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INTRODUCTION

Elina De Simone and Marcella D'Uva

Annals of CRISEI 2014 is a collection of theoretical and empirical contributions of some scholars of the Centro di Ricerca Interdipartimentale in Sviluppo Economico e Istituzioni (CRISEI) for the year 2014. Annals of CRISEI provides a multidisciplinary forum for debate and discussion where authors try to provide fresh new ideas for economic research. The content of this collection is, thus, not limited to a single topic but provides a selection of papers dealing with a wide range of economic issues.

For the 2014, the focus of the researchers concerns topics related to Eurozone economic policy, Foreign Direct Investments location choice in Hungary, schools of Economists' thought in Italy, Italian regional economic growth, risk theory, classification of welfare states, wealth and consumption functions, ethnic identity and labour outcomes for immigrants in Italy, the relationship between obesity and young workers' economic performance.

The first paper *Classifying welfare states: "whatever happened to the Mediterranean?"* written by Bonasia and De Siano, analyses the effects of welfare policy reforms and the recent financial and economic crises on the composition of existing regimes for European countries. The authors, relying on Bonoli's two-dimensional approach (1997), investigate the changes in the comparative positions of countries, both between and within welfare regimes, in the period 1995-2011. The main result is the disappearance of the Mediterranean regime, as they find a significant shift of Mediterranean countries towards the Continental quadrant after the implementation of welfare systems reforms and before the impact of the financial crisis. This finding is due to the pressure exerted on welfare regimes not only by ongoing reform process and the financial crisis, but also by demographic changes, lower employment rates, increasing female participation in the labour market and a different task distribution among household members.

The second contribution, *Obesity and Economic Performance of Young Workers in Italy*, by Giovanni S. F. Bruno, Floro Ernesto Caroleo and Orietta Dessy, explores recent ISFOL-PLUS 2006-2008-2010 data available for Italy about height and weight of young workers with the purpose of analysing the relationship between measures of obesity and measures of economic performance. They consider nine aspects of job satisfaction and find a general negative relationship between obesity and overweight. Interestingly, they find that the body mass index (BMI) does not discriminate young workers with respect to their job earnings, but it does affect negatively young workers' job satisfaction with important gender effects. In details, while for men being overweight is the most distressful condition, for women is obesity. So, overweight men are dissatisfied over work environment, organization of work times, pay, and development of skills, where obese females are dissatisfied over work duties and career opportunities.

The third paper, *the policy trilemma and the future of the Eurozone*, by Rosaria Rita Canale analyses the linkages among the net capital flows, the volatility of bond yields and the fiscal stance, as measures of the Eurozone trilemma dimensions. The sample consists of 11 Eurozone countries in the period 2002-2012. Moreover, the author considers the role of the economic crisis by dividing the sample into pre- (2002-2008) and post-crisis (2009-2012) periods as well as the difference between PIIGS and the non-PIIGS countries. Evidence supports the validity of the trilemma for the whole Euro area and for the whole period, with some distinctions between the pre- and post-crisis periods and between the PIIGS and the non-PIIGS countries are found significant. The existence of national constraints suggest to adopt centralized fiscal policy instruments in the Eurozone.

The fourth contribution, *Ethnic identity and labour market outcomes of immigrants in Italy*, by Maria Rosaria Carillo, Vincenzo Lombardo and Tiziana Venittelli, implementing an IV strategy, analyses the linkage between Italian immigrants' ethnic identity and labour market outcomes. In order to measure ethnic identity, they use a two-dimensional indicator based on the individual's sense of belonging to both the host and the home countries' culture, relying on cross-sectional data collected by the Istituto per lo Studio della Multietnicità (ISMU) Foundation in 2009. They

find that the probability of being employed, both regularly or irregularly, is higher for immigrants which self-identify with the culture of both the host and the home country (integrated immigrants) than that of separated ones, i.e. foreigners firmly tied to the home country's values and customs. They also find that that foreigners with strong identification with the country of destination and a low sense of belonging with the country of origin (assimilated) have no better chances of being employed than separate ones. The results seem to suggest that public policies supporting foreigners' assimilation must be combined with policies aimed at maintaining the customs and traditions of the minorities.

The fifth paper, *On matrix-exponential distributions in risk theory*, by Alessandra Carleo and Mariafortuna Pietroluongo, describes a particular class of matrix-exponential distributions, namely phase-type distributions and its use in risk theory. These distributions are particularly suitable for approximating most of other distributions as well as being mathematically tractable. In the paper, modelling both interarrival claim times and individual claim sizes with this class of distributions, an explicit formula for the probability of ultimate ruin is given.

The sixth contribution, *Schools of thought and economists' opinions on economic policy*, by Luca De Benedictis and Michele Di Maio explores the role of schools of thought in determining differences in economists' view on the functioning of the economy and on the evaluation of economic policies. The sample consists of 335 of Italian economists which responded to an on-line questionnaire in 2007. Results highlight that difference in the school of thought predicts economists' disagreement on several economic issues and that commonly used ways of grouping schools of thought as to create dichotomies (e.g. Mainstream vs Non-Mainstream, Orthodox vs Heterodox) have little explicative power in relation to individual opinions. They suggest that school of thought, together with their field of specialization, academic position and political opinions influence economists' policy advices.

The seventh paper, *FDI location choice across Hungarian counties: the role of local public policies* by Elina De Simone and Marcella D'Uva analyzes the determinants of foreign direct

investments in Hungarian counties in the period 2001-2011, relying on Hungarian Central Statistical Office data. Together with traditional FDI location factors, the local governments social welfare expenditures and the industrial parks are considered in the econometric model as proxies of the role of public policies. Market size and labour skills are found to significantly influence FDI location choices. Social support expenditure and special industrial areas are also confirmed to be significant predictors of FDI distribution across Hungarian counties, thus confirming the role of public policies in improving regional attractiveness for foreign investors.

The contribution of Oreste Napolitano, titled *What can a century of regional economic growth in Italy tell us? View from an allometric perspective* applies a new approach based on allometry to the study of regional growth convergence in Italy. The author uses a sample stretching from 1891 to 2007 applying a time-varying moment-based estimator. He finds that Italian economic growth has determined a process of regional imbalance. However, allometric convergence is found in macro areas, implying that macro areas are more homogeneous economic areas than the country as a whole.

Finally, Monica Paiella and Luigi Pistaferri's paper on *Decomposing the wealth effect on consumption*, try to decompose the wealth effect on consumption into its two components by distinguishing: 1) between exogenous and endogenous wealth changes and 2) between anticipated and unanticipated exogenous changes. The impact on consumption of the analyzed components is estimated using microeconomic panel data on consumption, wealth, and subjective asset price expectations in the period 2008-2010 drawn from the Bank of Italy's Survey of Household Income and Wealth (SHIW). Two main results are being reported. First, the overall wealth effect is around 1-3 cents per (unexpected) euro increase in wealth and is driven primarily by a positive consumption response to house prices. In contrast, the effect of a variation in stock prices is statistically insignificant. Second, the consumption response to anticipated changes in wealth is also found to be large and significant, of the same magnitude as the response to unanticipated changes, and similarly driven by changes in housing wealth. Authors explain the

fact that consumption is unaffected by exogenous shocks to stock market returns as a matter of the extreme uncertainty surrounding the Italian stock market during their sample period.

CLASSIFYING WELFARE STATES: "WHATEVER HAPPENED TO THE *MEDITERRANEAN*?"

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Abstract

The European welfare states show different characteristics due to their political, historical and economic past. Starting from some influential classifications of welfare states, the study looks at the effects of welfare policy reforms and the recent financial and economic crises on the composition of existing regimes for European countries. To this extent, we use the two-dimensional approach of Bonoli (1997) to investigate the changes in the comparative positions of countries, both between and within welfare regimes, in the period 1995-2011. The main evidence is the disappearance of the Mediterranean regime. In order to shed light on the changes in countries' welfare models, we look at their macroeconomic conditions. Reform processes, financial crisis, demographic changes, lower employment rates and the increase in female participation in the labour market appear to be the most important factors behind this outcome. Family support, a phenomenon common to all Mediterranean countries, has been undermined, and this has required greater involvement of governments in terms of both social spending levels and financing solutions through general taxation.

JEL Classification: H53, I38, O57

Keywords: comparative analysis, European countries, social expenditure, welfare reforms, welfare state regimes.

1. Introduction

"*Social protection can be regarded as an expression of solidarity and cohesion between the haves and have-nots, between governments and citizens, and even between nations*" (ERD, 2009).

Welfare state modelling, that is the way governments provide citizens with protection against social risks, has long been a major issue in comparative social policy. Initially, the literature focused mainly on classifying welfare states and identifying ideal types of welfare provision based on a single feature of social policy, with two main traditions being distinguished: the Anglo-Saxon and the French. The former emphasises the quantity of welfare provision in the so-called "how much" dimension, while the latter rather focuses on the coverage model (the "how" dimension), identifying two contrasting patterns of social protection, the Beveridgean and Bismarckian.

The literature regarding welfare state classification became particularly prominent after the publication of Esping-Andersen's '*The Three Worlds of Welfare Capitalism*' in 1990, which represented the first attempt to break away from the widely used quantifying approach. In his seminal work, Esping-Andersen pointed out that a classification based on a purely quantitative approach would lead to misleading results in terms of social policy effects. The question was not on the amount of social spending but on the way this amount was used. Given this belief, he proposed a threefold welfare state typology applying it to some Western developed countries. He based his classification on two fundamental indicators of social protection intervention, namely the decommodification index, defined as "*the degree to which individuals or families can uphold a socially acceptable standard of living independently of market participation*" (Esping-Andersen, 1990, p. 37), and the degree of social destratification, which measures the narrowing

or amplification of social equity. The ideal regimes thus identified, their characteristics and the countries assigned to each of them are the following: the Liberal, with low levels of decommodification and destratification, which entail the presence of a dualism of rich and poor in welfare states (Australia, Canada, the United States, New Zealand, Ireland and the United Kingdom); the Conservative, with moderate levels of decommodification and destratification, where governments are able to reduce the individual's market dependence and, at the same time, tend to preserve social differences (Italy, Japan, France, Germany, Finland and Switzerland). The Social Democratic, with a high level of decommodification, universal benefits and a high degree of benefit equality (Austria, Belgium, the Netherlands, Denmark, Norway and Sweden).

