Linking social capital	Income	Labour precariousness	Urban ecosystems	Bonding social capital
Bridging social capital			2.71 (0.45) 5.97			1.78 (0.46) 3.82
Linking social capital			0.45 (0.26) 1.75			
Income	-1.60 -3.34 (0.48)	1.14 (0.39) 2.90		-0.95 -1.82 (0.52)		-0.69 (0.57) -1.21
Labour precariousness	1.24 3.97 (0.31)		-2.06 (1.56) -1.32			-0.38 (1.31) -0.29
Urban ecosystems	1.25 2.60 (0.48)	-0.67 -1.68 (0.40)				

The model exhibits a satisfactory fit. It has 2 degrees of freedom and $\chi^2 = 1.61 < 4.60517$. RMR is 0.11, GFI is 0.97 and AGFI is 0.67, thus indicating a good fit.

C3. Refinements and goodness of fit measures for model (11)

Model (23) has 3 degrees of freedom and $\chi^2 = 1.48 < 6.25139$.

Root Mean Square Residual (RMR) = 0.087

Goodness of Fit Index (GFI) = 0.97

Adjusted Goodness of Fit Index (AGFI) = 0.83

The model is not falsified by data and exhibits an excellent fit.

The inclusion in model (23) the parameter β_{24} measuring the influence of urban ecosystems on economic growth shows that the quality of urban ecosystems exerts a weak but positive influence on income. The model now becomes:

$$\begin{bmatrix}\eta_1\\ \eta_2\\ \eta_3\\ \eta_4\end{bmatrix}=\begin{bmatrix}0 & \beta_{12} & 0 & 0\\ \beta_{21} & 0 & 0 & \beta_{24}\\ \beta_{31} & \beta_{32} & 0 & 0\\ \beta_{41} & 0 & 0 & 0\end{bmatrix}\cdot\begin{bmatrix}\eta_1\\ \eta_2\\ \eta_3\\ \eta_4\end{bmatrix}+\begin{bmatrix}0\\ \gamma_{21}\\ \gamma_{31}\\ 0\end{bmatrix}\cdot[\xi_1]+\begin{bmatrix}\zeta_1\\ \zeta_2\\ \zeta_3\\ \zeta_4\end{bmatrix}\quad\begin{bmatrix}1 & & & \\ \psi_{21} & 1 & & \\ 0 & \psi_{32} & 1 & \\ \psi_{41} & 0 & 0 & 1\end{bmatrix}$$

Table C2. Maximum likelihood estimates for the model						
Variables η and ξ		Developmental social capital	Income	Labour precariousness	Urban Ecosystems	Schooling
Developmental social capital	η_1		0.01 (0.17) 0.05			
Income	η_2	-0.37 (0.22) -1.66			0.92 (0.33) 2.81	0.05 (0.07) 0.74
Labour precariousness	η_3	3.04 (0.64) 4.78	-3.92 (0.62) -6.30			0.05 (0.24) 0.23
Urban Ecosystems	η_4	0.01 (0.26) 0.02				

The model has 3 degrees of freedom and $\chi^2 = 0.99 < 6.25139$.

Root Mean Square Residual (RMR) = 0.051

Goodness of Fit Index (GFI) = 0.98

Adjusted Goodness of Fit Index (AGFI) = 0.90

The model is not falsified by data and exhibits an excellent fit.