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Italian Universities: Institutional Mandate and Communitarian Engagement

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Abstract: To make their mandate more efficient, universities have to either offer services to students either produce innovation and scientific research. From this point of view it is difficult for universities to focus their attention on economic and financial performance. Instead, it is much more relevant for the university to find models of governance that are able to bring together profitability, financial sustainability, and social and communitarian commitment. Universities generate knowledge that can be used to improve the standard of economic and social life in the territorial environment. For these reasons it is important to analyze relations between university and community of reference. We found that Italian universities that perform better are associated with communities able to generate individual and social welfare. Better universities have also more active and skilled student populations. Monthly data are considered for the period 2012 and 2017 for 58 Italian universities. Data are collected from BES-ISTAT, Almalaurea and Center for World University Rankings-CWUR. The complex database has been realized by using KNIME mixing different sources in an original metric environment. We use panel data approach to estimate the level of Italian ranking in CWUR statistics by the usage of two different sets of variables: BES-ISTAT and SIOPE. The increasing in the Global International Ranking can be realized either directly by increasing the level of services and products generated, either indirectly improving the spillovers effect of universities in respect to a certain community of reference.

Keywords: *Management, research, development, governance, human capital.*

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Introduction

Universities are called to play an international role in the global competitive challenge (Shin, 2012). However, not all universities are prepared for this global challenge. In fact, the Italian university model seems to be characterized by a twofold dilemma: on the one hand universities lack financial resources (Agasisti & Salerno, Assessing the cost efficiency of Italian universities, 2007), on the other hand universities suffer from an inefficiency in resource management. The two elements together define a decline in the Italian universities that is evident in the Global Universities Ranking. One of the problems of the Italian universities is based on the question of multi-objective. In effect, universities have a multi-objective managerial model that is able to put together financial performance, educational objectives and social and communitarian commitment. Universities are also involved in realizing a stakeholder-oriented governance (Wise, Dickinson, Katan, & Gallegos, 2018).

This dual condition involves a reduction in the competitive capacity of the university body which is further complicated by the fact that it has a substantially multi-objective mandate (Piattoni, 2009). In fact, the aims of the university body are of various kinds, on the one hand, in fact, there are the traditional didactic and scientific research objectives, on the other hand there are, on the other hand, purposes of a further nature, which have been added to the performance of the academic activity, and which are essentially made up of spillovers towards local businesses in the sense of productive collaborations (Ciuchta, Gong, Miner, Letwin, & Sadler, 2016) of knowledge, innovation, human capital and patenting (Toole, Czarnitzki, & Rammer, 2015).

The role of universities has greatly increased. In fact, university bodies have increasingly become organizations with a substantially multi-objective character. However, this multi-objective condition has effectively modified and stressed the same university organizational structure that often lacks the financial, technological and human capital resources to

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be able to achieve the goals set by the legislator, chosen by university governance or explicitly requested by the stakeholders and constituencies of reference. The role of universities is therefore very varied. Clearly the size of the international competition operates within the various fields of activity and entails for the universities the need to be effectively productive both in teaching and in research (Harland, 2016) and also in the activities of strengthening the industrial, productive and institutional reference system. The possibility for the university to correspond to those that are multi-objective structures is essential also because indeed among the various activities carried out by the university there are virtuous relationships, or as a sort of "*Inner spillovers*" that are produced in the bringing together training, research and orientation (Tight, 2016) towards strengthening the entrepreneurial and institutional territorial system. In fact, many universities place themselves as tools for strengthening business activity (Rampersad, 2015), or rather as tools that can actually be able to guide the economic system towards productivity growth. Universities are involved in the attempt to change the cultural and social system through the development of new businesses and technologies. The universities then deal with both producing a new human capital that can be used within the context of the labor market considered, and also have the capacity to produce technologies, that is, the knowledge applied to high innovative content that are able to generate income, value added, increased productivity, and strengthening the company's competitiveness. University actively participate to regional development (Boucher, Conway, & Van Der Meer, 2003). However, it is also necessary to consider the role of the engagement of the reference communities (Weerts & Sandmann, 2010). That is the territories within which the university structures insist must be involved, or actively participate, in the processes of scientific, cultural and technological empowerment produced by the universities (Bringle & Hatcher, 2002). This creates an important spillover relationship between the university body and the local reference market that constitutes an essential dimension of the complex system of value-added creation within the economy and the knowledge society (Fitzgerald, Bruns, Sonka, Furco, & Swanson, 2016). In this sense the university produces and requires a certain cultural climate with respect to which there is evidently a certain endogenous relationship: that is, on the one hand the university has an impact on the productive realities through the determination of market outputs, while on the other hand, obviously, a production and growth-oriented society necessarily produces human capital that is more oriented both to attend the university and to actively participate through the engagement processes within the civilization project proposed by the university body (Ostrander, 2004). It is therefore very probable for example that the territorial economies characterized by a high added value also have an evolved and competitive international university system, while, on the contrary, the territories in which economic development is low have non efficient competitive international universities.

In particular we can analyze the complex set of rules and constraints that guide university governance. In particular there are 4 kind of dependent variables to explain the institutional constraints of the university i.e.:

- *Law University Order Regulations*: these are laws enforced at a State-level to determine what are the main objectives of universities. Laws are devoted to delimitate the role of universities either on a financial point of view either in the sense of global and social outputs.
- *Ministerial Regulations*: these are regulation generated at a governative level.
- *University Statues*: independent statues autonomously predisposed by universities;
- *Private Bargaining*: private contracts that are determined between private firms, public institutions and universities.

The relation among variables is indicated in the sequent formula:

$$\begin{aligned} \text{InstitutionalConstraints}_{it} &= a_1 + b_1(\text{LawUniversityOrderRegulations})_{it} + b_2(\text{MinisterialRegulation})_{it} \\ &+ b_3(\text{University Statues})_{it} + b_4(\text{PrivateBargaining})_{it} \end{aligned}$$

The complex set of Institutional Constraints is able to determine a certain number of limitation in respect to the ability of the university to generate valuable objective. Institutional constraints define the university governance. In particular universities should promote policies such as dialogue, integration, social and communitarian commitment, and should create a opportunities to improve the level of institutional performance and the degree of innovation and reasearch. Universities have to realize a multi-objective productivity function generating not only education and knowledge for students but also creating the conditions for a social, economic, institutional and enterpreneurial improvements (Christensen, 2011). In this sense it is very important to analyze what are the possibilities for the universities to improve private bargaining and university statues to increase the relationships among multiple stakeholders. In this sense, even if universities have to respect some kind of financial constraints they also have to realize a sort of stakeholder governance oriented model in which universities try to maximize the production function of constituencies and communities (Stanton, 2008). It is clear that the application of a stakeholder governance model for universities is important and crucial to correspond to the multiple objective function of the universities. For example in the case of a multiple stakeholder governance model for universities it is possible to maximize in the same set of choices either the position of students, either the position of lenders, the position of communities and societies that are both internal and external in respect to the governance model (Amaral & Magalhaes, 2002). The multi-stakeholder model has the ability

to help the universities either in the sense of governance and management either in the sense of empowerment, engagement with respect to communities generating deep and productive social relations (Miller, McAdam, & McAdam, 2014).

In our research we analyze two different models to estimate the role of Italian Universities in the Global Universities ranking. The independent variable is both the model is the same i.e. the rank of Italian Universities in the Global University Ranking. But dependent variables are different in both the models. In the first model a set of 11 BES-ISTAT dependent variables are regressed on the independent variable; in the second model a set of 22 Almalaurea dependent variables are regressed on the independent variable. Data in both cases are referred to 59 universities based on the Italian territory and collected on a monthly basis between 2012 and 2017.

In particular we argue that universities face an international and national competition (Cattaneo, Malighetti, Meoli, & Paleari, 2017). Italian universities in particular suffer for a twofold problem: on the one hand they have low financial resources, on the other hand they show inefficiency in the management of existing resources (Bini & Masserini, 2016). Our hypothesis is that not only universities are associated with the presence of more developed communities and, reversely, developed communities have the ability to promote internationally well-ranked universities (Shiel, Leal Filho, do Paço, & Brandli, 2016). This means that there is a bijective relation between communities and universities: performative universities promote developed communities and developed communities are associated to the presence of performative universities in the sense of global ranking (Hart, Gerhardt, & Rodriguez, 2009). To make their mandate more efficient, universities have to either offer services to students either produce innovation and scientific research. From this point of view, it is difficult for universities to focus their attention on economic and financial performance. Instead, it is much more relevant for the university to find models of governance that are able to bring together profitability, financial sustainability, and social and communitarian commitment (Gilchrist, 2019). Universities have financial and statutory constraints (Agasisti, Catalano, Di Carlo, & Erbacci, 2015). They have also to produce innovation and research that can produce value for communities and firms (Amador, Pérez, López-Huertas, & Font, 2018). Universities generate knowledge that can be used to improve the standard of economic and social life in the territorial environment (Audretsch, Lehmann, & Warning, 2017). For these reasons it is important to analyze relations between university and community of reference (Brennan, Cochrane, Lebeau, & Williams, 2018). We found that Italian universities that perform better are associated with communities oriented to generate individual and social welfare. Better universities have also more active and skilled student populations.

To analyze this topic we use monthly data collected during the period 2012-2017 for 58 Italian universities. The merge of these different databases is realized using KNIME.

Methodologically we analyze two different kinds of models: the first model is devoted to estimate the impact of BES-ISTAT (Istat, 2019) variables on the CWUR dataset; the second model describes how changes in composition of student population as indicated in Almalaurea database is associated to CWUR rankings. Interesting conclusions are realized showing that universities, evaluated in the sense of CWUR, prosper in connection with the presence of communities with good performance in the sense of ISTAT-BES and in connection with well-educated and prosperous student population. Such considerations let us infer the presence of a dualistic and reverse proposition in which not only universities generate good communities and well-educated and proactive student population, but also good communities and active student population are associated to more performative universities. Data are elaborated using OLS, panel data with fixed effects, random effect and using principal component analysis.

We conclude good communities in the sense of ISTAT-BES and the presence of a good quality of student population are associated to universities with good international rankings. We estimate two different kinds of models one able to shed light on the socio-economic condition of the communities and the other able to shed light on the relations between the world university score and the characteristics of the student population.

Causality, Causation and Regressions

Good universities are positively associated to high opulent economies and to affluent society (Mueller, 2006). But it is questionable if good universities generate opulent economies and affluent society or if opulent economies and affluent society generate good universities (Hausman, 2012). We should exclude the presence of cause-effect nexus between the presence of universities and the presence of opulent and affluent societies. The causality effect should be rejected. It's more useful referring to the association of different phenomena. We are not able to say if universities generate affluent societies or if affluent societies generate good universities. We can only say that either good universities and affluent societies are related and associated in a unified communitarian context. The rejection of the cause-effect nexus is based on the presence of logical and methodological limitations in respect to the presence of multiple analysis.

Causality, causation, correlation and regressions. Only a limited set of correlation can be considered as based on causation. In particular the causation effect is based on the possibility to affirm that a single cause generates a certain set of effects while correlations are simply devoted to indicate the presence of a certain set of relation among different categories. The correspondence between causation and correlation is limited.