This classification has given rise to an extensive debate involving both theoretical and empirical critiques of the ideal typologies. Most of such critiques focus on the methodology of regime construction. The main strand of criticism regards the indicators chosen as measures of the welfare states (Arts and Gelissen, 2002). Ferrera (1996), in particular, detaches totally from the quantifying approach, asserting the importance of the way social protection is delivered, as emphasised in the French tradition. He distinguishes the universalistic type, where all citizens are covered by a single scheme, and the occupational type, where individuals belonging to different groups are covered by different schemes. Starting from the statement that welfare regimes may differ with respect to eligibility, benefit formulae, financing regulation and organisational-managerial arrangements, he identifies four ideal regimes: 1) the Scandinavian (Denmark, Norway, Sweden, Finland) with universal eligibility, generous fixed benefits provided automatically when risks occur and financed through taxation. In this regime, the State is completely responsible for benefits provision; 2) the Anglo-Saxon (UK, Ireland), with universal eligibility for health care and very inclusive for all the other social risks. The benefits are fixed but, compared with those in Scandinavia, are less generous and provided upon needs' verifications. While health care is financed by taxes, cash benefits are largely covered by social contributions. The responsibility for social policies is the state's, although a marginal role is attributed to social partners; 3) the Bismarckian (Germany, Belgium, Netherlands, Luxembourg,

Austria, Switzerland, France), with a targeting eligibility linked to employment and/or family status. The benefits, financed through social contributions, are earnings-related and often diversified by profession. In this regime there is a greater collaboration between the state and the social partners; 4) the Southern (Italy, Spain, Portugal, Greece), where health care coverage, financed through taxation, is universalistic while for all the other policies benefits and contribution rates are differentiated by employment type.

Bonoli (1997), instead, stated that a more realistic classification of welfare regimes, aiming to reflect past and current changes of social policy, should account for both the "how much" and the "how" dimensions. He suggested combining the amount of resources devoted to social protection with the portions of social expenditure financed through contributions and taxation. The share of social expenditure financed through contributions or taxation is helpful to recognize the size of the Bismarckian/Beveridgean component in a welfare state (Chassard and Quentin, 1992). Bismarckian social policy models seek to keep workers' income stable while Beveridgean ones aim to prevent poverty risk. On the basis of these indicators he identifies four regimes, each of which is characterised by countries concentrated in a specific area of the European continent: the Beveridgean/high-spending which provides a universalistic high level coverage, including Nordic countries such as Norway, Denmark, Sweden and Finland; the Beveridgean/low-spending which, though covering the whole population, gives lower protection and uses also means-tested provision. This regime comprises the United Kingdom and Ireland; the Bismarckian/high-spending, including Continental countries such as the Netherlands, Belgium, France, Germany and Luxembourg, which show high social benefits provided on the basis of individual income; finally, the Southern regime, comprising Italy, Spain, Portugal, Greece and Switzerland, presenting Bismarckian/low-spending features with greater dependence on support from the family.

The approach suggested by Bonoli represents the first attempt to look at European welfare states both in terms of expansion/contraction and convergence/divergence, as he considers that "welfare states are not stuck in a position but can move in different directions".

The last two classifications, namely those of Ferrera (1996) and Bonoli (1997), whilst improving on the seminal study by Esping-Andersen, do not take into account the considerable implications of the European reform process which started in the 1990s. Indeed, the socio-economic and politico-institutional changes forced policymakers to recalibrate welfare policies in order to deal better with new social risks and priorities.

The reform process became necessary due to the weakening of the circumstances which favoured the establishment, consolidation and expansion of social policies. From the mid-1970s, Western economies registered a slowdown in growth together with an increase in female labour market participation, favoured by the transition to the post-industrial era of greater specialization in the services sectors. These changes led, respectively, to a reduction in resources available to the welfare system and to a different gender division of labour, with an effect on the family's very stability. Another factor which contributed to upsetting the equilibrium of the existing systems was the profound demographic crisis due to increasing life expectancy and the sharp reduction in the birth rate. As a consequence, the substantial aging of the population and the decrease in the ratio of active workers to pensioners called into question the financial sustainability of welfare policies.

In the light of the recent economic changes, our study sets out to explore the effects of welfare policy reforms on the composition of the existing regimes. To this extent, we use the two-dimensional approach adopted by Bonoli (1997) to investigate the changes in countries' comparative positions both between and within welfare regimes. We look at national characteristics in three different years, 1995, 2006 and 2011. The choice of the three points in time is far from random: 1995 represents the year in which the ongoing reforms had not yet produced effects, 2006 allows us to measure the effects of welfare reforms prior to the 2007-2008

financial crisis and, finally, the year 2011 permits us to take stock of the impact of the financial crisis on the real economy. Our intent is to raise a new question: *Does the Mediterranean model still exist?*

The analysis reveals the total shift in the Mediterranean regime and the partial conversion of the British one. Beyond these findings we seek to give an explanation for the evolution of different welfare state regimes.

The study is structured as follows: section two presents an overview of the debate on Mediterranean welfare regime characteristics; section three empirically describes welfare regimes, constructed according to Bonoli's two-dimensional approach, in different time periods; in section four we discuss the detected changes; section five concludes.

2. The Mediterranean regime in the literature

A comparison between Ferrera's and Bonoli's classifications shows the same country's membership of the regimes (except for Switzerland). Both the analyses confirm the presence of a Southern regime to which Italy, Spain, Portugal and Greece belong, initially ignored by Esping-Andersen. Indeed, other studies (Abrahamson, 1991; Leibfried, 1992; Fargion, 1997; Rhodes, 1997; Castles and Obinger, 2008; Kammer, Niehues and Peichl, 2012) identify the presence of a Southern regime labelling it as the "Latin Rim" or "Southern European" or "Mediterranean" welfare model. Such countries belong to a separate welfare model not because of their geographical position but for their common historical and cultural development processes. From an historical point of view, the main sources of their distinctiveness are their late democratisation and industrialisation (Gal, 2010). With the exception of Italy, which achieved democracy after the Second World War (1947), democratic consolidation in Spain, Portugal and Greece occurred only during the 1970s (respectively, 1978, 1976 and 1975). The very recent enfranchisement

from the authoritarian regime has contributed to weaken the power of the state in the sphere of social policies.

Compared to other Western countries, the delay in industrialisation was made up only in the late 1970s. This contributed to the development of a sizeable informal sector with two main consequences: worse protection of workers, and lower government revenues from taxes and contributions required to finance adequate social policies. The state of these economies has been further aggravated by the massive inflow of irregular immigrants.

The social schemes of the Mediterranean countries are often considered backward or rudimentary (Langan, Ostner, 1991; Leibfried, 1992; Rhodes, 1996; Katrougalos, 1996). However, as stated also by Trifiletti (1999), in our opinion their "different evolution" of social protection, compared to other Western countries, is due to different priorities of the same social risks. The ranking of such risks, in turn, depends effectively on cultural heritage related to family and religion.

The broad role of the family in sustaining its own social risks represents the main difference of Mediterranean with respect to Western countries. This feature influences both the amount of public resources devoted to covering social risks and the way they are financed. Moreover, there is a rigid division of tasks among household components, with adult males being breadwinners and women responsible for children, the elderly and the sick (Trifiletti, 1999; Andreotti et al., 2001; Moreno, 2004; Graselli et al. 2006; Gal, 2010). As a consequence, the labour laws contributed to strengthen the protection towards the head of the family at the expense of women and young workers. This could explain the low participation of the latter in the labour market and the relative higher unemployment rates.

This element recalls the *Residual Model* of Titmuss' (1974) classification[1]. This particular regime contemplates government intervention only when family or market are unable to fulfil social needs. Public effort, therefore, is limited in the amount of resources and duration of provision.

More recently, albeit controversially, religion has been considered an additional attribute called upon to explain the divergence between Mediterranean and Northern European countries. The main contribution of religion lies in its influence on political institutions in designing welfare policies (Gal, 2010). For examples, the communalistic ethic of Catholic and Orthodox religions, more prevalent in Mediterranean countries, emphasises the importance of family ties and of a faith-based community in supporting individual social needs. In contrast, the more individualistic Protestant ethic widely found in Northern European countries forces citizens to work and contribute in order to be eligible for welfare benefits.

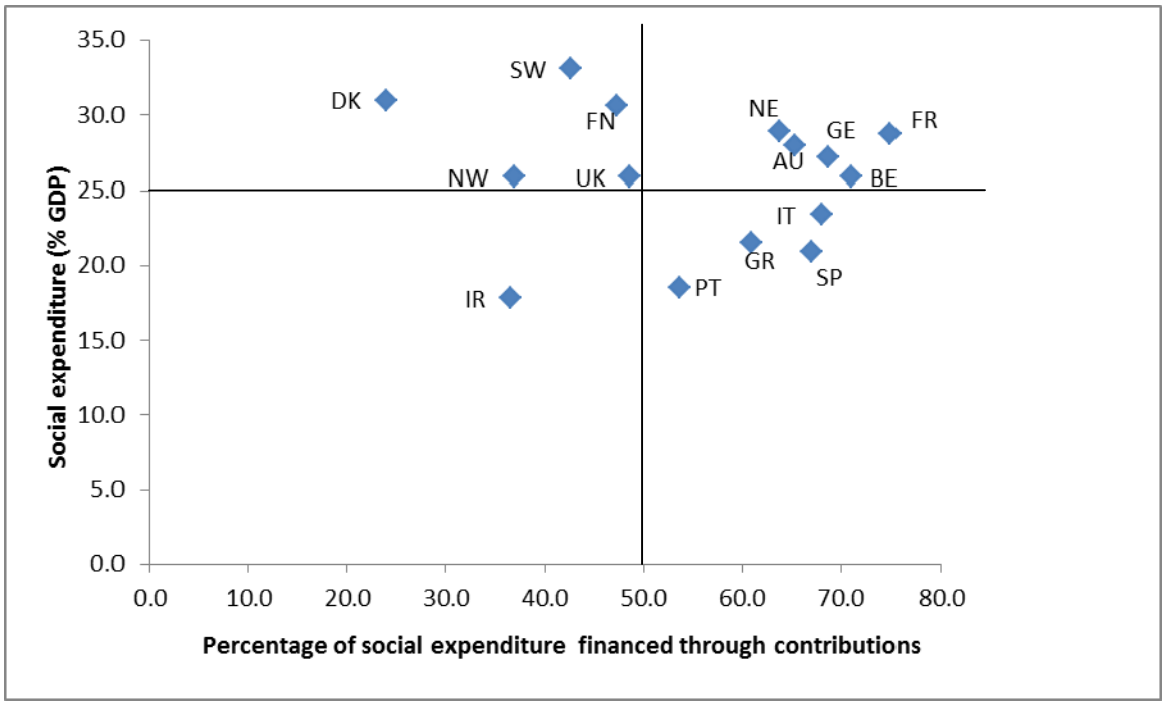
Finally, the Mediterranean countries undoubtedly present, more than others, a kind of backwardness related to distortions in the collection of contributions and in the provision of social benefits. The former is affected by problems of tax evasion often made good by fiscal amnesties, while the process of resource distribution may be affected by patronage and cheating. A further form of bias derives from political party interference aimed at protecting lobbying interests.

3. The recent evolution of European welfare regimes: an empirical analysis

In this study we follow the two-dimensional approach proposed by Bonoli (1997) in which countries are allocated to a four-quadrant diagram on the basis of the amount of resources devoted to social protection and the way it is financed. To this extent we use data relative to the total amount of social expenditure as a percentage of GDP and the portions of social expenditure financed through contribution or taxation, taken from the ESSPROS database of Eurostat, for 15 European countries: Austria, Belgium, Denmark, France, Finland, Germany, Greece, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, and the United Kingdom.

Bonoli (1997), using an average of 1989-92 social expenditure levels[2], found a correspondence between quadrants and the geographic position of countries. Our findings for the year 1995 (Figure 1) confirm the position of the countries found by Bonoli, with the exception of Norway and the United Kingdom, both on the boundary line between the Nordic and the British regimes and the inclusion of Austria (ignored by Bonoli) in the Continental regime.

Figure 1. *Countries position with a two-dimensional approach (1995)*

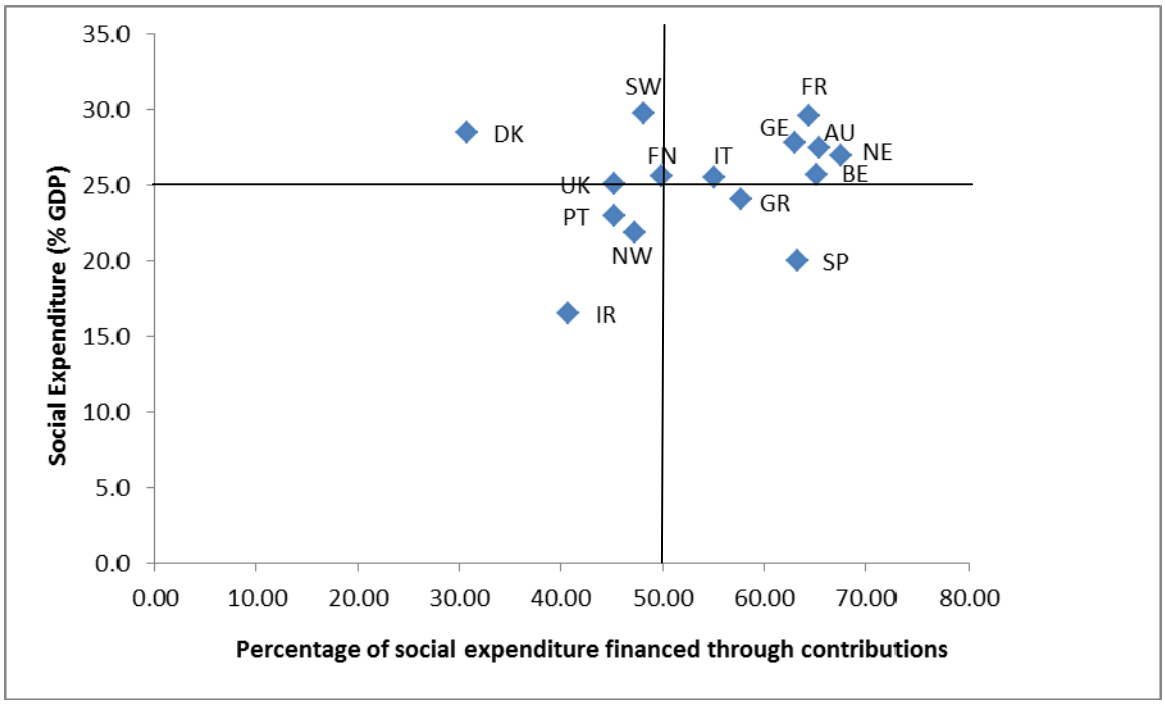


Source: Our elaboration on ESSPROS database

The percentage of social expenditure financed through contribution measures the relative size of the Bismarckian and Beveridgean provision within any given welfare state. Regimes financing social expenditure mainly through contributions are Bismarckian, with an occupational welfare coverage strictly linked to earnings. By contrast, Beveridgean regimes are characterised by non-earnings-related universalistic coverage. Our evidence confirms the recognized identification of the Continental and the Mediterranean as Bismarckian schemes and the Nordic and the British as Beveridgean. Turning to the amount of resources devoted to social policies, the Nordic and the Continental regimes appear to be the most generous.

The position of countries in 2006, as shown by figure 2, shifts significantly both between and within the quadrants. These changes may follow institutional and economic events that continue to modify social needs priorities. Mediterranean countries appear to have witnessed the largest increases in resources provided for social expenditure. This has contributed to bringing welfare dimensions of Mediterranean countries closer to their Continental counterparts.

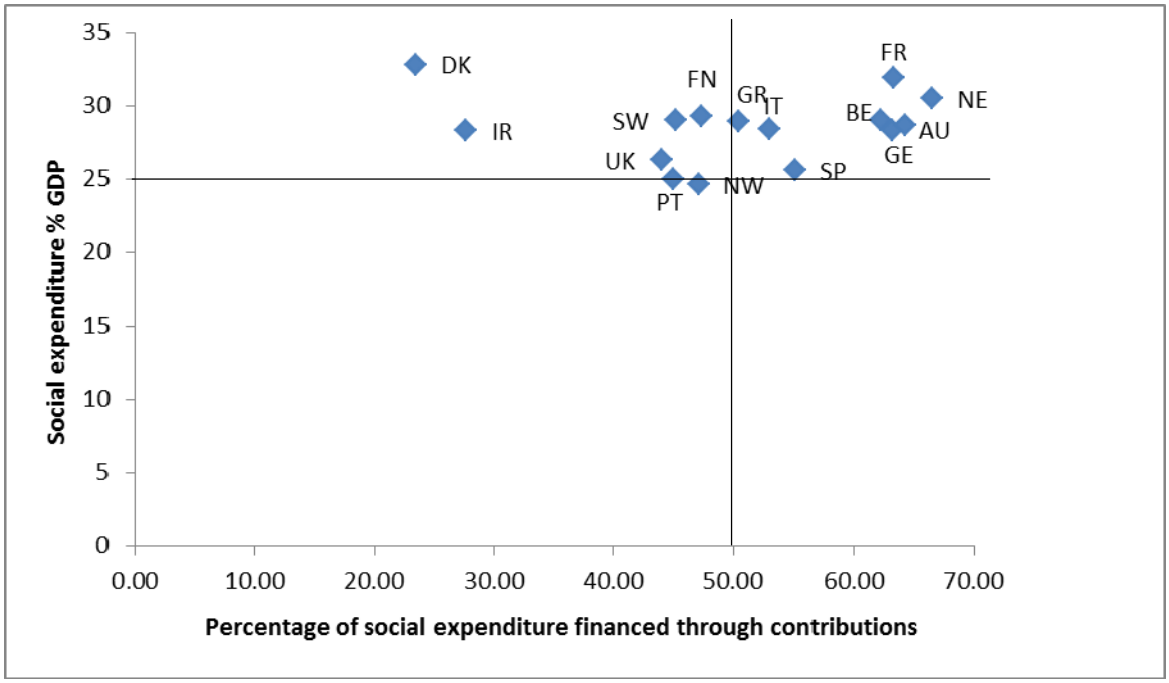
Figure 2. *Countries position with a two-dimensional approach (2006)*



Source: Our elaboration on ESSPROS database

Finally, figure 3 shows the changing position of countries due to the ongoing reform process together with the strong incidence of the recent financial and economic crises.

Figure3. *Countries position with a two-dimensional approach (2011)*



Source: Our elaboration on ESSPROS database

At first sight, our attention is captured by the disappearance of both the British and the Mediterranean regimes, while a closer look reveals other important changes. All the countries considered, with the exception of Norway, Sweden and Finland, exhibit an overall increase in resources allocated to social expenditure (table 1). In particular, countries belonging initially to the lower quadrants show such a considerable increase in social expenditure as to shift to the upper quadrants[3]. The share of GDP allocated to social spending in 1995 exhibits average values ranging from 21.8 for the British regime to 30.1 for the Nordic, while in 2011 this range drops dramatically (2.7 %). On an individual country basis, social expenditure growth rates range from

1.5 in the UK to 59 in Ireland. Actually, the average values of the British regime are completely conditioned by the extraordinary variations in Ireland, affected by a severe banking crisis stemming from a series of banking scandals experienced by the country. It has been considered the most important political and financial crisis in Ireland, responsible for its return to recession since the 1980s. This country has witnessed a considerable rise in unemployment and was the first to enter recession in the Eurozone.

Table 1. Social expenditure (% of GDP) and share financed by social contribution

Regime	Country	Social Expenditure (%GDP)				Social Expenditure financed through Social Contribution (%)			
		1995	2006	2011	percentage variation 1995-2011	1995	2006	2011	percentage variation 1995-2011
Continental	Austria	28	27.5	28.7	2.5	65.32	65.41	64.26	-1.6
	Belgium	25.9	25.7	29	12.0	71.1	65.18	62.19	-12.5
	France	28.7	29.6	31.9	11.1	74.91	64.4	63.34	-15.4
	Germany	27.2	27.8	28.3	4.0	68.64	63.07	63.13	-8.0
	Netherlands	28.9	27	30.5	5.5	63.75	67.62	66.52	4.3
	Mean	***27.74***	***27.52***	***29.68***	***7.0***	***68.74***	***65.14***	***63.89***	***-6.7***
Nordic	Denmark	31	28.5	32.8	5.8	23.96	30.8	23.45	-2.1
	Finland	30.6	25.6	29.3	-4.2	47.32	49.96	47.38	0.1

	Norway	25.9	21.9	24.6	-5.0	36.93	47.23	47.11	27.6
	Sweden	33.1	29.8	29	-12.4	42.71	48.16	45.18	5.8
	Mean	***30.15***	***26.45***	***28.93***	***-4.0***	***37.73***	***44.04***	***40.78***	***7.8***
Mediterranean	Greece	21.5	24.1	28.9	34.4	60.98	57.7	50.49	-17.2
	Italy	23.4	25.5	28.4	21.4	68.03	55.11	53.06	-22.0
	Spain	20.9	20	25.6	22.5	67.04	63.29	55.11	-17.8
	Portugal	18.5	23	25	35.1	53.62	45.32	45.01	-16.1
	Mean	***21.08***	***23.15***	***26.98***	***28.4***	***62.42***	***55.36***	***50.92***	***-18.3***
British	Ireland	17.8	16.5	28.3	59.0	36.58	40.77	27.68	-24.3
	United Kingdom	25.9	25.1	26.3	1.5	48.65	45.31	44	-9.6
	Mean	***21.85***	***20.80***	***27.30***	***30.3***	***42.62***	***43.04***	***35.84***	***-16.9***

Source: Our elaboration on ESSPROS database.

As regards the way that social expenditure is financed, all countries, except for Sweden (27.6), Norway (5.8), the Netherlands (4.3) and Finland (0.1), show a reduction in the social contribution share. The increase in social expenditure is therefore achieved by policymakers by diverting public resources to welfare policies.

The welfare systems of the Continental and the Nordic regimes seem to have been able to better absorb the shocks in the last few decades. By contrast, the British and Mediterranean regimes have tackled these shocks by increasing social spending and employing tax finance provision

more widely. In particular, while Italy, Spain and Greece have shifted towards the Continental framework, the United Kingdom, Ireland and, surprisingly, Portugal approach the Nordic one.