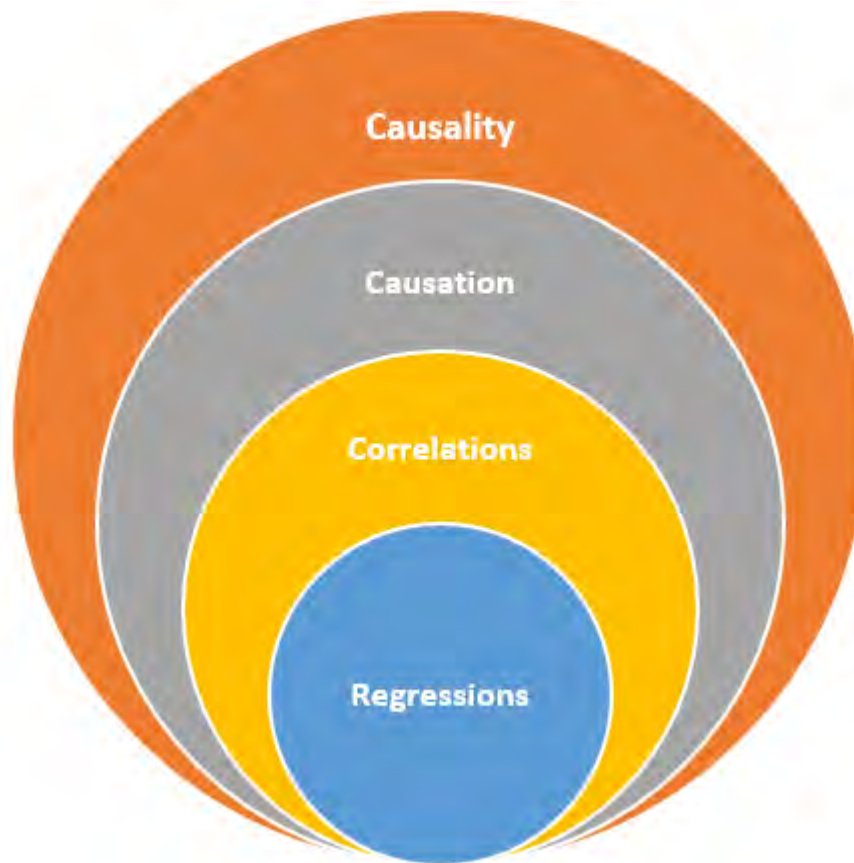


Figure 1. The relations between causality, causation, correlation and regressions.

Causality can be considered as a general that affirm the presence of cause-effect nexus. While, on the other side causation is a strong definition of causality in which a certain cause define a limited set of effects. But even if it possible to affirm that regressions, and correlations are able to illuminate a certain degree of causation is not possible to prove metrically the causation effects. The idea of causality has been introduced in the econometric framework through the idea of Granger causality (Granger, 1988) in time series modeling. In particular Granger causality asserts that if there is causality between two different variables than the prediction of a single variable using both variables performs better than the prediction of the single variable using only one time series. Then it is possible to assert than between the two variables there is a causality in the sense of Granger. But Granger causality is only a formal definition of causality. There are many critiques in the usage of strong causality in the context of social sciences (Rein & Winship, 1999).

In fact, the presence of causality in the socio-economic context remains effectively a remote possibility due to the presence of endogeneity. Socio-economic variables in fact are characterized by strong endogeneity. The presence of endogeneity in the economic context has generated relevant theories such as for example in the case of theory of endogeneous growth. Due to the presence of strong endogeneity it is difficult to analyze the presence of causality. In this sense it is important to distinguish between causality and causation.

In particular causation (Philosophy, The Metaphysics of causation, 2003) can be considered as a strong definition of causality. Causation asserts that the presence of a certain effect is due to a certain cause. It is not possible to exclude the existence of a causation effects in the presence either of endogeneity or exogeneity. The absence of causation does not mean that correlations don't apply (Philosophy, Aristotle on Causality, 2019). In effect while causation is rare and difficult to prove and justify, correlation and mere relations, that are approximations of causality, can be found easily and used to justify complex economic models.

We have to analyze the multiple relation between endogeneity, exogeneity, causation and a-causation. In particular we can say that the econometric techniques are not able to determinate with a high degree of certainty the presence of causation in endogenous and exogenous models. Econometric techniques are only able to affirm that some variables are related or co-related with others. In the case of endogenous models the correlation or regressions are all determined inside the economic modeling, while in the case of exogenous models the correlations and regressions are determined in the connection between internal and external relation models.

In this sense either endogenous and exogenous models are able to determine relation based on causation or a-causation. The difference between causation in endogenous models and exogenous models is based on the mechanism by which the causation operates. In particular in the case of endogenous models the causation is based on the internal

relation between variables while in the case of exogenous models the causation model operates as a tool between internal and external variables.

The relation between causation and a-causation in respect to endogeneity and exogeneity causation and a-causation

	<i>Causation</i>	<i>A-Causation</i>
<i>Endogeneity</i>	<p><i>Main effect:</i> The economic phenomena is determined in the context of analysis. Causation is determined for example in model developed by Romer able to explain economic conditions using endogeneity tools.</p> <p><i>Modeling technique:</i> models are based on the relation between individual variables that are all endogenous. The focus is based on internal relationships and modeling.</p>	<p><i>Main effect:</i> Models are based on endogeneity but they can't affirm the existence of a certain defined causation effect. Modeling can just affirm the existence of association among phenomena.</p> <p><i>Modeling technique:</i> the elimination of the presumed endogenous cause does not generate the elimination of the estimated effect.</p>
<i>Exogeneity</i>	<p><i>Main Effect:</i> the cause able to generate the economic phenomena is external in respect to the economic context. The absence of the external cause implies the nullification of the internal effect in the economic modeling.</p> <p><i>Modeling technique:</i> modeling are based on the relationship between internal and external variables.</p>	<p><i>Main effect:</i> Models are based can't affirm the existence of a certain defined causation effect. Modeling can just affirm the existence of association among phenomena.</p> <p><i>Modeling technique:</i> the elimination of the presumed exogenous cause does not eliminate the presence of estimated effect.</p>

Database technology KNIME

We used Knime (*Konstanz Information Miner*) as data transformation and DSS technology, a data pipelining tool which enable to perform complex analysis tasks on potentially huge amounts of data. In this tool, the pipeline is formed from consecutively connected processing units called nodes. The raw input data can be read from various data sources, such as text files and databases. Typically, the data is remodeled into table-like representations. These tables are then passed along the pipeline to other nodes, which handle pre-processing such as normalizing numerical values, filtering rows based on specific criteria or joining tables from different branches of the workflow. Subsequent nodes then apply machine learning or data mining algorithms to build models based on the input data.

We performed a specific ETL (Extraction Transformation Load) for each data source, enforcing data quality and consistency standard, so that separate sources can be used together for analysis. The complete dataset has enabled the extraction of a set of Key Performance Indicators (KPI) for universities. These have been grouped in three domains

1. ORGANIZATIONAL EFFICIENCY

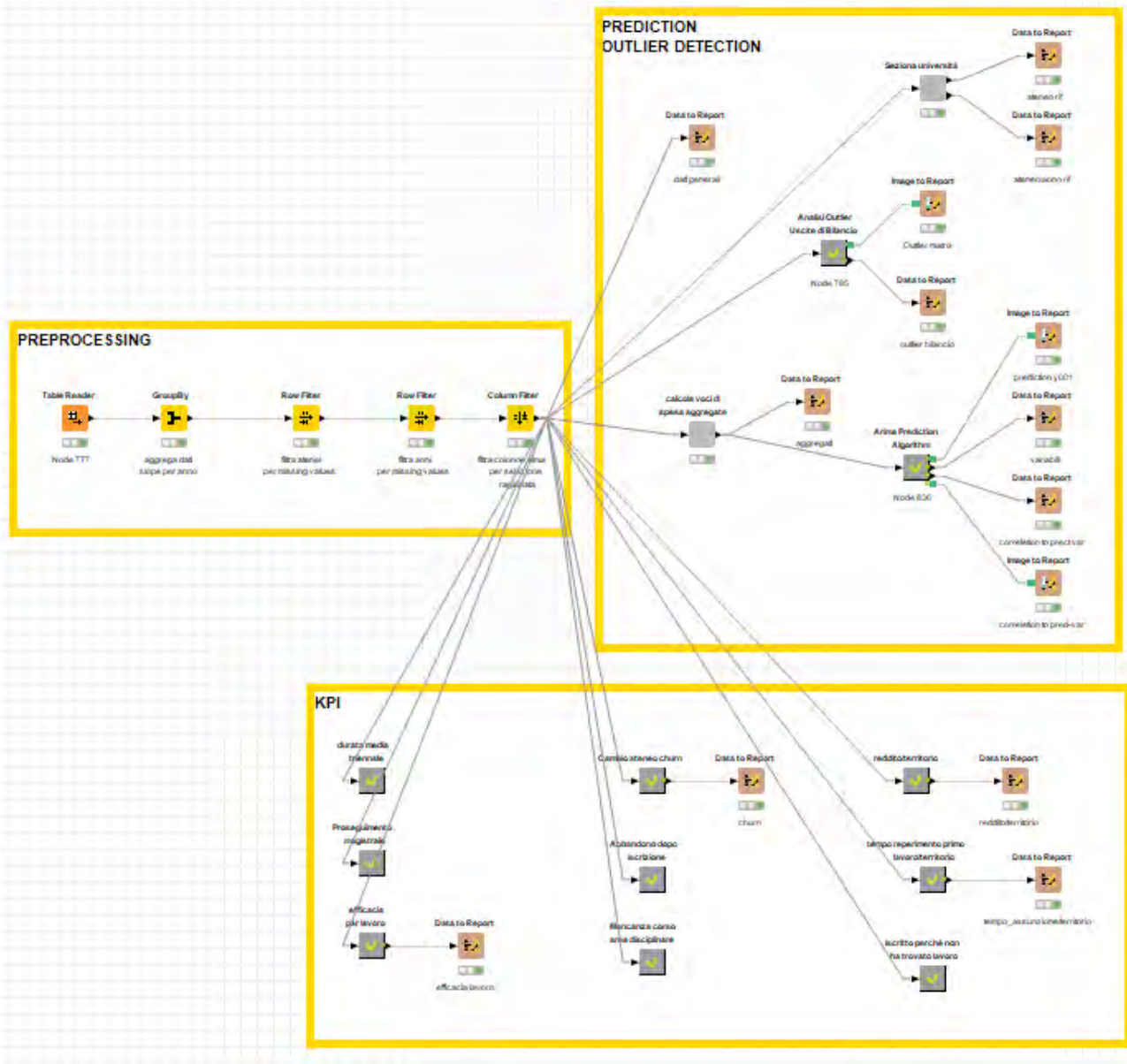


Figure 2. General Knime workflow

- a. Average duration for obtaining a Bachelor's degree
- b. Percentage of continuation in the master's degree
- c. Effectiveness of studies for work

2. RISK INDICATORS

- a. Percentage of university turnover after bachelor's degree
- b. Percentage of dropouts after enrollment
- c. Absence of a master's course in the disciplinary area of the bachelor's degree

3. RELATIONSHIP WITH THE REGION

- a. Indicator of graduate income compared to the average income of the reference region
- b. Indicator of job placement time compared to the job offer in the region
- c. Percentage of enrolment to the master's degree due to lack of job offer in the region

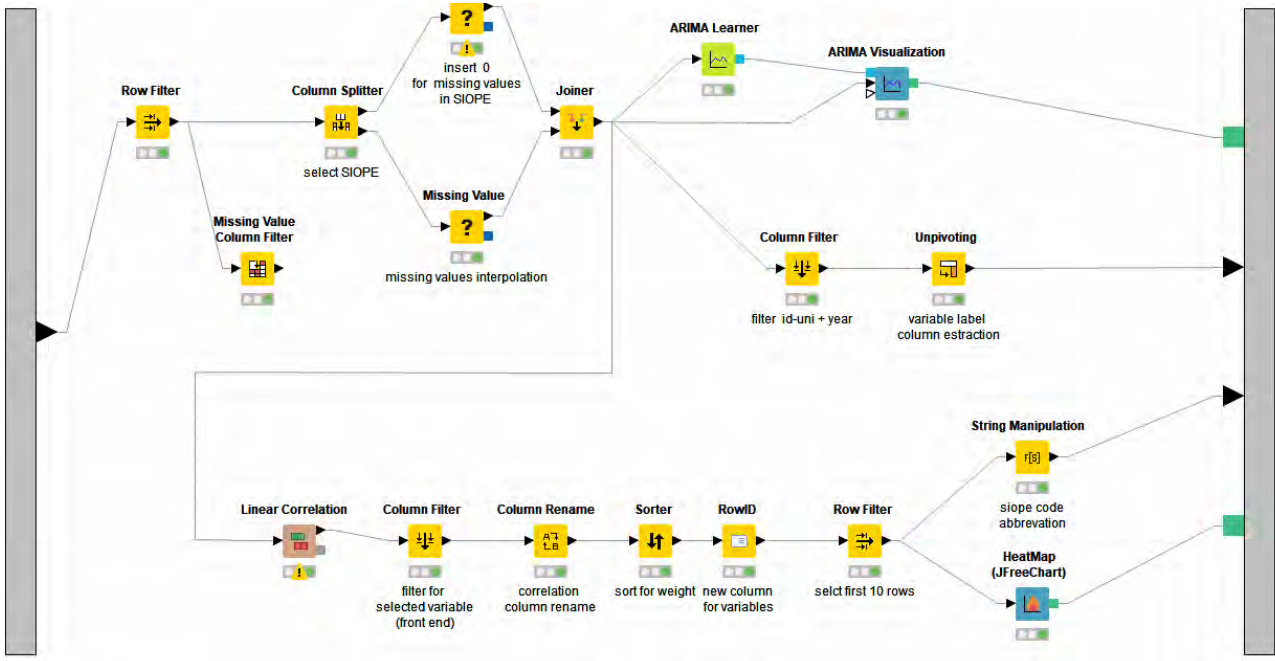


Figure 3 Knime metanode for ARIMA prediction

In order to allow greater flexibility of the dashboard with respect to the needs of individual universities, the system has been designed so that the user can select a variable of interest from the front-end on which three different operations are performed in real time:

- Construction of the historical series of values
- Prediction of the evolution of the value for the following year, with an indication of the expected range of variability.
- Identification of the variables most closely related to the variable of interest.