4. What caused the disappearance of the Mediterranean regime?

In order to shed light on the movements of countries' welfare systems, shown in figure 3, it might be useful to look at their macroeconomic conditions, focusing in particular on economic growth, the labour market and demographic indicators. The analysis of per capita GDP, from 1980 to 2011, highlights the differences between the trends of the four welfare regimes. While there is an overall persistent increase in per capita GDP, the existing gap between countries belonging to the Mediterranean regime and all the others became more pronounced from the mid-1990s onwards (figure 4 in the appendix). The growth rates are always positive except for the years after the 2007-2008 financial crisis (figure 5 in the appendix). However, the Mediterranean countries show an average negative growth rate for all the years after the crisis while all the other regimes have exhibited a recovery since 2010.

The whole period can be divided into two phases, each characterised by a common reversed U-shaped trend, the first before and the second after the early 1990s. The growth slowdown in the past decade has broadened the range of social risks and needs to be fulfilled through government intervention. This has led to an increasing share of GDP devoted to social spending as shown in table 1, with the exception of countries belonging to the Nordic regime. There have been considerable increases in social expenditure on the part of Mediterranean and British countries, which has shifted them into the other two upper regimes (figure 3).

As regards labour market indicators, figure 6a (in the appendix) reveals an overall increase in the workforce participation rate that is most likely due to the increase in the female participation rate (figure 6b in the appendix) favoured by increasing wage levels, increasing numbers of part time jobs and a forward movement in the life cycle of marriage and births. This is especially noticeable in Mediterranean countries where the end of the transition from industry to the services sector has contributed to boost female involvement in the labour market. At the same time, there has been an overall improvement in employment levels in European countries as shown by the reduction in unemployment rates (figure 7a in the appendix). Particularly significant for the purpose of our analysis is the decrease in female unemployment rates which is more pronounced in Mediterranean countries (figure 7b in the appendix). In our opinion, this has contributed to modify the role of women within the family with a consequent change in the division of tasks among household members. As a result, governments have become more involved in the coverage of social needs for the care of children, the elderly and the sick.

Social expenditure by function and regime for the years 1995, 2006 and 2011 is represented as a percentage of GDP in figure 8. The social spending categories we consider, aggregated by the main functions, are the following: family/children, sickness/health care, housing facilities, old age-survivors-disability (OSD), unemployment and others. For the decade 1995-2006 there is a slight increase for family/children, sickness/health care and OSD expenditure almost exclusively for the Mediterranean regime. These countries are the only ones to show an increase in total social expenditure, as also highlighted by table 1. The reduction in disposable income, caused by the 2007-2008 financial crisis, requires a more intensive intervention in terms of social protection expenditure. The stabilisation function of social protection is achieved through an increase in benefits paid for unemployment, sickness/health care and OSD. In particular, for Mediterranean and British countries, the rise in unemployment spending is due to the considerable increase in the number of unemployed since 2006 (figure 7a), while the average benefit has decreased. The increase in the other two spending categories reflects growing social needs and risks related to the ongoing aging population. The increase in ODS expenditure, moreover, has occurred despite an

extension of the retirement age, the shift from the pay-as-you-go to the defined contribution system and the tightening of eligibility criteria for social security benefits, introduced with the 1990s' reforms. These adjustments have contributed to shift countries belonging to these regimes towards the Continental and Nordic regimes.

The position of the countries is influenced also by the "how" dimension, that is the portions of social expenditure financed through contributions or taxation. In the period 1995-2011, the state participation in financing social needs changed considerably. The great initial differences with Nordic countries have disappeared over time. Nordic countries (except Denmark) have experienced an increase in the percentage of social spending financed through contribution while all the others (except the Netherlands) have seen a rise in tax financing.

The total amount of resources resulting from social contributions might be expected to depend inversely on the unemployment rate. When high unemployment occurs, it is necessary to compensate for the reduction in available resources from labour income with a more substantial public intervention for social needs through tax financing. The data on unemployment rates[4] and social contribution shares (table 1) show that this expectation in our analysis is confirmed for ten[5] out of the fifteen countries considered. The impact of the financial crisis on the labour market, greater in some countries than others, has exacerbated the need for public resources to be devoted to social policies. In Continental and Nordic regimes the unemployment rate was predominantly stable from 2006 to 2011 (fig.7a), confirming their ability to absorb the economic shocks. By contrast, all Mediterranean countries and Ireland were more affected by the crisis and hence had a greater need to adapt social policies to the new economic condition. For these countries, the consequence is a considerable increase in social spending, as shown above.

5. Conclusion

The European welfare states show different characteristics due to their political, historical and economic past. They are particularly distinguished by the size and composition of social spending, the types of social needs and risks to cover, the eligibility criteria and the way these provisions are financed (general taxation/social contributions). The empirical literature suggests various categorisations, each of which clusters countries according to distinct features.

In this paper we followed Bonoli's approach to classifying welfare regimes in which countries are allocated to a four-quadrant diagram on the basis of the total amount of social expenditure as a percentage of GDP and the portions of social spending financed through contributions and taxation. The aim of the study was to analyse and compare the relative position of the European countries in 1995, 2006 and 2011, in order to verify whether they continue to belong to the same regime after the 1990s' reforms and the 2007-2008 financial crisis.

With respect to the initial position, our analysis shows that there was a significant shift of Mediterranean countries towards the Continental quadrant after the implementation of welfare systems reforms and before the impact of the financial crisis. The relative position in 2011 reveals that the financial crisis contributed to foster the shift of these countries towards the Continental regime and Ireland to the Nordic regime.

In our opinion, the total or partial disappearance of the Mediterranean and British regimes from the lower quadrants is due to the pressure exerted on them not only by the ongoing reform process and the financial crisis, but also by demographic changes, lower employment rates, increasing female participation in the labour market and a different task distribution among household members. First, the aging population has increased the demand for pension, health care and social assistance services. Secondly, the rise in the number of unemployed, due to the economic recession, and the decrease in active individuals, due to the aging population, have

increased the financial pressure on the social balance. Thirdly, the greater participation of women in the labour market has contributed to modify the division of tasks within families, requiring more public interventions for assistance to children, the sick and the elderly. Finally, the family, which in Mediterranean countries has always ensured the coverage of risks and needs, is no longer able to provide social support as it has been weakened by the adverse economic conditions.

The social, demographic and economic changes experienced by European countries in the last few decades have particularly highlighted the inadequacy of the Mediterranean welfare regime. Hitherto, the social risks and needs of these countries were supported more by the family than by the State compared with Continental and Northern countries. The current conditions have necessitated a greater involvement of the public sector both in terms of social spending and in terms of financing through general taxation. This has resulted in a conversion of Mediterranean welfare schemes to the Continental model.

This study thus contributes to show the new configuration of European welfare regimes, pointing out the main reasons for their recent evolution. Of course, further analyses could investigate other aspects relative to comparative cross-national social models. It would be interesting, for example, to ascertain whether, given increased social spending and greater government intervention in supporting social needs, the ongoing welfare reforms have also achieved better results in terms of effectiveness, efficiency and, above all, equity.

Notes

1. The other two regimes indicated by Titmuss (1974) are the Remunerative, where the State provides benefits completing private insurance, and the Institutional-Redistributive where the State gives universalistic social protection.

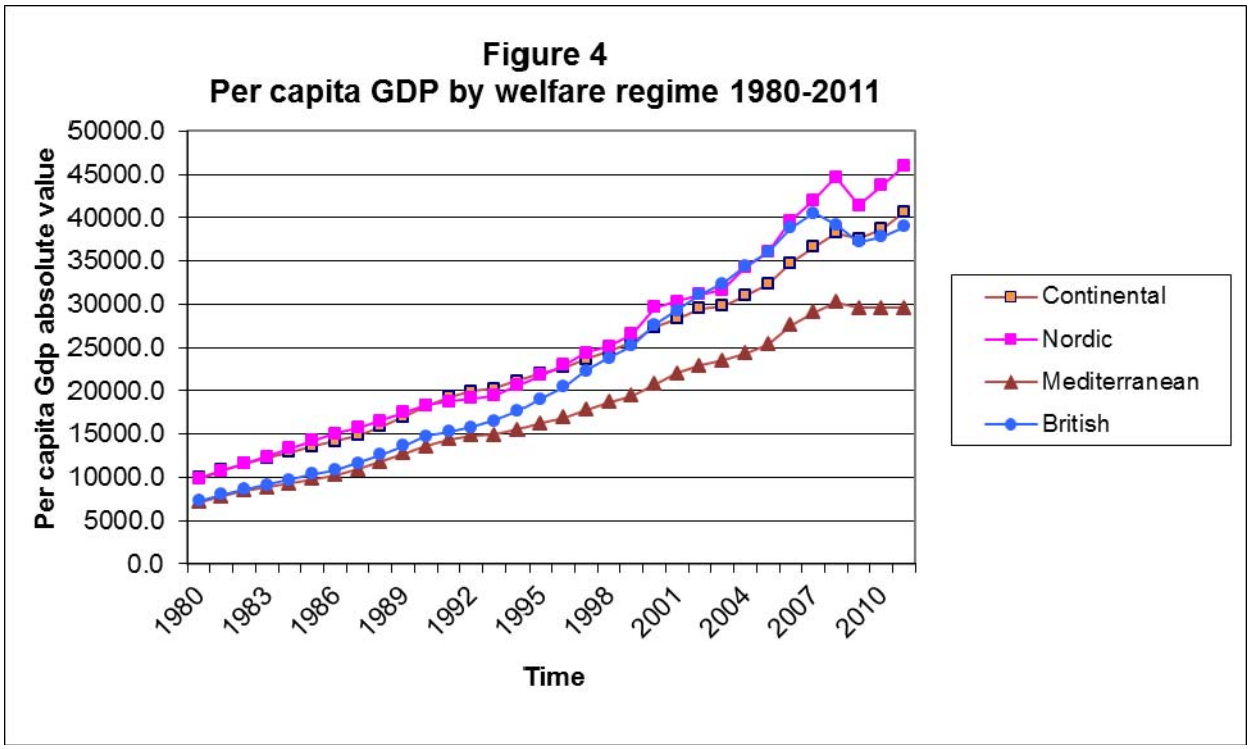
2. Bonoli used a combination of different data sources: Eurostat, 1995; Nordic Statistical Office, 1995; Fluckiger and Cordero, 1995.