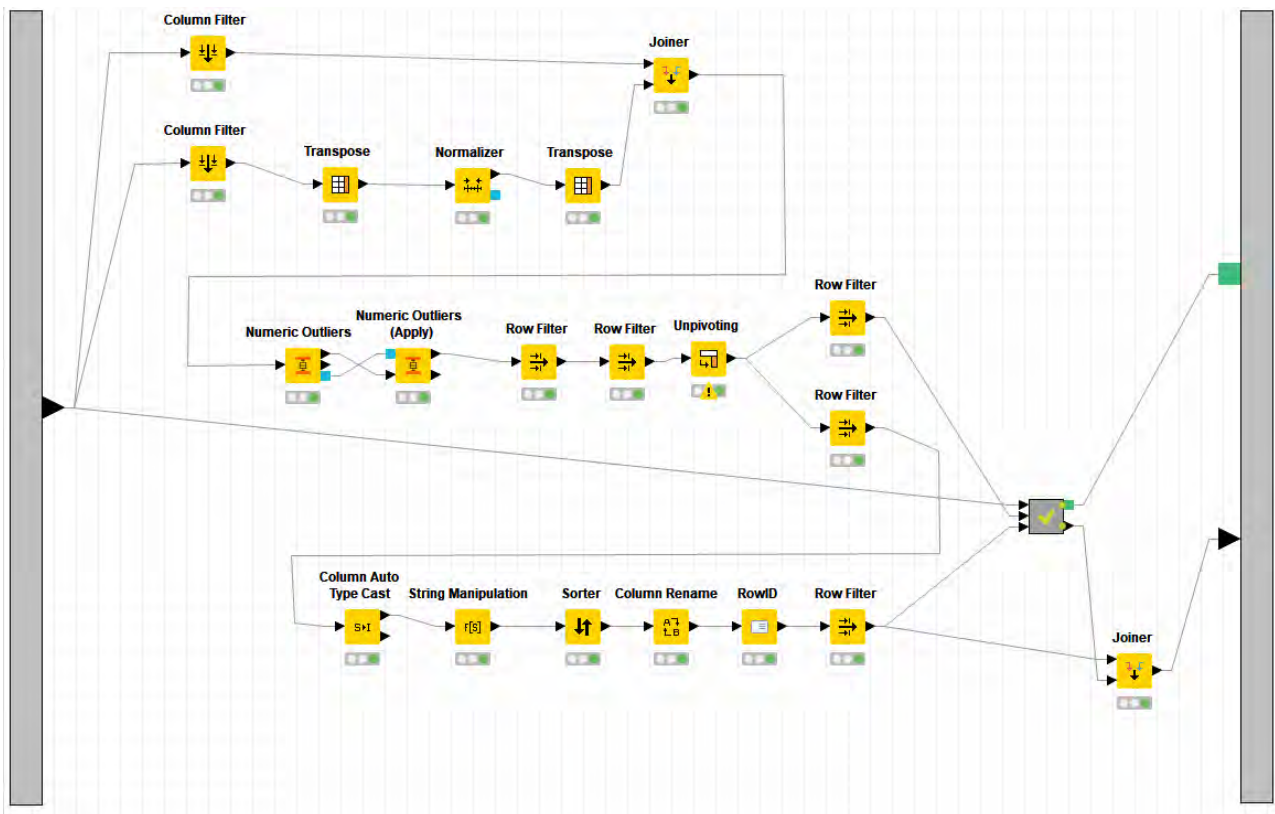


Figure 4 Knime metanode for Outlier detection

In the context of prototype development, we limited the application of the prediction algorithms to the ARIMA (AutoRegressive Integrated Moving Average) model, which allows an effective interpolation of data with non-steady short-term trend and allows to identify the possible evolution of the monitored variable within a range subject to the influence of other variables. This feature is valuable in a business intelligence context where it is necessary to make choices in the short term (1 year) and on single expense items by identifying correlated variables.

The Outlier analysis allows the identification of financial statement anomalies, providing a useful tool to discover information otherwise shadowed. Outliers are defined as anomalous and out-of-average values, which can only be explained by particular conditions and can reveal potential resources not yet fully used.

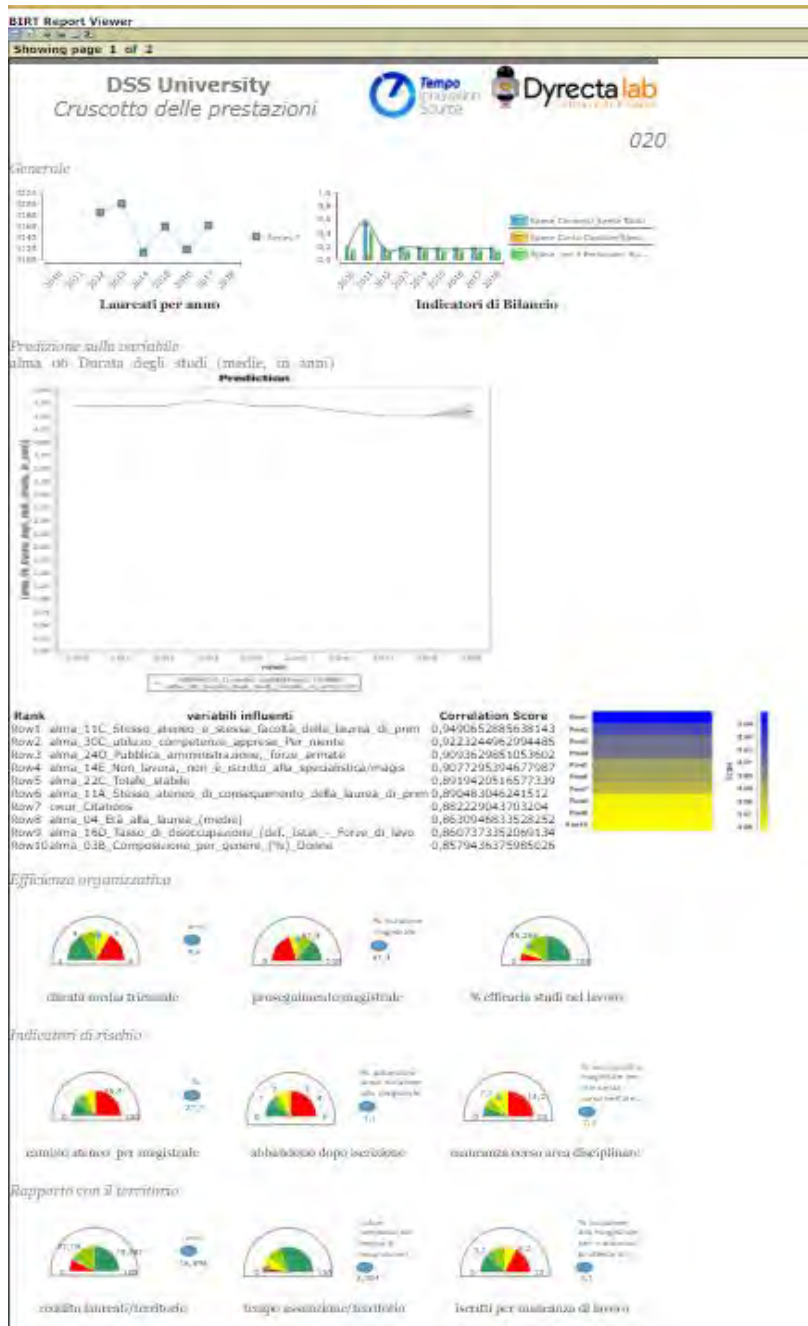


Figure 5 Knime DSS front-end

Global Universities Ranking and Equitable Sustainable Well-Being

We estimate the position of universities in the global ranking using a set of variables taken from the Istat-BES database. The objective of the regressions models performed with a Panel Data technique consists in the individualization of social and economic determinants that are associated with a higher performance of universities. The causation and causality effects are excluded from methodological and epistemological reasons, and sequently, the relations analyzed are twofold i.e.: on one side estimations express the impact of socio-economic determinants on the international

university ranking. But on the other side these relations can be enforced also by universities in their attempt to change favorably the socio-economic environment to boost universities.

In effect universities are considered as social and economic institutions that can improve their international and local impact encouraging different set of stakeholders in being active in the sense of financial economics. In particular better universities are located in better communities defined in the sense of economic improvements, social relations, cultural environments, and the presence of quality of work and services. Due to this kind of socio-economic set of variables, universities can try to create new policies that can improve the positions of universities in the global ranking. The results of the analysis are in the appendix. In particular using data from ISTAT-BES and World Global University Ranking we estimate the sequent formula for Italian universities:

$$\begin{aligned} & \text{WorldUniversityScores}_{it} \\ &= a_1 + b_1(\text{Health})_{it} + b_2(\text{Education})_{it} + b_3(\text{Employment})_{it} + b_4(\text{QualityOfWork})_{it} \\ &+ b_5(\text{IncomeAndInequality})_{it} + b_6(\text{SocialRelations})_{it} + b_7(\text{PredatoryCrimes})_{it} \\ &+ b_8(\text{SubjectiveWellBeing})_{it} + b_9(\text{Landscape})_{it} + b_{10}(\text{Environment})_{it} + b_{11}(\text{QualityOfServices})_{it} \end{aligned}$$

We found that the degree of Universities in global ranking has the sequent relations:

- *Employment*: there is a negative relation between employment and the degree of universities in global ranking. The negative relation is due to the fact that were the level of employment is low, also the level of enrolment of students in universities is low. In effect the graduate and postgraduate education is realized to improve the probability of unemployed to be employed. But where unemployed is low, the incentive of workers to acquire a formal education is low, too. In effect employed workers have less motivations to be enrolled in universities in respect to unemployed workers. Employed workers can be more interested in increasing their professional skills through courses realized in the corporate environment. Employed Workers are not interested in under graduate and postgraduate courses in universities.
- *Predatory crimes*: the relation between the rank of university in international rankings and the level of predatory crimes is negative. This means that universities in mean insist in territory characterized by low predatory crimes. The presence of violence, or the presence of criminals, reduce the quality of human and social capital, and reduce the ability of the university to acquire credibility using spillovers in respect to the social environment. Predatory crimes are the sign of low educated population and in this sense the possibility of the university to perform well in the context of international ranking is scarce. Universities are related to human capital, and they try to use these connections to increase their local, national and international background.
- *Subjective well-being*: the relation between the international ranking of universities and subjective well-being is negative. People that experiment a high level of subjective well-being is less motivated to study and be enrolled in the global competition of professional skills and competences. Subjective well-being can be considered as an approximation of happiness. Subjective well-being shows the presence of a level of life satisfaction that reduce the motivation of the people towards the efforts to learn a science, a profession, a skills. If universities are located in proximity with communities in which there is a high level of subjective well being, there are negative probabilities to obtain high level in global universities ranking due to the presence of a low motivated student population.
- *Landscape*: The relation between landscape and international university ranking is negative. Communities and territories that are located in proximity with beautiful landscape tend to invest less in universities in respect to places in which there is a low level of landscape quality. For example, in big cities where the quality of landscape is tendentially low there are good universities while on the other hand in universities located in periphery, where there is a good quality of landscape, the level of international ranking is low. Landscape is negatively associated to the high degree of international university ranking for the fact that good landscape is an approximation of peripheral areas and peripheral areas are in general associated with low degree in university rankings.
- *Environment*: the relation between environment and international university ranking in negative. A good quality of environment is negatively associated to a high level of international university ranking. In particular cities and communities that are characterized by high level of environment are generally in peripheral zones in which, typically, the level of universities in global rankings is low. At the contrary universities that are located in cities, where the level of environment is generally low, or above the mean of the distribution, are characterized by high level in international universities rankings.
- *Health*: The relation between health and international university ranking is positive. There increase in the level of health of the population is associated to a higher level of university rankings. Universities that have an international high rank are also associated to more healthy population. The level of health of population growths in connection to healthcare services, and cities are able to offer more healthcare in respect to

peripheral areas. In this sense there is a positive connection between the level of health of the population and the level of universities in the global ranking. Healthcare system especially in Italy are related to universities especially for the case of "Polyclinic" that are traditionally related to Italian universities.