3. UK, unlike the other countries, shows only a small increase in this share (1.5).

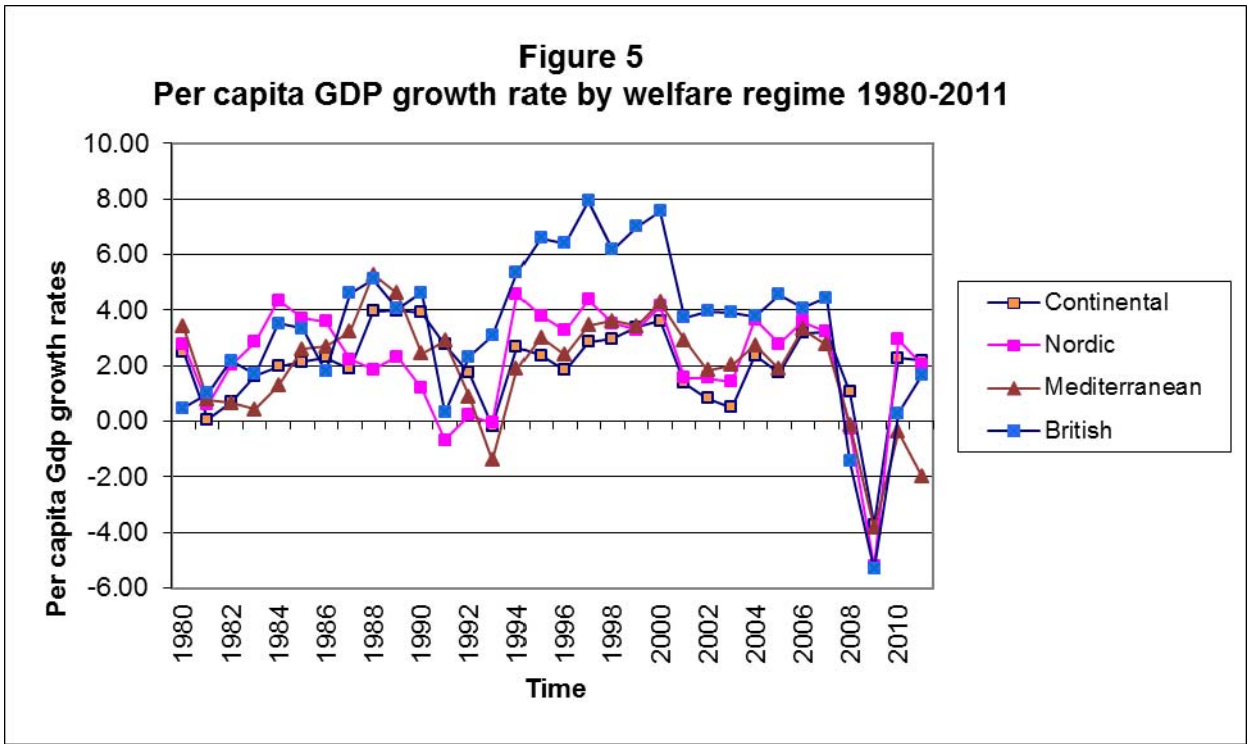
4. Figure 7a shows average total unemployment rates for each welfare regime. Data at a country level are available from the authors upon request.

5. Austria, the Netherlands, Denmark, Finland, Norway, Sweden, Greece, Portugal, Spain and Ireland.

Appendix

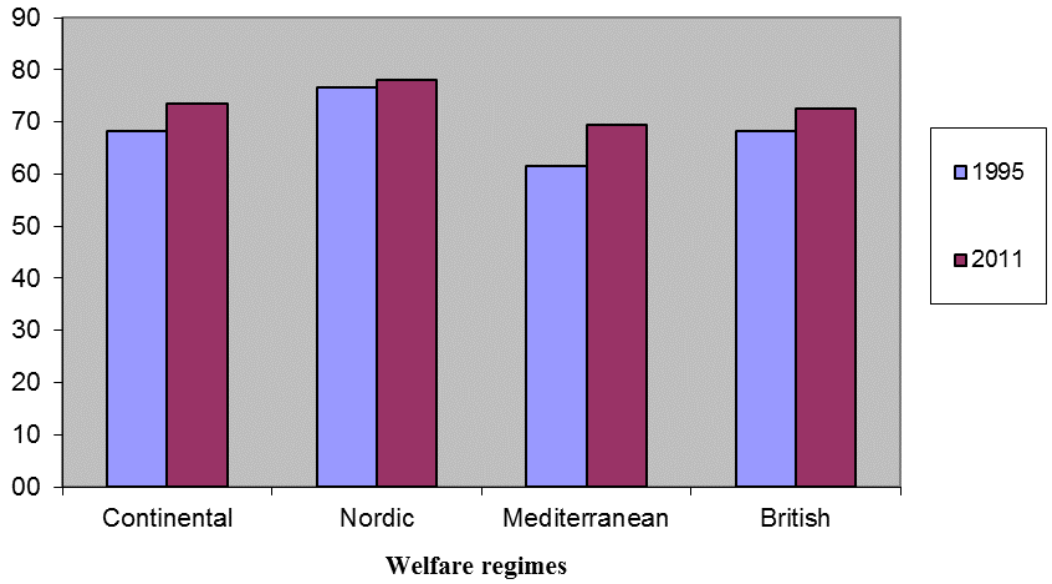


Source: Our elaboration on OECD – National Accounts Statistics

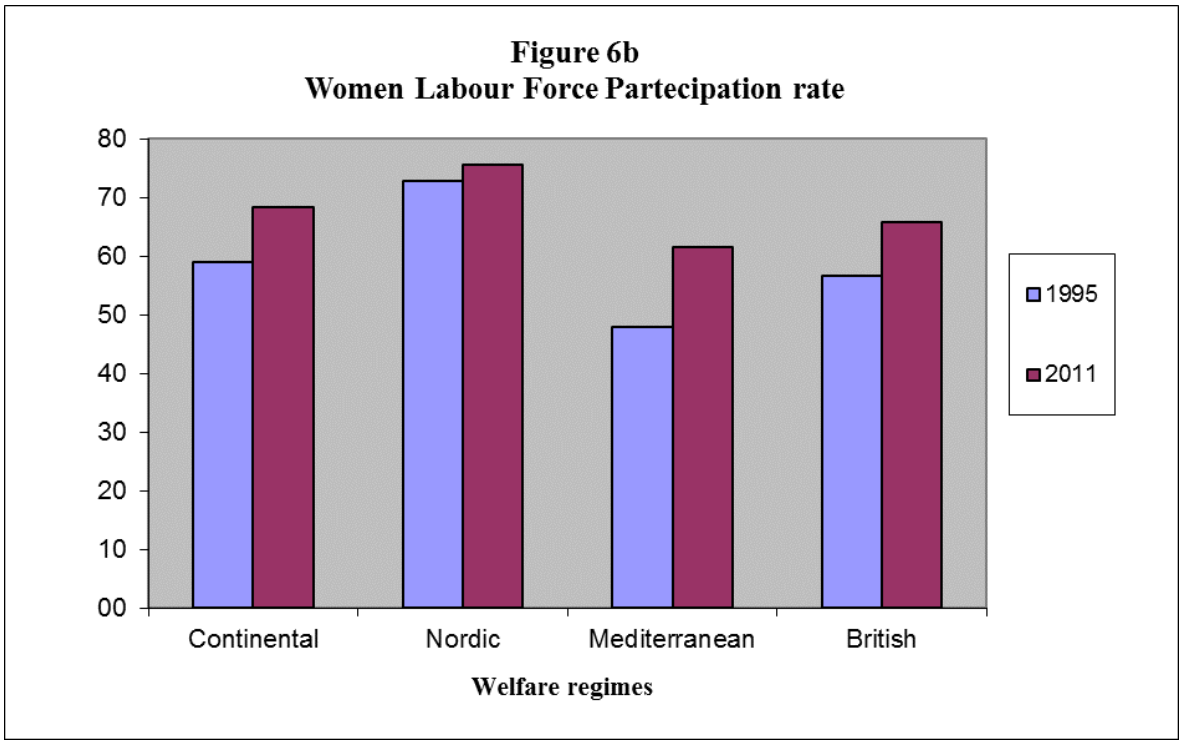


Source: Our elaboration on OECD – National Accounts Statistics

Figure 6a
Total Labour Force Partecipation Rate



Source: Our elaboration on Eurostat Statistics



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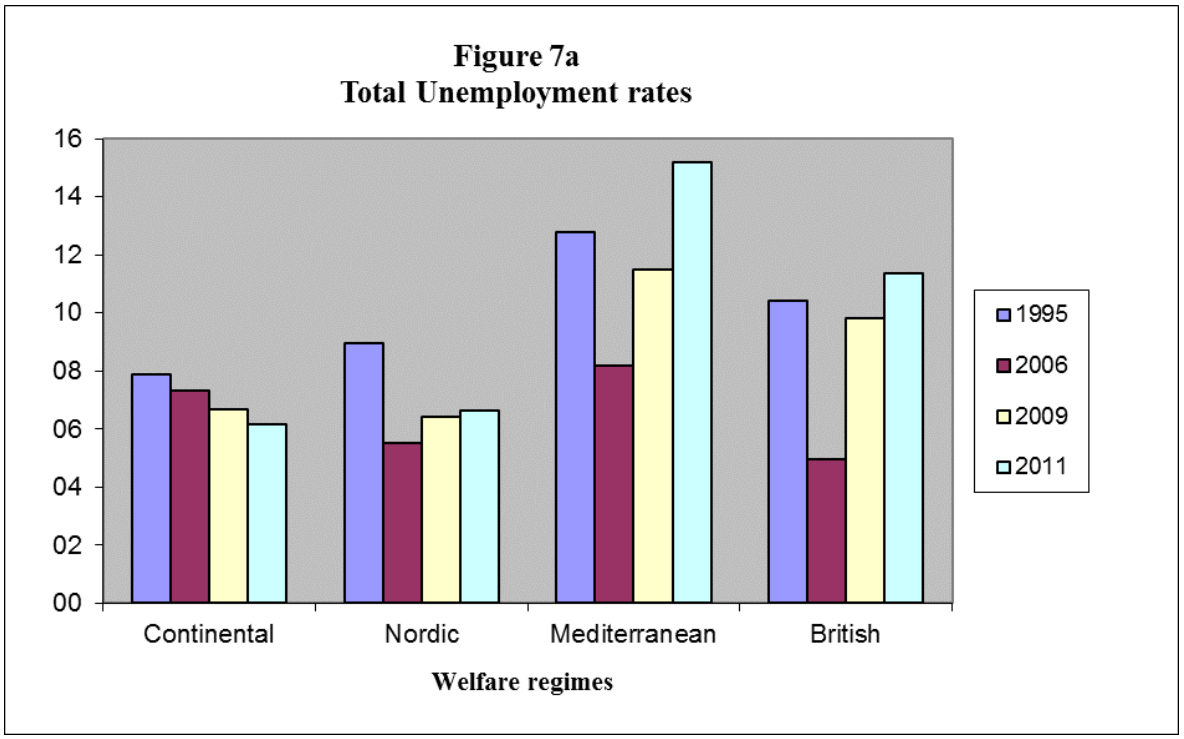
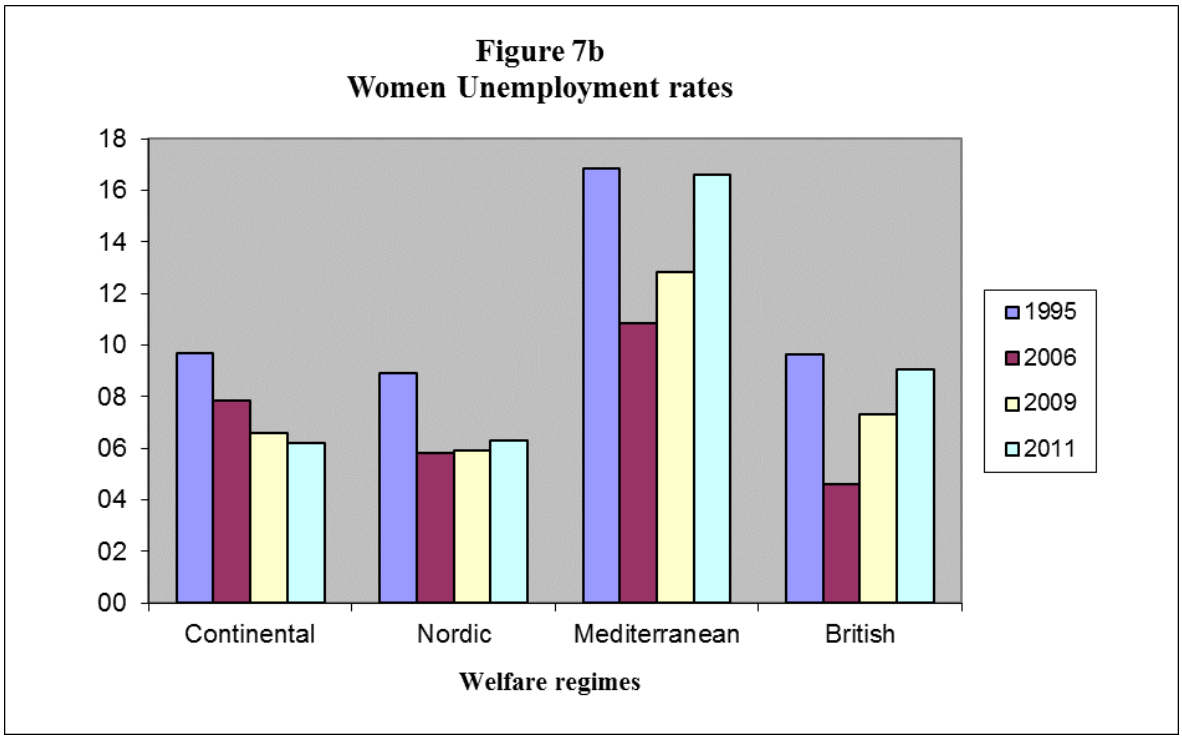


Source: Our elaboration on Eurostat Statistics



Source: Our elaboration on Eurostat Statistics

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OBESITY AND ECONOMIC PERFORMANCE OF YOUNG WORKERS IN ITALY

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Abstract
In this paper we explore recent ISFOL-PLUS 2006-2008-2010 data available for Italy about height and weight of young workers with the purpose of analysing the relationship between measures of obesity and measures of economic performance. Among the latter, we introduce job satisfaction, both overall and for nine specific aspects, which has not been previously considered in the literature on the effects of obesity. Interestingly enough, we find that BMI does not discriminate young workers with respect to their job earnings, but it does affect negatively young workers' job satisfaction with important gender effects.
JEL classification: J28, J81, I14
Keywords: Obesity, overweight, body mass index, job satisfaction, gross income

1 Introduction

It is a well-known fact that obesity is nowadays one of the most important public health concerns: obesity is a risk factor for numerous health problems and many chronic diseases and its prevalence has increased by 10-40% in most European countries over the last decade (WHO (2003)). Moreover, obesity affects not only adults but also teenagers and children, especially in southern Europe (IOTF (2002),IOTF (2003)).

For all these reasons, it is important to assess both the determinants and the consequences of obesity. The effects of obesity on labor market outcomes for the US have been established in a large number of studies. One of the most robust findings is that obese women tend to earn less than their non-obese counterparts and that there are differences by ethnicity and/or race (Cawley (2000), Cawley (2004)). Wage and occupational effects for men are less dramatic. The evidence available for Europe is overall consistent with what found for the US, although the differences found among countries can be explained either with cultural aspects or with the methodologies applied. One fundamental issue in this literature is in fact the endogeneity of obesity. Obesity might lower wages by lowering productivity or because of workplace discrimination. But at the same time low wages might cause obesity because poorer people consume cheaper, more fattening foods. Moreover, unobserved variables might cause both obesity and low wages. This problem has been dealt with in many different ways in the literature, according to the information available and the estimation method applied.

In this chapter we present recent evidence for Italy, a country for which to our knowledge no previous analyses on obesity are available. The originality of our approach consists in taking into account not only the usual quantitative measures for evaluating the labor market outcome of people overweight (wages and probability of having a job), but also a number of qualitative aspects of the job that previously have not been considered.

Our effort is to open the analysis of the consequences of obesity on the labor market to a recent multidimensional perspective adopted by a number of international institutions (the United

Nations Millennium Declaration, approved by the UN Assembly in September 2000; ILO, in its school to work transition survey, as explained in Elder (2009); Lisbon Agenda, 2000; Eurofound (2007) and Eurofound (2012)) for evaluating jobs. Indeed, undertakings have been made not only to increase employment, but also to improve its quality. The question therefore arises as to whether obese workers can be discriminated against not only in terms of probability of being hired or in terms of wages but also for the quality of their jobs.

In this paper we attempt to answer this question, focussing on the quality of jobs among young workers as reflected by their own perceived job satisfaction levels. In fact, although workers' job satisfaction has been widely analysed by sociologists and industrial psychologists, it also conveys useful information about economic life and labour market decisions that should not be ignored (Freeman (1978); Eurofound (2007)).

Job satisfaction is a subjective measure of how people feel about their job. Broadly speaking, it can be thought of as a multidimensional construct involving subjective aspirations and objective opportunities. In this paper we focus on so-called cognitive job satisfaction, which is the extent of the individual's satisfaction with particular aspects of their jobs, such as the work environment, work organization, duties, protection against sickness, accident and industrial injury, career perspectives, pay, competence and skills development, and job security.

Not only is job satisfaction useful as a proxy for job quality, but also for the following two reasons. First, it increases job productivity (Hamermesh (1997)) and therefore firm productivity (Oswald (1997)); and second it improves social welfare, as it is extremely closely correlated to overall individual happiness and well-being (social life, family, etc.) (Addabbo and Solinas (2012))[1].

For our analysis we use the 2006-2008-2010 panel collected by the Institute for Workers'

[1] For other analyses of job satisfaction, in particular related to contractual characteristics of workers, see for example van Praag et al., 2003, for Germany; de Graaf-Zijl (2012) for the Netherlands; A. Booth and Frank (2002), Bardasi and Francesconi (2004) and Green and Heywood (2011)for the UK; Bruno et al. 2013 for Italy.

Professional Development (Istituto per lo Sviluppo della Formazione Professionale dei Lavoratori, ISFOL) in the 2Participation, Labour, Unemployment Survey (PLUS). This data set has a number of advantages for the purposes of our research: 1) it is a panel, and as such it allows us to treat unobserved heterogeneity across workers, which is crucial when working with models of personal evaluation; 2) it covers a time period that is subsequent to the introduction of labour market reforms meant to improve the labor market performance of young workers in Italy; 3) it includes self-declared measures of height and weight, that allow the construction of the Body Mass Index (BMI) to classify individuals as obese or not, as in most of the previous literature; 5) it presents a unique wealth of information about selfdeclared satisfactions on an uncommonly large number of job-aspect satisfactions. More specifically, we observe nine dimensions of job satisfaction, whereas for other countries' data far fewer levels are available (for example four in Green and Heywood (2011); five in de Graaf-Zijl (2012)). As a classical measure of labor market outcome we also consider wages.

Endogeneity of obesity could be an issue also in a job-satisfaction model, although the reason why this may be so is less obvious than in a wage equation. It may be for example that latent individual traits affect the eating habits of an individual along her/his well-being in the work-place. There could be also an inverse causality effect if bad conditions of work and low job satisfaction may bring about a change in the diet for an individual. A this stage of the analysis, we do not pursue the endogeneity issue beyond an attempt to control for correlated latent heterogeneity.

Our findings are the following. We find that for young people in Italy the wage-penalty of obesity is never existent. Conversely a job-satisfaction effect of obesity clearly emerges and the aspects of job satisfaction for which obese men and women are dissatisfied are different.

The chapter is organised as follows: in Section 2 we revise the existing literature on the consequences in the labor market of obesity, mainly in the European countries. Section 3 describes our data. Section 4 presents the econometric analysis and Section 5 concludes. Tables are relegated into an appendix.

2 The literature

The analysis of the economic consequences of obesity in the labor market has quite a long story. Obesity is one way of measuring and taking into account the physical attractiveness of individuals considered for the first time in economics by Biddle and Hamermesh (1994), Biddle and Hamermesh (1998). Since then, the empirical research has followed two different strands: one is to construct subjective measures of beauty, a concept that is difficult to quantify since it is exquisitely subjective; the other is to work with more objective measures of beauty, based on the observation of height, weight, fat mass, BMI, or other quantifiable aspects of perceived physical attractiveness[2].

In this chapter we follow the second strand of the literature, therefore in this section we will briefly survey the economic literature on obesity, focussing on the European case.

The evidence about the economic consequences of obesity in the European countries covers mainly the last decennium and a limited number of countries: UK (Sargent and Blanchflower (1994), Morris (2006)); Germany (J. Cawley and Lillard (2005)); Finland (Sarlio-Lahteenkorva and Lahelma (1999)); Denmark (Greve (2005)) and Germany (Caliendo and Gehrsitz (2014)). In the work by Sargent and Blanchflower (1994), hourly earnings of women at age 23 are found to be lower conditioned on being obese at age 16, but no such a relation is found for men. More recently, Morris (2005), Morris (2006) shows that body mass index (BMI) has a positive and significant effect on mean hourly occupational earning in males and a negative and significant effect in females, although the association for males is not robust across different specifications. However, after using the mean BMI (and/or the prevalence of obesity) across individuals living in the same health authority area as an instrument for individual BMI, he finds no statistically significant effect, either for men or for women. In Finland, obese females are found to have lower

[2]For a recent analysis of the relationship between subjective and anthropometric measures of attractiveness see Oreffice and Quintana-Domenque (2014)

income levels than non-obese ones, but that is not the case for males (Sarlio-Lahteenkorva and Lahelma (1999)). The empirical evidence for Germany shows that obesity is negatively associated with wages, both for men and for women (J. Cawley and Lillard (2005)). Finally, preliminary evidence for Denmark shows a negative effect of obesity and overweight on employment for women, while for men overweight seems to have a positive effect on employment (Greve (2005)).