- *Quality of work:* The relation between international university ranking and quality of work is positive. Quality of work increases in relation to income and in urban cities. Low level of quality of work, is connected to marginal areas, in particular to areas that are characterized by low income and low servitization of the production. The quality of work declines when economies increase their production in the agricultural sector, or in construction or in manufacture. A good quality of work is associated to a development of economic system in the sense of service. Generally good universities are located in connection with cities in which the percentage of workers in the service sector is higher than in peripheral area.
- *Income and Inequality:* the relation between income and inequality and university international ranking is positive. The level of international ranking increases with the increasing level of income. The greater the income in the area in which the university is located the higher the level of the degree of ranking of universities in the international ranking. Generally, people with a higher income can pay higher fees to have access to universities and universities that have more found have also more probability to receive better evaluation in the international ranking.
- *Social Relations:* The relation between international university ranking and social relations is positive. The increase in the quality and quantity of social relations is associated to better performance of the universities in the global ranking. In particular universities need to be installed in collaborative communities that can perform cooperative behaviors. Universities organize human and social capital and try to generate knowledge for communitarian purposes. In this sense deeper social relations in the communitarian environment can improve the performance of universities either in the global competition for excellence.
- *Quality of services:* The relation between university international ranking and quality of services is positive. The presence of good quality of services is a sign of a developed economy. The increasing quality of services determine also a deeper level of sophistication of the economic process, that can be determined by a diffusion of scientific, technological and professional knowledge that generally is associated to the presence of high internationally ranked universities.
- *Education:* the relation between education and international university ranking is positive. A good university is determined in connection with a good educational system not only in the sense of graduate and postgraduate formation as in the sense of bachelor, masters and Ph.Ds but also in the sense of schools that can improve the level of knowledge in student population. At the end, also professional and technological educational system determine an increase in knowledge.

Based on the explained relation it is possible to determine connection between elements of the socio-economic condition of the communities and the presence of high ranked universities in the globalization. In particular the possibility for universities to receive a higher international rank depends on a complex set of social and economic factors that include also cultural and environmental features. In this sense it is clear that the presence of urban prosperous economies oriented to servitization and knowledge can be considered as an essential pre-requisite that can improve the performance of universities in global ranking. Anyway, the effect is twofold: not only good universities are associated to performing societies but also performing societies are associated to good universities.

Universities are the product of social and economic environment, and they can prosper only if there are multiple connections with various stakeholders. There are multiple stakeholders' approach can be used to understand the complex commitment that universities have in respect to communities and territories. In particular, to perform better universities require to be interconnected with the entrepreneurial system, the cultural environment, and the institutional order. In particular better universities participate of communities that are urban, oriented to the servitization, with good quality of work and services, and in which a not so high level of happiness widespread in the population. In this sense high performing universities in the international ranking are determined in connection to economic order orientated to globalization, servitization and knowledge society. In effect servitization, globalization and knowledge society even in its definition of learning society, are able to generate an economic environment in which human and social capital can find naturally their anchoring in the university system.

The relation is twofold, and this means that Italian universities that are interested in a better position in the international ranking have to promote communities that are oriented to quality of work and services, to higher income, better health, and more efficient education system either in the pre-universitarian degree of education. In this sense it is necessary to consider the impact of a university in the context of a certain economy as a sort of development economics politics that can be applied to produce an economic and social change in the societal environment.

The relation between global university ranking and almalaurea

In the sequent model we have estimated the impact of World University Ranking of Italian universities based on a set of variables that are related to Almalaurea. Almalaurea is based on data based on Italian laureates and offers a synthesis of a socio-economic conditions of Italian students and former students. In particular we try to estimate if the level of international university ranking based on the characteristics of the student population. The results of the analysis are in the appendix. Our estimation is indicated in the follow relation:

$$\begin{aligned}
 \text{WorldUniversityScore}_{it} &= a_1 + b_1(\text{ResponseRate})_{it} + b_2(\text{ComPerGenderMan})_{it} + b_3(\text{GraduationGrade})_{it} \\
 &+ b_4(\text{DurationOfStudies})_{it} + b_5(\text{EnrInASpecDegree})_{it} + b_6(\text{EnToImpCulBack})_{it} \\
 &+ b_7(\text{EnrAtTheSameUniToContinueToStudy})_{it} + b_8(\text{PostgraduateFormation})_{it} \\
 &+ b_9(\text{Internship_Apprenticeships})_{it} + b_{10}(\text{PastWorkerUnemployed})_{it} \\
 &+ b_{11}(\text{NumberOfEmployees})_{it} + b_{12}(\text{GraduatesWhoContinuePreviousWork})_{it} \\
 &+ b_{13}(\text{PeriodToFindTheFirstJob})_{it} + b_{14}(\text{PeriodFromDegreeToFirstJob})_{it} \\
 &+ b_{15}(\text{PublicSectorWorkers})_{it} + b_{16}(\text{NetMonthlySalaryForMen})_{it} \\
 &+ b_{17}(\text{NetMonthlySalaryForWomen})_{it} + b_{18}(\text{ImprovementInWorkDueToGrad})_{it} \\
 &+ b_{19}(\text{JobsThatRequireADegree4LegReas})_{it} + b_{20}(\text{JobsForWhichTheDegreeIsEffective})_{it} \\
 &+ b_{21}(\text{SatisfactionWithTheWorkDone})_{it} + b_{22}(\text{InactiveLook4WorkInTheLast15Days})_{it}
 \end{aligned}$$

We perform a series of econometric model in the form of panel data with random and fixed effects.

- *Enrolled in a special degree:* there is a negative relation between being enrolled in a special degree and the level of university in the global ranking. The negative relation is due to the fact that universities in global ranks are oriented to realize especially research and development activities instead of pure educational activities.
- *Enrolled in the same faculty to continue to study:* There is a negative relation between the number of students enrolled in the same faculty to continue to study and the level of universities in the global ranking. The greater the number of students enrolled in the same faculty to continue to study the greater the level of university in the global and international rankings.
- *Postgraduate formation:* there is a negative relation between postgraduate formation and the degree of universities in the global university ranking. The greater the number of postgraduate students the lower the degree of universities in the international rankings.
- *Internship and Apprenticeships:* there is a negative relation between the number of internship and apprenticeships and the degree of universities in the global context. An increase in the number of internship and apprenticeships is connected with a decrease in the level of international rank of universities.
- *Past worker unemployed:* there is a negative relation between the number of past worker unemployed and the degree of universities in the international ranks. The greater the number of the past worker unemployed the lower the degree of universities in the international ranks.
- *Graduates who continue previous work:* there is a negative relation between the number of graduates who continue previous work and the degree of universities in international rank. The greater the number of graduates who continue previous work the lower the degree of universities in the international rank.
- *Period from degree to first job:* there is a negative relation between the period intervened between the degree and the first job and the position of universities in the global ranking. The longer the period intervened between the first degree and the first job and the lower the position of universities in the global ranks.
- *Net Monthly Salary for Men:* There is a negative relation between the monthly salary for men and the position of universities in the global ranking. The greater the monthly salary for men the higher the position of universities in the global rankings.
- *Net Monthly salary for Women:* There is a negative relation between monthly salary for women and the position of universities in the global rankings. The greater the monthly salary for woman the higher the position of universities in the global rankings.
- *Job that require a degree 4 legal reasons:* there is a negative relation between the number of jobs that require a degree for legal reasons and the position of universities in the global ranking. In particular the greater the number of jobs that require a degree for legal reasons the lower the positions of universities in the global rankings.
- *Improvement in work due to grad:* there is a negative relation between the number of students that have a improvement in work due to graduation and the position of universities in the global rankings. In particular

the increasing of the number of people that has an improvement in work due to graduation is associated to a reduction in the position of universities in the global rankings.

- *Satisfaction with the work done:* there is a negative relation between the satisfaction of with the work done and the positions of universities in the global rankings. The increase in the satisfaction with work done is associated with a decline in the position of universities in the global rankings.
- *Response rate:* there is positive relation between the response rate of the student population and the position of universities in the global rankings. The increase in the response rate is associated with an increase in the position of universities in the global rankings.
- *Compensation based on gender Man:* there is a positive relation between the compensation based on gender especially for man and the position of universities in the global rankings. The increase in the compensation for male is associated with an increase in the position of universities in the global rankings.
- *Graduation grade:* there is a positive relation between the presence of graduation grade and the position of universities in the global rankings. The increase in the number students that holds a graduation is associated with an increase in the position of universities in the global rankings.
- *Duration of studies:* there is positive relation between the duration of studies and the position of universities in the global rankings. The increase in the duration of studies is associated with an increase in the position of universities in the global rankings.
- *Enrolled to improve cultural background:* There is a positive relation between the number of students enrolled to improve cultural background and the position of universities in the global rankings. In particular the increase in the number of people that is enrolled in the universities to improve their cultural background is associated with an increase in the positions of universities in the global rankings.
- *Number of employees:* there is a positive relation between the number of employees and the positions of universities in the global rankings. In particular the increase in the number of employees in the area is associated with an increase in the position of universities in the global rankings.
- *Period to find first job:* there is a positive relation between the period to find the first job and the position of universities in the global rankings. In particular the greater the period to find the first job for student population the higher the position of universities in global rankings.
- *Public sector workers:* there is a positive relation between the presence of public sector workers and the position of universities in the global rankings. In particular the increase in the number of public sector workers is associated to an increase in the position of universities in the global rankings.
- *Jobs for which the degree is effective:* there is a positive relation between the number of job position for which the degree is effective and the position of universities in the global rankings. In particular the increase in the number of jobs for which a degree is effective is associated to an increase in the position of universities global rankings.
- *Inactive look 4 Works in the last 15 years:* there is a positive relation between the presence of inactive people searching for work in the last 15 years and the position of universities in the global rankings. In particular the increase in the number of inactive employed that are searching for work in the last 15 years is associated to an increase in the position of universities global rankings.

We have estimated a series of variables to understand the effective relation between the position of universities in the global rankings and the characteristics of the student population and in general demographic population located in the same territory of the university. We find that more active population are generally associated with the presence of universities well-ranked at a global level. The best student population is interested not only in education but also in the culture trying to acquire not only knowledge not only for professional purpose or to acquire skills and competence. Universities require a demographic and cultural environment devoted to knowledge in general sense and not only for professional skills. But to improve motivation for excellence is also necessary a population that is not too satisfied with their jobs, since high degree of happiness and satisfaction of the population are negatively associated to an increase in the position of university global rankings.

Conclusion

In conclusion we can say that the presence of universities high positioned in the global rankings is determined by a set of variables defined either on a sociological point of view either demographic. Universities can improve their global rank creating better social and communitarian relationships. In particular universities that are located in communities that are more oriented to socially appreciate culture and knowledge have also better probabilities to increase their global ranking. In particular the presence of pro-active communities is essential not only to develop more performing

universities operating at an international level but also to generate more efficient spillovers in respect to the same communities. Universities in fact can generate important positive externalities on a communitarian level especially in the sense of promoting technological and innovative effects in the productive context. More pro-active communities, that have higher sensibility in respect to culture and knowledge can favour the development of more innovative universities with greater impact also in the sense of organizational spillovers. Spillovers can impact the socio-economic condition of the population of a certain community determining further positive effect on the development of universities. In this sense it is important to analyze the role of universities in respect to their communities. In this sense we have affirmed the presence of a nexus between high performing universities and the presence of pro-active communities on a local level. But we have also showed skepticism about the possibility to consider the nexus in the sense of causality or causation: we can only say that a certain nexus exists, that these phenomena are associated but we can't affirm the presence of a specific causality nexus. We can only affirm that certain phenomena are associated but we can't say if they are effectively in the order of causation of a causality.