On the other hand, there are some comparative studies across the European countries carried out on the 1998-2001 waves of European Community Household Panel (ECHP) that find contrasting results according to the methodology of the analysis carried out. Villar and Quintana-Domeque (2006), Brunello and d'Hombres (2007) and V. Atella and Vuri (2008) analyze the effect of BMI on wages in Europe. With their descriptive evidence, Villar and Quintana-Domeque (2006), find overall no wage or gender effects in Europe, however the heterogeneous correlations found across countries can be explained with cultural or institutional settings (collective bargaining coverage, provision of health insurance by employer, prevalence of obesity in the country, and social interactions). Brunello and d'Hombres (2007) instead, pooling all the countries together, find that the association between BMI and wages is negative for women, and positive for men. Using BMI from biological family members as an instrument for individual BMI, they report a negative effect of BMI for both men and women and therefore no gender effect. Interestingly enough, Brunello and d'Hombres (2007) highlight a geographical effect: obese workers pay a wage penalty in 'olive belt' countries (Spain, Greece, Italy, Portugal) and earn a positive premium in 'beer belt' countries (Austria, Ireland, Denmark, Belgium, Finland). Controls for country-GDP per capita and temperature seem to explain this evidence as follows: in worm countries obese people are less productive than in cold countries and this explains their lower wages. On the same data V. Atella and Vuri (2008) apply an original method: quantile regression with instrumental variables. They also find high heterogeneity in Europe as the relationship between obesity and wages changes across countries and wage quantiles, but in their case cultural, environmental or institutional settings do not seem to be able to explain differences

across countries. According to V. Atella and Vuri (2008) the observed differences across countries are therefore due to a pure discriminatory effect hypothesis.

Sousa (2005) and Villar and Quintana-Domeque (2006) focus on the probability to be employed for obese people. Sousa (2005) applies the propensity score technique (matching estimator) in order to assess the causal effect of BMI on the successful outcome in the labor market. Pooling all the countries together, she finds that the average treatment effect for those having a BMI above 25 decreases labor force participation for women, whereas it increases male labor force participation. Villar and Quintana-Domeque (2006) instead find no employment or segregation effects with their descriptive analysis.

Finally, there is a recent study by P. Lundborg and Lindgren (2007) carried out on the 2004 wave of the Survey of Health, Aging and Retirement in Europe (SHARE) where the authors analyze the effect of obesity on employment, hours worked and hourly wages in 10 European countries for people aged 50 and above. Pooling all the countries together and using as instrumental variables birth order and the sibling sex composition of the respondent, they find that obesity is negatively associated with being employed for both men and women and with female hourly wages. They also observe heterogeneity across EU-countries: the effects of obesity on employment are bigger for men in Southern or Central Europe whereas the effects on wages are worse for women in Central Europe.

The purpose of our paper is to study this issue for Italy, focusing on young people. To our knowledge no previous studies for this country have been carried out.

3 The data

Our empirical analysis is based on micro-data collected by ISFOL in the Participation, Labour, Unemployment Survey (PLUS). This survey, started in 2005, consists in a sample of about 38,000 working age people interviewed by telephone. Detailed personal data, information about education, family background, occupational characteristics and job search condition are

collected[3].

In methodological terms, the representativeness of the sample follows exactly the same criteria as the national survey carried out by the Italian National Institute of Statistics (ISTAT): the Labour Force Survey (LFS). But the general purpose of the PLUS questionnaire is also to record people's self-perceptions about different aspects of their lives, and especially of their jobs, thereby completing the canonical information available in the LFS. In our analysis we use the longest 2006-2008-2010 panel version available for taking advantage of the longest working history of individuals. We focus on the population of young working people, selecting the sample of people aged between 15 and 35 years. The choice of this high upper bound for age is due to the evidence that in Italy exit from school/entrance into the labour market is often delayed, and hence the category of young workers is wider than in other countries. The sample does not include immigrants (identified as those without Italian citizenship) and those working for the armed forces. Table 1 reports same basic characteristics of the sample.

The ISFOL-PLUS is a balanced panel of 6820 observations, 38% men and 62% women. In 2010 the survey has collected information about height and weight[4], and also on some healthy behaviors of individuals such as sport practice and smoking. In particular, from height and weight we can calculate the BMI defined a persons's weight in kilograms divided by the square of her height in metres (kg=m2).

Using the World Health Organisation (WHO)'s classification we classify an individual as

- Overweight if her/his BMI is greater than 25 and smaller than 30,
- Obese if her/his BMI is greater than or equal to 30

Accordingly we generate the dummy overweight, which is unity when 25 < BMI < 30 and the dummy obesity, which is unity when BMI _ 30.

[3]For a complete description of the survey see Mandrone (2012)

[4] Height and weight are self-reported, and as such (see Danubio et al. (2008)) can lead to misclassification of the prevalence of obesity since the participants overestimate or underestimate height, weight and/or both, and such misclassification vary according to gender and age.

Table 1 shows some descriptive statistics both for the overall and the estimation sample of height, weight and BMI. As we can see men are on average taller and fatter than women, with a BMI of 23.59 versus 21.67 of women, and a percentage of 23% with BMI > 25 compared to 13% of women. Since we observe individual weight and height only for 2010 we have to restrict to this wave for estimation.

As a result, more than half observations are lost in the estimation sample. Also, a small portion of this data loss is due to missing values in 2010. Interestingly enough, though, means and standard deviations in the estimation sample are very close to those of the complete sample, indicating that sample selection does not seem a serious concern for these data.

All the workers in the panel report their job satisfaction in each of the three years (2006, 2008 and 2010) both overall and in nine dimensions, available as answers to the following questions: Overall, what is your level of satisfaction with respect to: 1) work environment (relationships with colleagues and superiors); 2) work organisation (timetable, shifts, overtime, holidays); 3) duties; 4) content of job; 5) protection against sickness, accident and industrial injury; 6) career perspectives; 7) pay; 8) competence and skill development; 9) job-stability". Responses are self-evaluations at four possible levels, which we have re-ordered homogeneously for increasing intensity as follows: low, medium-low, medium-high, high. The 'do not know' and 'not applicable' options have been eliminated from the sample.

As already remarked, we observe individual weight and height only for 2010, and so our empirical analysis is restricted to the 2010 wave of the ISFOL panel. Nonetheless, we try to exploit the panel information by including the group means of the time varying explanatory variables observed also in the previous waves in order to model correlated unobserved heterogeneity. Then, we use the available information on personal and family characteristics as explanatory variables. These variables comprise: sex, age, age squared, education (three groups: primary, secondary and tertiary education), region of residence (four macro-areas: North-West, North-East, Centre, South and Islands), three type of contracts (permanent employment, temporary employment, other temporary arrangements introduced by the recent labor market

reforms), occupation (3 groups: high-medium-low skilled), sectoral membership (5 groups: agricultural, manufacturing, construction, trade and food, services) and a dummy variable that is unity if the individual has kids, the number of family components and its square.

Gross annual earnings are computed by ISFOL in order to make the information on work income homogeneous across contracts. In fact, in the original data, workers report annual or monthly wages according to the contract typology of their job. Unfortunately, due to the information available, no better homogeneous measures for labor earnings can be constructed.

4 Empirical analysis

Our research question is to examine the effects of overweight and obesity on job satisfaction (overall and in the nine aspects of job satisfaction provided by the ISFOL panel data). We also implement a wage equation to evaluate their effects on job earnings. All models include the same control variables: personal and family characteristics and, to control for correlated latent heterogeneity, the group means of the explanatory variables that are both time-varying and observed over the three waves. Caution should be exerted in interpreting our estimation results as causal effects, though, since the group means can accommodate only the time-invariant latent heterogeneity components that are correlated with a subset of control variables one that excludes overweight and obesity.

The estimation strategy is based on the Van Praag's probit OLS estimator (see Praag and i Carbonell 2004 and Praag and i Carbonell 2006 and, for an application to the ISFOL PLUS data, Bruno, Caroleo, and Dessy 2014). The estimation sample is of at most 2903 individuals with 1168 observations for males and 1735 for females.[5]

Estimation results are in Tables 2-4. For each categorical variable we include the full set of dummies, excluding the reference category. So, the reference individual has a permanent contract

[5] 5The estimation sample slightly varies depending on the satisfaction variable. The actual sample sizes are reported in the Tables.

in the agricultural sector, is high skilled, lives in the North-West of the country, does not have kids, has the lowest level of education and is of normal weight. Table 2 reports the estimation results for the regression model pooling males and females. It includes a gender dummy that is unity if the individual is a male. Tables 3 and 4 report results for the males and the females subsamples, respectively.

Focusing on the results from the pooled model in Table 2, we observe that the two measures of excess body fat exert almost always a negative impact, which is significant only in a few cases though: overweight individuals have significantly lower satisfaction over organization of work times, while obese individuals are significantly dissatisfied with their career opportunities and development of skills.

It seems likely that the sporadicalness of significant results in Table 2 may be the consequence of gender heterogeneity and, indeed, looking at the separate male and female subsamples shows that this is the case. Results for men in Table 3 show that the set of satisfaction aspects where being over-weight exert a significantly negative impact, in addition to organization of work times, includes work environment, work duties, pay and skills. Obese men are significantly dissatisfied over development of skills and job stability only, and significantly satisfied over work duties, which is admittedly quite difficult to explain. From results in Table 4 we see that the being overweight is relatively less distressful for women than for men, while the reverse is true for obesity. Overweight women, in fact, are never significantly dissatisfied and, likewise obese men, are actually significantly satisfied over work duties. Obese women, instead, are dissatisfied over work duties and also over career opportunities.

Overall job satisfaction is not affected by either obesity or overweight for all the samples considered.

Heterogeneity between males and females is observed also for the satisfaction impact of another unhealthy behavior: smoking. Smoking has almost always a positive satisfaction impact for men, which is significant in the cases of satisfaction for work environment, organization of times, work duties and overall job-satisfaction. There is the exception of a significantly negative impact of

smoking on the satisfaction over job safety (protection). For females smoking has never a significantly negative satisfaction impact. It has a significantly positive impact in the cases of satisfaction over content of job, job safety, job stability and overall job satisfaction.

Having kids has an ambiguous effect on the different aspects of job satisfaction, but it is more often significant and sizeable for women than for men. There is the notable exception, though, of a negatively significant overall job satisfaction impact for men where in contrast the same coefficient is insignificant for women. Low skilled males are significantly less satisfied than both high and medium skilled across many aspects of job satisfactions. Medium skilled females are often less satisfied than high skilled with the statistically significant exception of satisfaction over job safety. Coherently with what found in Bruno, Caroleo, and Dessy (2014), temporary workers are less satisfied than permanent workers. Sectoral membership does not seem to play a role for most aspects of men's job satisfaction. To the opposite female agricultural workers are the least satisfied over the two apsects of job content and career. Moreover, we do observe some regional effects but not important education effects.