Well performing universities are also more prone to be determined in connection with better student populations. In our analysis we have showed what are the characteristics of the student population that can sustain deeper performance of universities. In particular students that are more devoted to culture and knowledge, that consider universities as a tool to improve their personal and cultural abilities have more probabilities to perform better even in the global rankings. In this sense we can say that generally well-performing universities have good students but also that good students can generate well-performing universities. In our estimations we have found that the possibility for universities to better perform in a global environment are effectively related to presence of certain characteristics of the communities and in particular of the student population.

Limitations

There are three limitations in this article. The first limitation is the absence of the analysis of the connection between well performing universities and the local industrial and productive system. The second limitation is the presence of an excess of exogeneity in the relation between well ranked universities and well performing students. The exogeneity is difficult to eliminate due to the fact that high level of social capital in a certain territory is associated either to good universities either to well performing students. The third limitation is the fact that the dataset is only related to Italian universities and it does not consent to create international comparisons among different countries. The consequence of this limitation is the fact that the study can't be generalized without a preliminary analysis of the performance of non-italian universities in comparison with italian universities. To remove these limitations it is necessary to continue the research increasing the dataset and applying techniques able to solve or better investigate the question of exogeneity.

Recommendation

Our analysis shows that better universities have better students. But either universities and students participate of the social, cultural and human capital of a certain territory. Policy makers and governmental institutions interested in the performance of universities should act increasing the value of social, cultural and human capital. In well-ordered society in which values such as cooperation, knowledge, human relations, are effectively performed, there is a high probability to develop either well-performing universities, either to have a good student population. Policy makers and institutions can operate either endogenously either exogenously, designing better incentives and promoting a society more oriented to culture and knowledge. It is important also to implement policies able to create connections between the industrial system and the university system especially in the field of innovation and new technologies. If policy makers are able to increase the level of general trust in institutions and are capable to design incentives to increase the degree of knowledge and culture either in non-profit organization either in the industrial and manufactural sector, then the population can have extrinsic and intrinsic motivations to engage universities not only as a way to obtain professional knowledge but also interiorizing the need for a virtuous life based on culture. Policy makers have to promote either a better efficient university system either a better student population more oriented to culture and knowledge. The combination of more efficient universities and more performing student population can have a relevant impact on the ability of the society as a whole to generate values either in the industrial system either in the cultural environment.

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Appendix

Data and models affecting the relation between world university rankings and ISTAT-BES variables

Variable	Obs	Mean	Std. Dev.	Min	Max
WorldUnive~e	1814	44.96787	1.950472	42.49	74.7
Health	3650	101.9778	8.086812	81.6	124.8
Education	3729	105.791	8.358318	84	129.3
Employment	3729	99.37198	17.46225	68.6	128.6
QualityOfW~k	3729	94.28941	10.44127	69.8	112.5
IncomeAndI~y	3349	99.86984	12.75191	67.6	122
SocialRela~s	3571	97.39039	9.877346	79.5	128.1
PredatoryC~s	3349	93.75417	8.339138	76.8	116
Subjective~g	3571	90.4879	8.955798	69.3	127.8
Landscape	3578	95.70548	12.2103	72.3	126.1
Environment	3571	101.5735	4.545237	89.4	120.3
QualityOfS~s	2875	97.21537	10.16311	75	117.5

Figure 6. Sum of variables of the model estimating the relation between World University Rankings and BES-ISTAT

	WorldU~e	Health	Educat~n	Employ~t	Qualit~k	Income~y	Social~s	Predat~s	Subjec~g	Landscape	Enviro~t	Qualit~s
WorldUnive~e	1.0000											
Health	0.2494	1.0000										
Education	0.1227	0.7856	1.0000									
Employment	0.2525	0.9390	0.8363	1.0000								
QualityOfW~k	0.1962	0.8952	0.7661	0.9306	1.0000							
IncomeAndI~y	0.2337	0.9225	0.8078	0.9632	0.9514	1.0000						
SocialRela~s	0.1966	0.9033	0.8092	0.9382	0.8743	0.9268	1.0000					
PredatoryC~s	-0.4051	-0.4942	-0.1907	-0.5136	-0.4258	-0.5116	-0.3827	1.0000				
Subjective~g	0.1113	0.8144	0.8002	0.8110	0.7610	0.8220	0.9077	-0.2797	1.0000			
Landscape	0.1775	0.9363	0.8076	0.9399	0.9124	0.9405	0.9493	-0.3723	0.8474	1.0000		
Environment	-0.0180	0.4333	0.6843	0.4715	0.5502	0.5555	0.5179	0.0759	0.5221	0.5054	1.0000	
QualityOfS~s	0.2070	0.9164	0.7664	0.9378	0.9402	0.9313	0.9182	-0.4120	0.8396	0.9388	0.5274	1.0000

Figure 7. Correlation matrix.

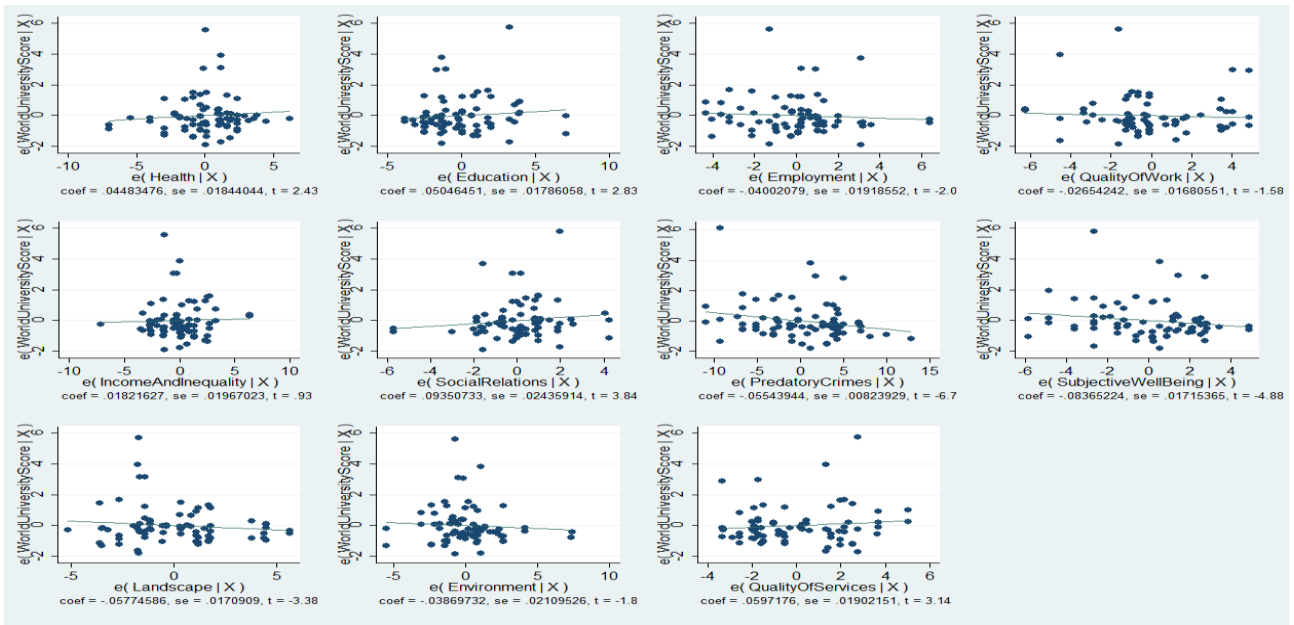


Figure 8. OLS for the model that regress World University Ranking and BES-ISTAT data.

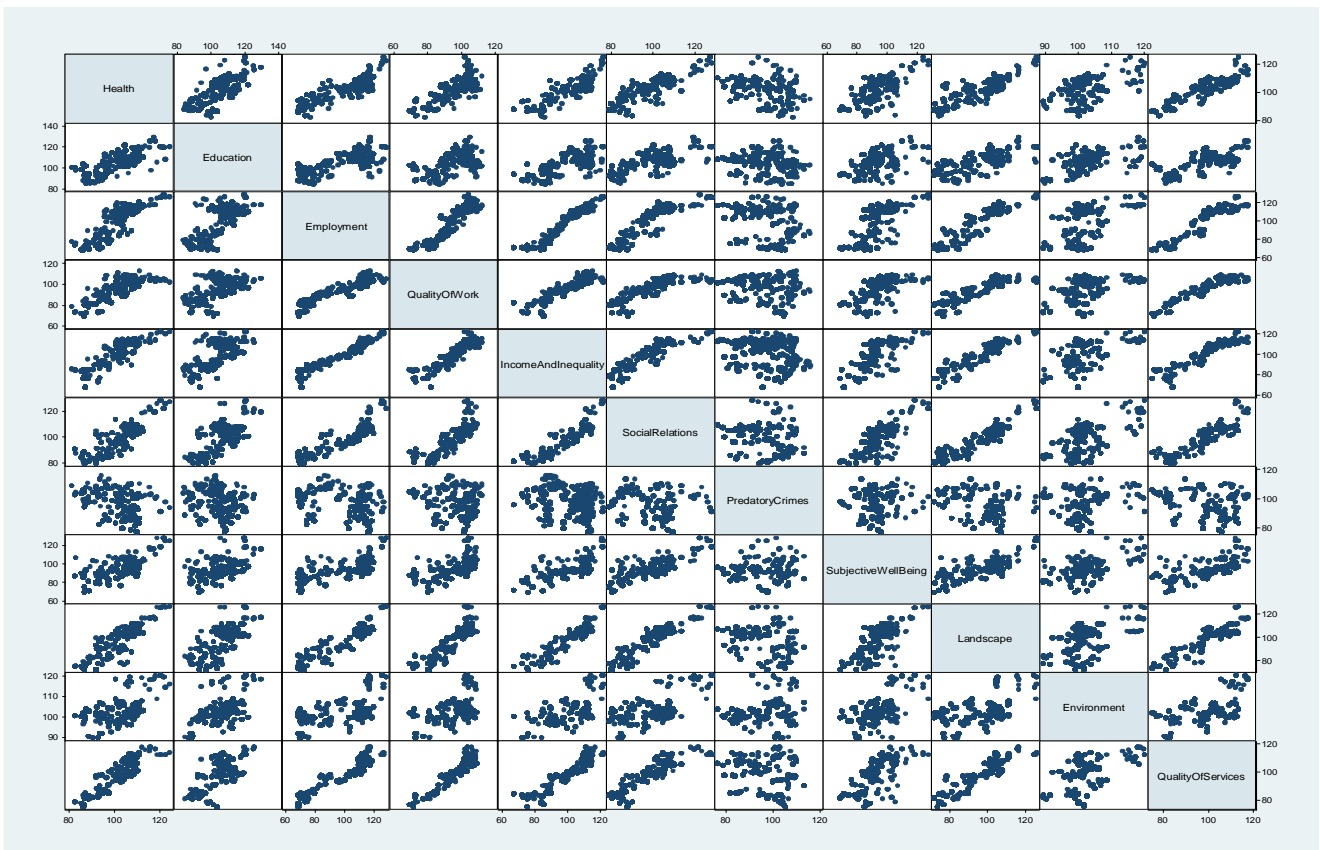


Figure 9. Correlation matrix of the relation between World University Ranking and BES-Istat

Fixed-effects (within) regression		Number of obs	=	864		
Group variable: id_uni		Number of groups	=	36		
R-sq: within	= 0.6605	Obs per group: min	=	24		
between	= 0.1338	avg	=	24.0		
overall	= 0.1411	max	=	24		
corr(u_i, Xb) = -0.5839		F(11,817)	=	144.50		
		Prob > F	=	0.0000		

WorldUniversitySc~e	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
Health	.0890916	.0109724	8.12	0.000	.0675543	.1106289
Education	.0565088	.0083758	6.75	0.000	.0400683	.0729494
Employment	-.141658	.0153235	-9.24	0.000	-.171736	-.11158
QualityOfWork	.0225756	.008738	2.58	0.010	.0054239	.0397272
IncomeAndInequality	.0317377	.0056476	5.62	0.000	.0206522	.0428232
SocialRelations	.0513437	.0050032	10.26	0.000	.0415231	.0611644
PredatoryCrimes	-.1192689	.0049754	-23.97	0.000	-.129035	-.1095027
SubjectiveWellBeing	-.0477259	.0072398	-6.59	0.000	-.0619367	-.0335151
Landscape	-.0269593	.009238	-2.92	0.004	-.0450923	-.0088262
Environment	-.1150984	.0104693	-10.99	0.000	-.1356484	-.0945484
QualityOfServices	.1639507	.012255	13.38	0.000	.1398957	.1880057
_cons	47.47675	1.006041	47.19	0.000	45.50202	49.45148
sigma_u	1.5810965					
sigma_e	.1393213					
rho	.99229524	(fraction of variance due to u_i)				

F test that all u_i=0:	F(35, 817) = 1896.85	Prob > F = 0.0000
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Figure 10. Panel Data Fixed Effects.

Random-effects GLS regression		Number of obs	=	864		
Group variable: id_uni		Number of groups	=	36		
R-sq: within	= 0.6597	Obs per group: min	=	24		
between	= 0.1311	avg	=	24.0		
overall	= 0.1398	max	=	24		
corr(u_i, X) = 0 (assumed)		Wald chi2(11)	=	1578.99		
		Prob > chi2	=	0.0000		

WorldUniversitySc~e	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
Health	.0862487	.0108039	7.98	0.000	.0650735	.1074238
Education	.0628777	.0077037	8.16	0.000	.0477788	.0779767
Employment	-.152801	.013252	-11.53	0.000	-.1787745	-.1268275
QualityOfWork	.0174094	.00844	2.06	0.039	.0008673	.0339516
IncomeAndInequality	.0345029	.00534	6.46	0.000	.0240367	.0449692
SocialRelations	.0526756	.0049452	10.65	0.000	.0429832	.062368
PredatoryCrimes	-.1147272	.0045804	-25.05	0.000	-.1237046	-.1057497
SubjectiveWellBeing	-.0521225	.0068962	-7.56	0.000	-.0656387	-.0386063
Landscape	-.0331219	.0083197	-3.98	0.000	-.0494283	-.0168155
Environment	-.1097155	.0102951	-10.66	0.000	-.1298935	-.0895374
QualityOfServices	.1637362	.01193	13.72	0.000	.1403539	.1871185
_cons	48.30734	.9421166	51.28	0.000	46.46083	50.15386
sigma_u	1.4636609					
sigma_e	.1393213					
rho	.99102082	(fraction of variance due to u_i)				

Figure 11. Panel data Random Effects.

Data and analysis on the relation between the global, university ranking and Almalaurea variables.

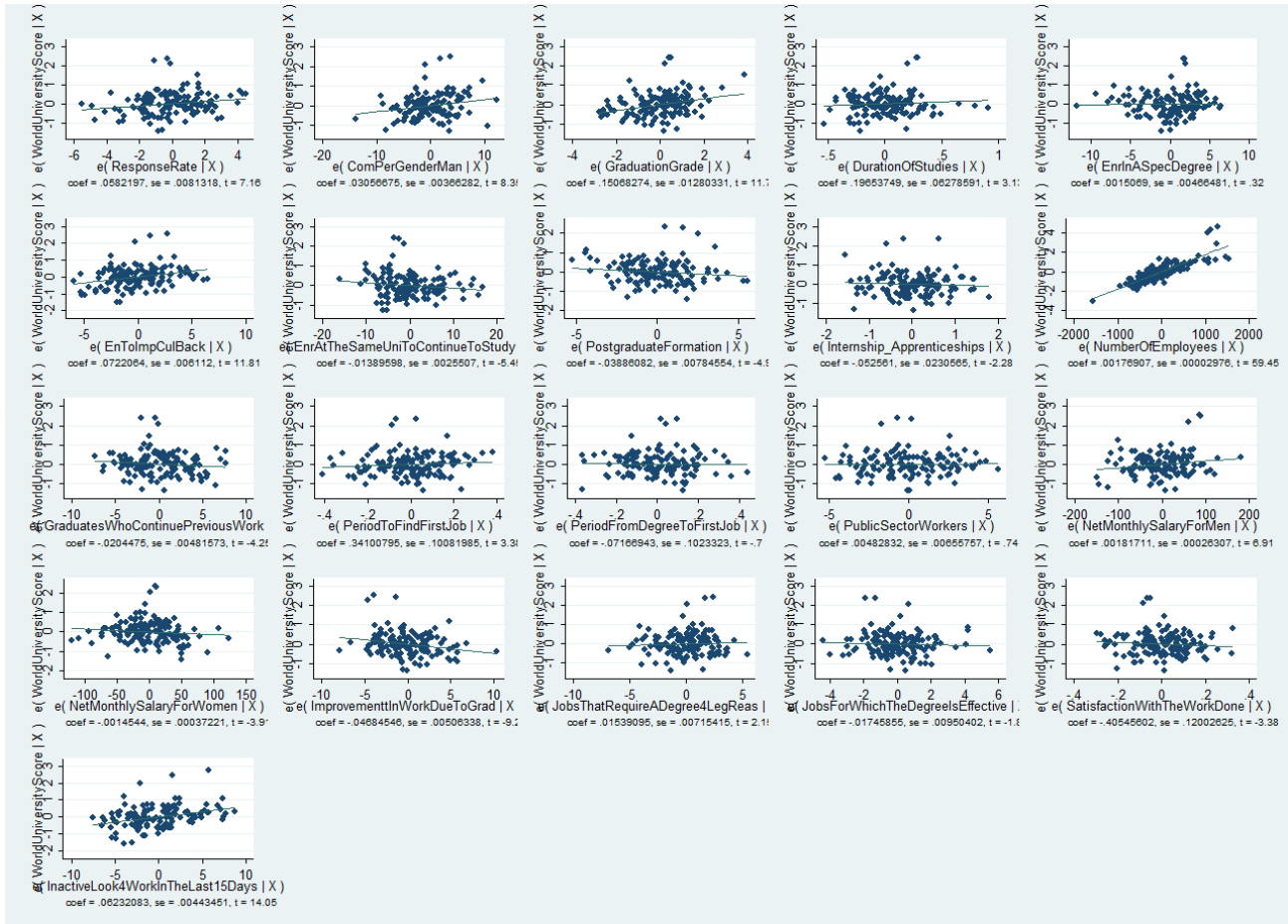


Figure 12. OLS among variables estimating the position of universities in the World Ranking with data from Almalaurea.

Variable	Obs	Mean	Std. Dev.	Min	Max
WorldUnive~e	1814	44.96787	1.950472	42.49	74.7
ResponseRate	3868	83.08157	4.738468	62.5	92.9
ComPerGen~an	3868	40.93428	10.53035	7.7	73.6
Graduation~e	3868	99.86125	2.100433	92.9	106.4
DurationOf~s	3868	4.629292	.5567582	3.2	6.2
EnrInASpec~e	3868	54.68014	12.09511	4.3	85.6
EnToImpCul~k	3867	27.97422	5.203184	14.7	100
EnrAtTheSa~y	3867	67.86111	13.61717	10	95.9
Postgradua~n	3868	32.11595	6.731656	15.2	70.8
Internship~s	3868	4.887099	2.207919	.8	26.7
PastWorker~d	3868	16.60305	3.361846	3	34.3
NumberOfEm~s	3868	729.0109	763.6062	11	3759
GraduatesW~k	3868	42.46714	10.6883	3.7	87.7
PeriodToFi~b	3868	3.116598	.582921	1.3	6
PeriodFrom~b	3868	4.152404	.5540522	1.7	7.3
PublicSect~s	3865	15.63847	7.085241	1.4	55.1
NetMonth~Men	3868	1026.555	162.819	540	1907
NetMonth~men	3868	795.9951	156.4859	361	1509
Improvemen~d	3853	28.6931	7.672475	7.7	100
JobsThatRe~s	3868	21.26711	12.98322	.9	79.8
JobsForWhi~e	3868	40.59038	11.10581	12.3	85.7
Satisfacti~e	3868	7.026138	.3523417	5.6	8.5
InactiveLo~s	3868	54.95548	8.211455	26	90

Figure 13. Sum of variables.

Fixed-effects (within) regression
 Group variable: id_uni
 Number of obs = 1607
 Number of groups = 35
 R-sq: within = 0.9187
 between = 0.0635
 overall = 0.2819
 Obs per group: min = 12
 avg = 45.9
 max = 48
 F(22,1550) = 796.62
 Prob > F = 0.0000
 corr(u_i, Xb) = -0.0337

WorldUniversityScore	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
ResponseRate	.0851122	.004671	18.22	0.000	.0759501	.0942744
ComPerGenderMan	.0225671	.004984	4.53	0.000	.012791	.0323432
GraduationGrade	.177335	.0162574	10.91	0.000	.1454462	.2092238
DurationOfStudies	.5699716	.0763443	7.47	0.000	.4202226	.7197206
EnrInASpecDegree	-.0182991	.0046091	-3.97	0.000	-.0273398	-.0092584
EnToImpCulBack	.0386184	.0041637	9.28	0.000	.0304513	.0467855
EnrAtTheSameUniToContinueToStudy	-.0082415	.0022964	-3.59	0.000	-.0127458	-.0037371
PostgraduateFormation	-.0679042	.0047156	-14.40	0.000	-.0771538	-.0586546
Internship_Apprenticeships	-.0512434	.0126371	-4.05	0.000	-.076031	-.0264557
PastWorkerUnemployed	-.0620895	.0071861	-8.64	0.000	-.0761851	-.047994
NumberOfEmployees	.0004192	.0001151	3.64	0.000	.0001934	.000645
GraduatesWhoContinuePreviousWork	-.027192	.003807	-7.14	0.000	-.0346593	-.0197246
PeriodToFindFirstJob	.4215542	.0518322	8.13	0.000	.3198855	.5232229
PeriodFromDegreeToFirstJob	-.3088817	.0533607	-5.79	0.000	-.4135485	-.2042149
PublicSectorWorkers	.0100462	.0040874	2.46	0.014	.0020288	.0180635
NetMonthlySalaryForMen	-.0004447	.0001554	-2.86	0.004	-.0007496	-.0001398
NetMonthlySalaryForWomen	-.0013808	.0002571	-5.37	0.000	-.0018852	-.0008765
ImprovementtInWorkDueToGrad	-.0172349	.0023851	-7.23	0.000	-.0219134	-.0125565
JobsThatRequireADegree4LegReas	-.0345762	.0051452	-6.72	0.000	-.0446685	-.0244839
JobsForWhichTheDegreeIsEffective	.014613	.0050732	2.88	0.004	.0046619	.024564
SatisfactionWithTheWorkDone	-.4906557	.0614884	-7.98	0.000	-.611265	-.3700464
InactiveLook4WorkInTheLast15Days	.023458	.0023032	10.18	0.000	.0189403	.0279756
_cons	25.58314	1.792875	14.27	0.000	22.06643	29.09986
sigma_u	1.442372					
sigma_e	.22341498					
rho	.97656994	(fraction of variance due to u_i)				

F test that all u_i=0: F(34, 1550) = 296.67 Prob > F = 0.0000

Figure 14. Panel data fixed effects.

Random-effects GLS regression		Number of obs	=	1607		
Group variable: id_uni		Number of groups	=	35		
R-sq: within	= 0.9177	Obs per group: min	=	12		
between	= 0.5073	avg	=	45.9		
overall	= 0.6154	max	=	48		
corr(u_i, X) = 0 (assumed)		Wald chi2(22)	=	16986.97		
		Prob > chi2	=	0.0000		

WorldUniversityScore	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
ResponseRate	.0754057	.0045504	16.57	0.000	.0664871	.0843243
ComPerGenderMan	.0201178	.0048374	4.16	0.000	.0106368	.0295988
GraduationGrade	.1679158	.0161796	10.38	0.000	.1362043	.1996273
DurationOfStudies	.4768473	.0742675	6.42	0.000	.3312857	.6224089
EnrInASpecDegree	-.0215606	.0043994	-4.90	0.000	-.0301832	-.012938
EnToImpCulBack	.0427755	.0041649	10.27	0.000	.0346124	.0509386
EnrAtTheSameUniToContinueToStudy	-.0070111	.0023062	-3.04	0.002	-.0115313	-.0024909
PostgraduateFormation	-.0704779	.0047595	-14.81	0.000	-.0798064	-.0611494
Internship_Apprenticeships	-.0593929	.0127476	-4.66	0.000	-.0843777	-.0344081
PastWorkerUnemployed	-.0643002	.0071521	-8.99	0.000	-.078318	-.0502824
NumberOfEmployees	.000878	.0000962	9.13	0.000	.0006895	.0010666
GraduatesWhoContinuePreviousWork	-.0280966	.0038364	-7.32	0.000	-.0356158	-.0205774
PeriodToFindFirstJob	.3892808	.0522514	7.45	0.000	.2868699	.4916917
PeriodFromDegreeToFirstJob	-.2888069	.0540517	-5.34	0.000	-.3947463	-.1828675
PublicSectorWorkers	.0114893	.0041279	2.78	0.005	.0033986	.0195799
NetMonthlySalaryForMen	-.0005512	.0001567	-3.52	0.000	-.0008583	-.0002441
NetMonthlySalaryForWomen	-.0013187	.0002591	-5.09	0.000	-.0018265	-.0008109
ImprovementtInWorkDueToGrad	-.0167031	.0024193	-6.90	0.000	-.0214449	-.0119614
JobsThatRequireADegree4LegReas	-.0369878	.0051568	-7.17	0.000	-.0470948	-.0268807
JobsForWhichTheDegreeIsEffective	.0173674	.0051165	3.39	0.001	.0073393	.0273955
SatisfactionWithTheWorkDone	-.4913802	.0621507	-7.91	0.000	-.6131934	-.3695671
InactiveLook4WorkInTheLast15Days	.0268593	.0022906	11.73	0.000	.0223697	.0313489
_cons	27.31849	1.778267	15.36	0.000	23.83315	30.80383
sigma_u	.77266507					
sigma_e	.22341498					
rho	.9228439	(fraction of variance due to u_i)				

Figure 15. Panel data random effects.

```
. hausman fe re
```

	Coefficients			sqrt (diag (V_b-V_B)) S.E.
	(b) fe	(B) re	(b-B) Difference	
ResponseRate	.0851122	.0754057	.0097065	.0010545
ComPerGen~an	.0225671	.0201178	.0024493	.0012001
Graduation~e	.177335	.1679158	.0094192	.0015881
DurationOf~s	.5699716	.4768473	.0931243	.0176859
EnrInASpec~e	-.0182991	-.0215606	.0032615	.0013745
EnToImpCul~k	.0386184	.0427755	-.0041571	.
EnrAtTheSa~y	-.0082415	-.0070111	-.0012304	.
Postgradua~n	-.0679042	-.0704779	.0025737	.
Internship~s	-.0512434	-.0593929	.0081495	.
PastWorker~d	-.0620895	-.0643002	.0022107	.0006987
NumberOfEm~s	.0004192	.000878	-.0004588	.0000632
GraduatesW~k	-.027192	-.0280966	.0009046	.
PeriodToFi~b	.4215542	.3892808	.0322734	.
PeriodFrom~b	-.3088817	-.2888069	-.0200748	.
PublicSect~s	.0100462	.0114893	-.0014431	.
NetMonth~Men	-.0004447	-.0005512	.0001064	.
NetMonth~men	-.0013808	-.0013187	-.0000621	.
Improvemen~d	-.0172349	-.0167031	-.0005318	.
JobsThatRe~s	-.0345762	-.0369878	.0024116	.
JobsForWhi~e	.014613	.0173674	-.0027544	.
Satisfacti~e	-.4906557	-.4913802	.0007245	.
InactiveLo~s	.023458	.0268593	-.0034014	.0002401

b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

```
chi2(22) = (b-B)'[(V_b-V_B)^(-1)](b-B)
          =      57.04
Prob>chi2 =      0.0001
(V_b-V_B is not positive definite)
```

Figure 16. Hausman test.

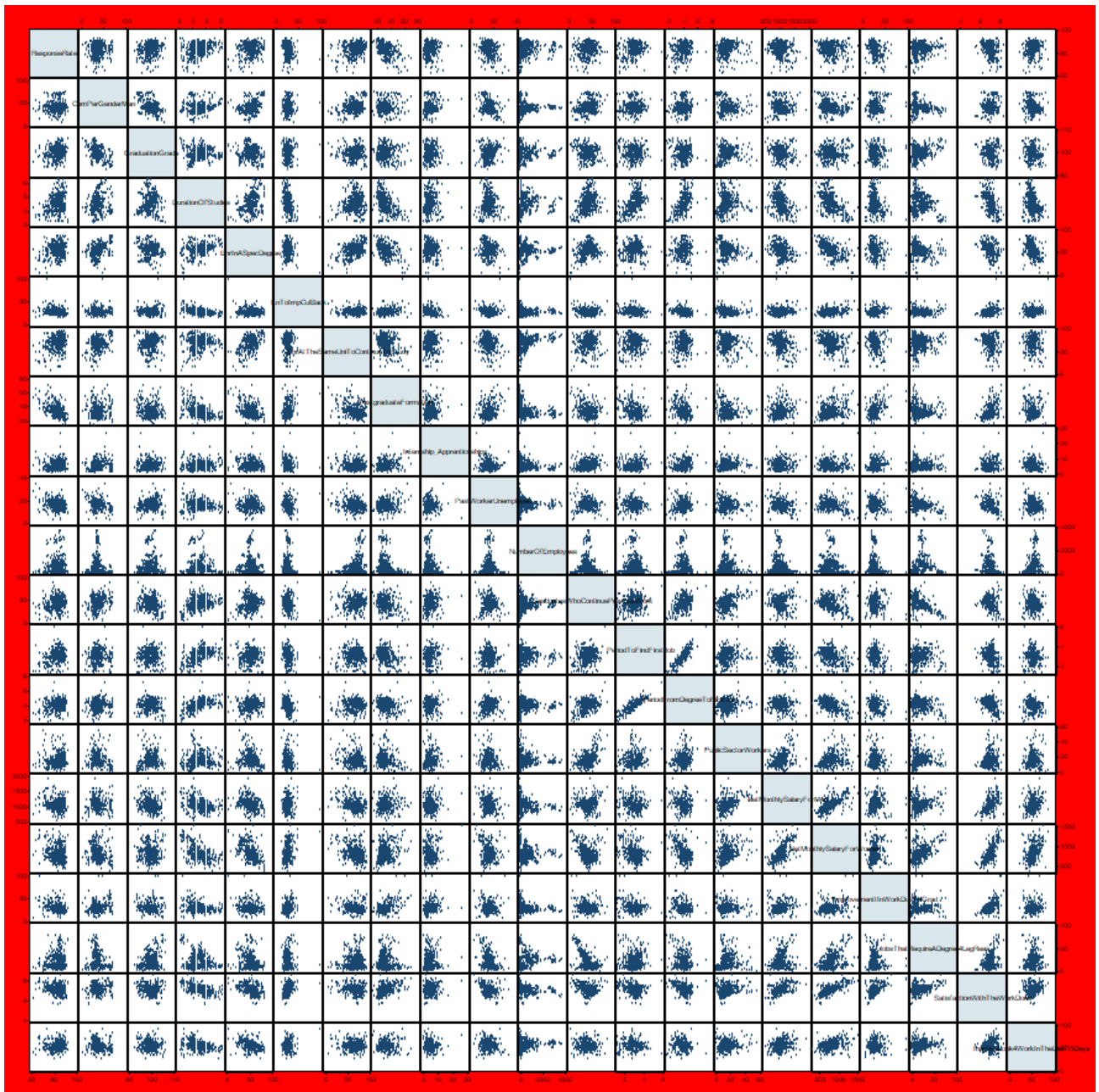


Figure 17. Correlation matrix.

	ResponseRate	ComPerGen-an	GraduationRate	DurationOf-s	EnrInASpec-e	EnToImpCul-k	EnrAtTheSa-y	FostGradu-n	Internship-s	PastWorker-d	NumberOfEm-s	GraduatesW-k	PeriodToFi-b	PeriodFrom-b	PublicSecr-s	NetMonch-Men	NetMonch-men	Improv-ad	JobTh-s	Satisf-e	Inact-ys	
ResponseRate	1.0000																					
ComPerGen-an	0.0546	1.0000																				
GraduationRate	0.1455	-0.4116	1.0000																			
DurationOf-s	0.3542	0.1342	0.0539	1.0000																		
EnrInASpec-e	0.0938	0.3918	-0.0832	0.4173	1.0000																	
EnToImpCul-k	-0.3607	0.0991	-0.0980	-0.4376	-0.0333	1.0000																
EnrAtTheSa-y	0.2122	0.3263	0.0347	-0.1549	0.4622	0.0131	1.0000															
FostGradu-n	-0.5558	-0.0637	0.0620	-0.4693	-0.4467	0.3236	-0.2964	1.0000														
Internship-s	-0.0117	0.0756	0.0831	0.2142	-0.1599	-0.3374	-0.1554	0.2853	1.0000													
PastWorker-d	-0.1431	-0.4541	0.3765	-0.1671	-0.0286	-0.1222	-0.1167	0.2024	0.0230	1.0000												
NumberOfEm-s	0.0415	-0.0642	-0.0640	-0.1726	-0.0256	-0.0008	0.4084	-0.1170	-0.2225	-0.0201	1.0000											
GraduatesW-k	0.1437	0.2416	-0.0345	0.1788	0.2371	-0.0218	0.1275	-0.1977	0.0992	-0.0101	-0.1417	1.0000										
PeriodToFi-b	0.4103	-0.0295	0.1174	0.5451	0.0650	-0.2653	0.1669	-0.3697	0.0824	-0.1631	-0.0777	0.0684	1.0000									
PeriodFrom-b	0.2785	-0.0061	0.1344	0.5463	0.2329	-0.3148	0.2072	-0.3142	0.1000	0.0208	-0.1153	0.2077	0.8660	1.0000								
PublicSecr-s	-0.0144	-0.1857	0.0797	-0.0295	-0.3547	-0.1157	-0.2498	-0.0258	0.1143	-0.0068	-0.1491	0.4057	0.0608	0.0787	1.0000							
NetMonch-Men	-0.2602	-0.1793	-0.1468	-0.2852	-0.4773	0.0913	-0.5096	0.1505	-0.0055	-0.1488	-0.1584	-0.0385	-0.1659	-0.2253	0.5387	1.0000						
NetMonch-men	-0.2269	-0.2810	-0.1056	-0.2026	-0.6495	0.1839	-0.5090	0.2698	-0.0876	-0.0871	0.0458	-0.3051	-0.3525	-0.5153	0.3472	0.6913	1.0000					
Improvemen-d	-0.3108	0.1489	0.0396	-0.2065	-0.2851	0.2371	-0.2753	0.4784	0.3037	-0.1198	-0.1664	0.0498	-0.2221	-0.2391	0.0203	0.1779	0.2242	1.0000				
JobsThatRe-s	0.0740	-0.1371	0.1564	-0.1257	-0.4493	-0.1393	0.0191	0.0691	0.0569	-0.2446	0.2342	-0.6190	0.1426	-0.0640	0.0136	0.1534	0.4227	0.0519	1.0000			
Satisfacti-e	-0.3135	0.0283	-0.1385	-0.4691	-0.5071	0.3866	-0.3316	0.4169	-0.0280	-0.2707	-0.0896	-0.2103	-0.2419	-0.3865	0.1936	0.5126	0.6465	0.5230	0.3651	1.0000		
Inactivel-o-s	0.1609	-0.2102	-0.0585	-0.3813	-0.5125	-0.0008	-0.1152	-0.0625	-0.1670	-0.0673	0.2738	-0.0897	-0.0190	-0.1973	0.1784	0.3085	0.4801	-0.0817	0.2375	0.1677	1.0000	

Figure 18. Correlation matrix.

Variable	RE	FE	RE_Robust	FE_robust	BE	OLS	OLS_Robust	OLS_Be
ResponseRate	.07540572	.08511225	.07540572	.08511225	.02801249	.05074187	.05074187	.05074187
ComPerGen~an	.0201178	.0225671	.0201178	.0225671	.03912819	.03117771	.03117771	.03117771
Graduation~e	.1679158	.177335	.1679158	.177335	.1374001	.17052098	.17052098	.17052098
DurationOf~s	.4768473	.5699716	.4768473	.5699716	.3066208	.15451191	.15451191	.15451191
EnrInASpec~e	-.02156058	-.01829909	-.02156058	-.01829909	.00485012	-.00140294	-.00140294	-.00140294
EnToImpCul~k	.04277547	.0386184	.04277547	.0386184	.09108472	.06663253	.06663253	.06663253
EnrAtTheSa~y	-.0070111	-.00824146	-.0070111	-.00824146	.00043182	-.01299757	-.01299757	-.01299757
Postgradua~n	-.07047789	-.06790419	-.07047789	-.06790419	-.04469222	-.03994673	-.03994673	-.03994673
Internship~s	-.0593929	-.05124335	-.0593929	-.05124335	.40909724	-.05324733	-.05324733	-.05324733
PastWorker~d	-.06430018	-.06208952	-.06430018	-.06208952	.02487227	-.03260142	-.03260142	-.03260142
NumberOfEm~s	.00087802	.00041923	.00087802	.00041923	.00148188	.00176441	.00176441	.00176441
GraduatesW~k	-.02809658	-.02719197	-.02809658	-.02719197	-.08201818	-.02541853	-.02541853	-.02541853
PeriodToFi~b	.3892808	.42155421	.3892808	.42155421	-5.6345527	.2589735	.2589735	.2589735
PeriodFrom~b	-.28880689	-.30888172	-.28880689	-.30888172	4.2082065	.04514422	.04514422	.04514422
PublicSect~s	.01148925	.01004618	.01148925	.01004618	.01535702	.01150359	.01150359	.01150359
NetMonth~Men	-.00055116	-.00044472	-.00055116	-.00044472	.00627375	.00166838	.00166838	.00166838
NetMonth~men	-.00131869	-.00138084	-.00131869	-.00138084	-.00431974	-.00123322	-.00123322	-.00123322
Improvemen~d	-.01670314	-.01723494	-.01670314	-.01723494	.04539137	-.04604168	-.04604168	-.04604168
JobsThatRe~s	-.03698778	-.0345762	-.03698778	-.0345762	.10739192	.00961242	.00961242	.00961242
JobsForWhi~e	.01736738	.01461296	.01736738	.01461296	-.12095565	-.01771403	-.01771403	-.01771403
Satisfacti~e	-.49138024	-.49065572	-.49138024	-.49065572	-2.8431067	-.44368528	-.44368528	-.44368528
InactiveLo~s	.02685931	.02345795	.02685931	.02345795	.12693681	.06081222	.06081222	.06081222
_cons	27.318493	25.583142	27.318493	25.583142	35.739138	21.898253	21.898253	21.898253

Figure 19. Confrontation among panel data random effects, panel data with fixed effects, panel data with random effects robust, panel data with fixed effects robust, between, OLS, OLS robust, OLS between.

Principal components/correlation Number of obs = 1607
 Number of comp. = 23
 Trace = 23
 Rho = 1.0000

Rotation: (unrotated = principal)

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	6.31825	2.23458	0.2747	0.2747
Comp2	4.08367	1.19579	0.1776	0.4523
Comp3	2.88788	.819795	0.1256	0.5778
Comp4	2.06809	.557032	0.0899	0.6677
Comp5	1.51105	.395053	0.0657	0.7334
Comp6	1.116	.374747	0.0485	0.7820
Comp7	.741255	-.020471	0.0322	0.8142
Comp8	-.721208	-.0323203	0.0314	0.8455
Comp9	-.688888	-.148251	0.0300	0.8755
Comp10	-.540637	-.0533092	0.0235	0.8990
Comp11	-.487328	-.116171	0.0212	0.9202
Comp12	-.371156	-.0773569	0.0161	0.9363
Comp13	-.293799	-.0373258	0.0128	0.9491
Comp14	-.256474	-.0200074	0.0112	0.9602
Comp15	-.236466	-.0388774	0.0103	0.9705
Comp16	-.197589	-.0466042	0.0086	0.9791
Comp17	-.150985	-.0570631	0.0066	0.9857
Comp18	-.0939215	-.0193958	0.0041	0.9898
Comp19	-.0745257	-.0144294	0.0032	0.9930
Comp20	-.0600963	-.00961098	0.0026	0.9956
Comp21	-.0504853	-.0149005	0.0022	0.9978
Comp22	-.0355848	-.0209321	0.0015	0.9994
Comp23	-.0146528	.	0.0006	1.0000

Principal components (eigenvectors)

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Comp7	Comp8	Comp9	Comp10	Comp11	Comp12	Comp13	Comp14	Comp15	Comp16	Comp17	Comp18	Comp19	Comp20
WorldUnive-e	-0.0319	-0.1183	0.4642	0.2826	0.0800	0.0680	-0.0565	-0.1753	-0.0541	0.1575	-0.0149	0.3836	-0.0414	-0.1189	0.0534	0.2094	0.0784	-0.1585	-0.0718	-0.6082
ResponseRate	-0.0659	0.1583	0.3660	-0.3519	0.0796	-0.2294	0.1756	-0.0666	-0.0507	0.0898	-0.0564	0.2110	-0.0326	0.4455	-0.1377	-0.3400	0.4282	0.0729	0.0536	0.0606
ComPerGen-an	-0.0348	-0.2973	-0.1382	-0.1550	0.2532	0.0810	0.4118	0.2866	-0.0240	0.4673	-0.1617	0.3383	-0.0502	0.0325	0.1545	0.2565	-0.0381	0.0296	0.0322	0.1395
Graduation-e	0.0297	0.3057	-0.0218	0.2086	0.3884	0.0901	0.0240	-0.0996	0.0178	0.5669	-0.2974	-0.1902	0.0122	-0.1979	-0.3657	-0.0278	0.0683	-0.0148	0.0967	0.1341
DurationOf-s	-0.2129	0.3090	-0.0489	-0.1053	0.0010	0.1960	-0.1937	-0.1948	0.1053	0.0569	-0.2967	0.1376	0.4469	0.3950	0.0560	0.3701	-0.2130	-0.1231	-0.1397	0.0860
EnrInApe-e	-0.3141	-0.1634	-0.2060	0.0142	0.0738	0.1783	-0.0132	0.1347	-0.1449	-0.0065	-0.1309	0.0108	-0.1889	-0.1673	-0.1465	0.0714	0.2477	-0.2804	0.1635	0.0643
EnToImpCul-k	0.0737	-0.3326	0.0309	-0.0818	0.1811	0.3713	-0.1339	-0.3410	-0.0466	0.3332	0.2729	-0.3181	0.0062	0.2133	0.4297	-0.0614	0.1549	-0.0363	-0.0485	0.1178
EnrAtTheSa-y	-0.1574	-0.1733	0.1708	0.2890	-0.0886	0.4070	0.1707	0.4024	0.1103	-0.1601	-0.0061	-0.2403	0.4008	0.2064	-0.2060	-0.2238	0.1690	-0.0878	0.0087	-0.1154
Postgradua-n	0.2353	0.1251	-0.1384	0.2945	-0.2022	-0.1657	0.4386	-0.1871	0.0359	0.2023	0.1516	-0.0131	0.0996	0.1483	0.0106	-0.2893	-0.2828	-0.3870	-0.1169	-0.0544
Internship-s	0.0641	0.3295	-0.1966	0.1932	-0.2538	0.0945	-0.2801	-0.1893	-0.1477	0.2092	-0.0238	0.1024	-0.0185	0.0604	0.3290	0.0046	0.4900	0.1093	0.3253	-0.0241
PastWorker-d	-0.0131	0.1411	-0.2340	0.3383	0.2366	-0.3134	-0.2820	0.4619	-0.0023	0.2323	0.2881	0.1385	0.1454	0.2092	0.2218	0.0492	0.1948	0.1581	-0.0919	-0.0389
NumberOfM-s	-0.0001	-0.1671	0.2937	0.5050	-0.0196	0.0613	-0.0786	-0.1522	-0.0371	-0.1178	0.0430	0.3252	-0.0689	0.0699	-0.0726	-0.0270	-0.1363	0.1907	0.1395	0.6155
GraduatesW-k	-0.2792	-0.1308	-0.0547	0.0632	0.3295	-0.0773	0.4355	-0.1578	0.2337	-0.0601	0.0147	-0.1258	0.0600	0.0130	0.0268	0.0796	-0.1982	0.5787	0.0665	-0.2055
PeriodToFi-b	-0.1624	0.3150	0.2558	-0.1552	-0.0631	0.2208	0.0050	0.0886	0.2700	0.1053	0.2695	-0.0054	-0.1130	-0.0904	0.0937	-0.0450	-0.0826	0.0354	0.1757	0.0064
PeriodFrom-b	-0.2326	0.3239	0.1197	-0.0329	-0.0862	0.1512	-0.0121	0.1611	0.2173	0.1003	0.3200	0.0442	-0.1576	-0.1116	0.1121	-0.0256	-0.2095	-0.1096	0.1948	0.0482
PublicSect-s	0.1043	0.1761	0.0040	0.0093	0.5780	0.1805	0.3379	0.1776	-0.2595	-0.3300	0.0873	-0.2499	0.1601	0.2132	0.0955	-0.1070	-0.2631	-0.0543	0.0689	0.0689
NetMonth-Men	0.2866	-0.0310	-0.0939	-0.2143	0.2272	0.1815	0.0921	-0.0113	0.1989	-0.0642	0.1043	0.4256	0.4771	-0.4568	0.0679	-0.1861	0.1509	0.0023	-0.0486	0.1211
NetMonth-wen	-0.3523	-0.1112	0.0804	-0.0736	0.1018	-0.1002	-0.1290	0.1135	-0.0560	0.0091	-0.1391	-0.0624	0.2027	0.1359	0.0784	0.0158	-0.2264	-0.0500	0.7830	-0.1496
Improvement-d	0.2159	-0.0346	-0.2606	0.1462	0.0104	0.1211	-0.0809	-0.0768	0.6913	-0.1175	-0.2320	0.1372	-0.3772	0.2275	0.0433	-0.0544	0.2163	-0.0656	0.0813	-0.0913
JobsThatRe-s	0.3073	0.1867	0.1535	0.0328	-0.1581	0.2222	-0.0092	0.1679	-0.1883	0.0362	-0.2023	-0.1426	-0.0290	0.1354	-0.0406	-0.0138	0.2568	-0.0693	-0.0492	0.0492
JobsForWhi-e	0.3379	0.1551	0.0839	0.0198	-0.1291	0.2429	0.0460	0.1730	-0.0311	0.0501	-0.1872	-0.0392	-0.0570	-0.0029	0.0602	0.0485	-0.0073	0.3194	-0.2440	-0.0308
Satisfacti-e	0.3075	-0.1149	-0.0440	-0.1738	0.0762	0.1567	-0.0257	0.0437	0.0247	0.0555	0.4633	0.0600	-0.0873	0.2253	-0.6308	0.3385	-0.0993	0.0429	-0.0720	-0.0446
Inactivelow-s	0.1656	-0.0725	0.3983	-0.0052	0.0293	-0.3396	0.1693	0.1321	0.3300	-0.0309	-0.0303	-0.3323	0.0803	-0.1367	0.1030	0.4564	0.1902	-0.2210	-0.1089	0.2575

Variable	Comp21	Comp22	Comp23	Unexplained
WorldUnive-e	0.0162	-0.0146	-0.0145	0
ResponseRate	0.1669	-0.0439	-0.0334	0
ComPerGen-an	-0.2071	-0.0620	0.0569	0
Graduation-e	-0.1743	-0.0951	0.0185	0
DurationOf-s	0.1502	0.0642	0.0564	0
EnrInApe-e	0.6040	0.3225	-0.0904	0
EnToImpCul-k	0.0676	-0.0341	-0.0217	0
EnrAtTheSa-y	-0.1315	-0.0926	0.0338	0
Postgradua-n	0.2459	0.1982	-0.0123	0
Internship-s	-0.0855	-0.0548	-0.0176	0
PastWorker-d	0.0812	0.1048	0.0226	0
NumberOfM-s	0.0445	0.0570	-0.0169	0
GraduatesW-k	0.2419	0.0478	0.0454	0
PeriodToFi-b	-0.2469	0.6587	-0.0106	0
PeriodFrom-b	0.3022	-0.6056	-0.0535	0
PublicSect-s	-0.1728	-0.0265	-0.0113	0
NetMonth-Men	0.1134	-0.0062	0.0708	0
NetMonth-wen	0.0849	0.0369	-0.1073	0
Improvement-d	-0.0385	-0.0376	0.0617	0
JobsThatRe-s	0.2992	0.0492	0.6709	0
JobsForWhi-e	0.1923	0.0347	-0.7047	0
Satisfacti-e	0.0892	0.0158	0.0856	0
Inactivelow-s	0.1277	0.0168	0.0359	0

Figure 20. Principal component analysis.