We have also investigated the impact of the overweight and obesity variables on the gross income using the same set of controls and on the same samples as in the satisfaction equations. Results for these exercises are reported in Table 5 and constantly show insignificant effects for all the samples considered.

5 Conclusions

In this paper we have analysed empirically the relationship between measures of excess body fat (overweight and obesity) and labor market outcomes for young workers in Italy using the ISFOL-PLUS 2006-2008-2010 panel data. For the first time we have considered in particular as a measure of labor market outcome the quality of jobs evaluated through self-reported assessments on job satisfaction.

Considering nine aspects of job satisfaction we have found a general negative relationship between on the one hand obesity and overweight and on the other aspects of job satisfaction, with

significant gender differences both about which is the most distressful condition, overweight or obesity, and about the aspects of job satisfaction that are mostly affected. While for men being overweight is the most distressful condition, for women is obesity. So, overweight men are dissatisfied over work environment, organization of work times, pay, and development of skills, where obese females are dissatisfied over work duties and career opportunities. Obese men are only dissatisfied over development of skills and job stability and overweight women are not dissatisfied at all. There is the interesting, although hard to explain, result that obese men and overweight women are more satisfied than their normal weight counterparts over burden of work duties. Overall job satisfaction is not affected by either obesity or overweight in either subsamples. Similarly the analysis on the gross-income effect of overweight and obesity does not yield significant results.

On a methodological note, from all the above findings we gather that considering aspects of job satisfaction as measures of labor market outcome improves significantly the analysis of the labor market consequences of obesity. Limiting the analysis to labor earnings, or also to overall job satisfaction, would have not uncovered any effect of an high BMI for Italian young workers. But some important effects are there, indeed, and become evident when the focus shifts to specific aspects of job satisfaction. Also the distinction between overweight and obesity seem relevant, as it is that between young men and women.

If, according to the recent European directions, a good quality of jobs should be a goal to reach in all countries, the analysis of the Italian case shows that attention should be given to the problem of obesity for young people, although further research is needed for exploring the causal relationship between BMI and labor market outcomes.

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APPENDIX

Table 1: Descriptive Statistics of the ISFOL-PLUS 2006-2008-2010 panel

TOTAL SAMPLE							ESTIMATION SAMPLE					
	Males		Females		Total		Males		Females		Total	
	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent
Observations	2,583	37.87	4,237	62.13	6,820	100	1168	40.2	1735	59.8	2903	100
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Height	178.07	6.76	164.84	6.41	169.85	9.16	177.98	6.88	164.87	6.30	170.15	9.17
Weight	74.88	11.28	58.91	10.19	64.95	13.13	75.35	11.15	58.62	10.11	65.35	13.36
BMI	23.59	3.13	21.67	3.46	22.39	3.46	23.77	3.12	21.55	3.45	22.44	3.50
BMI>25	0.23	0.42	0.13	0.34	0.17	0.37	0.26	0.44	0.12	0.33	0.18	0.38

Table 2: Aspects of Job Satisfaction - Total sample - Probit OLS estimates

SATISFACTION	environment	organisation	duties	content	protection	career	pay	skills	stability	overall
Male	0.155*	0.0247	-0.00114	0.198**	0.0627	0.359***	0.270***	0.0994	0.271***	0.269***
	(0.0815)	(0.0883)	(0.0852)	(0.0908)	(0.0769)	(0.0818)	(0.0857)	(0.0889)	(0.0779)	(0.0935)
25<BMI<30	-0.0549	-0.192***	-0.00374	-0.0681	-0.0250	-0.123	-0.0882	-0.112	-0.0801	-0.0608
	(0.0765)	(0.0739)	(0.0829)	(0.0845)	(0.0709)	(0.0802)	(0.0788)	(0.0835)	(0.0726)	(0.0817)
BMI≥30	-0.0975	-0.0134	-0.278	0.0317	-0.0782	-0.404***	-0.177	-0.228*	-0.163	-0.191
	(0.184)	(0.169)	(0.223)	(0.186)	(0.159)	(0.137)	(0.191)	(0.125)	(0.153)	(0.124)
Smoke	0.0865	0.189***	0.0806	0.183**	-0.00579	0.111*	0.113*	0.0741	0.104*	0.201***
	(0.0628)	(0.0666)	(0.0715)	(0.0720)	(0.0564)	(0.0626)	(0.0637)	(0.0595)	(0.0572)	(0.0657)
Age	7.347*	6.221	0.346	6.021	14.88***	0.659	-5.207*	-9.888***	1.144	-1.811
	(4.223)	(4.687)	(5.882)	(3.801)	(3.616)	(7.070)	(3.130)	(3.580)	(2.193)	(2.075)
Age squared	-0.134*	-0.112	0.00416	-0.112*	-0.268***	-0.0298	0.0660	0.160**	-0.0263	0.0307
	(0.0753)	(0.0844)	(0.104)	(0.0678)	(0.0643)	(0.125)	(0.0576)	(0.0648)	(0.0439)	(0.0407)
Kids	0.847	4,719*	-5.529***	-2.981***	-5.171***	-832.1	-6.031***	-1,779	-0.0362	-0.509
	(0.701)	(2,754)	(1.171)	(0.624)	(0.485)	(2,518)	(0.579)	(2,298)	(0.572)	(0.557)
# family comp.	-0.0730	-0.195	0.137	-0.339	0.180	-0.313	0.130	-0.0372	0.0550	-0.254
	(0.208)	(0.211)	(0.238)	(0.215)	(0.183)	(0.241)	(0.225)	(0.257)	(0.183)	(0.223)
# family comp. sq.	0.0149	0.0263	-0.0129	0.0549*	-0.0345	0.0366	-0.0285	-0.00770	-0.0182	0.0389
	(0.0321)	(0.0318)	(0.0367)	(0.0318)	(0.0271)	(0.0354)	(0.0341)	(0.0392)	(0.0279)	(0.0349)
Temporary employee	-0.257*	-0.360**	-0.124	-0.114	-0.0281	-0.119	-0.191	-0.0724	-0.562***	-0.178
	(0.136)	(0.141)	(0.147)	(0.144)	(0.121)	(0.135)	(0.123)	(0.131)	(0.102)	(0.153)
Temporary	-0.0492	-0.210	0.154	-0.0353	-0.435*	-0.469*	-0.443*	-0.160	-1.368***	-0.413*

other arrangem.										
	(0.212)	(0.243)	(0.249)	(0.276)	(0.238)	(0.256)	(0.231)	(0.293)	(0.232)	(0.213)
North-East	2.101***	-0.0899	1.019	1.975***	1.341***	-0.892	0.275	0.722	-0.216	0.0685
	(0.609)	(0.713)	(0.767)	(0.367)	(0.338)	(0.567)	(0.450)	(0.460)	(0.981)	(0.228)
Centre	0.499	1.262	0.824	0.574	0.270	-1.051	-0.648	0.447	-0.105	0.155
	(0.618)	(0.886)	(0.714)	(0.594)	(0.626)	(0.993)	(0.796)	(0.619)	(0.724)	(0.846)
South-Islands	0.707	1.002	1.081*	0.970**	-0.210	0.111	-0.0537	0.579	0.767*	0.502
	(0.489)	(0.663)	(0.634)	(0.393)	(0.566)	(0.410)	(0.391)	(0.368)	(0.434)	(0.859)
Secondary Education	-0.147	0.107	-0.0942	-0.174	-0.00907	0.231	0.0892	0.236**	0.275**	-0.0814
	(0.170)	(0.175)	(0.180)	(0.182)	(0.152)	(0.156)	(0.141)	(0.119)	(0.135)	(0.186)
Tertiary Education	-0.0862	-0.00752	-0.255	-0.386*	-0.115	0.183	0.225	0.136	0.0401	-0.386*
	(0.217)	(0.217)	(0.225)	(0.229)	(0.196)	(0.200)	(0.188)	(0.188)	(0.193)	(0.215)
Medium skilled	0.00963	0.0272	-0.00645	-0.110*	0.0498	-0.128*	0.0521	-0.236***	0.0529	-0.0430
	(0.0571)	(0.0577)	(0.0637)	(0.0637)	(0.0640)	(0.0663)	(0.0629)	(0.0634)	(0.0538)	(0.0574)
Low skilled	-0.134	-0.0890	-0.0961	-0.316***	-0.0948	-0.367***	-0.127	-0.420***	0.0117	-0.408***
	(0.107)	(0.113)	(0.107)	(0.106)	(0.0944)	(0.106)	(0.102)	(0.108)	(0.0983)	(0.113)
Manufacturing	-0.0385	0.121	0.255	0.475***	0.118	0.434**	-0.224	0.0776	-0.183	-0.362
	(0.178)	(0.164)	(0.207)	(0.182)	(0.176)	(0.185)	(0.231)	(0.228)	(0.182)	(0.356)
Construction	0.0573	0.191	0.135	0.492**	-0.0562	0.849***	0.00171	0.198	-0.0233	-0.152
	(0.205)	(0.185)	(0.240)	(0.226)	(0.211)	(0.227)	(0.249)	(0.243)	(0.201)	(0.366)
Trade and food	-0.145	-0.0975	0.271	0.342*	-0.171	0.425**	-0.263	0.0491	0.0789	-0.321
	(0.171)	(0.153)	(0.206)	(0.181)	(0.174)	(0.185)	(0.225)	(0.225)	(0.165)	(0.337)
Services	-0.0779	0.0654	0.187	0.437**	-0.106	0.519***	-0.245	0.0833	0.0285	-0.298
	(0.166)	(0.138)	(0.201)	(0.174)	(0.170)	(0.177)	(0.223)	(0.224)	(0.163)	(0.340)
Constant	-12.23	-11.55	0.749	-11.21	-29.85***	-1.963	11.82*	19.14**	-0.595	6.535
	(8.550)	(9.457)	(11.82)	(7.770)	(7.411)	(14.19)	(6.550)	(7.467)	(4.686)	(4.509)

Observations	2,884	2,888	2,886	2,896	2,855	2,843	2,870	2,863	2,856	2,903
R-squared	0.074	0.074	0.049	0.096	0.075	0.110	0.102	0.097	0.148	0.096

Number of family components (and its square) and age (and its square) are count variables. All the other regressors are binary indicators. The reference individual is a female of normal weight with a permanent contract in the agricultural sector, who lives in the North-West, does not have kids, is high skilled and has the lowest level of education. The group means of the time-varying regressors observed over the three waves are included in all regressions (the corresponding coefficient estimates are not reported in the table).

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 3: Aspects of Job Satisfaction – Males sample - Probit OLS estimates

SATISFACTION	environment	organisation	duties	content	protection	career	pay	skills	stability	overall
25<BMI<30	-0.155*	-0.245***	-0.174*	-0.107	-0.0803	-0.132	-0.177*	-0.216**	-0.0901	-0.0978
	(0.0925)	(0.0849)	(0.0988)	(0.0973)	(0.0869)	(0.107)	(0.0959)	(0.101)	(0.0845)	(0.101)
BMI≥30	0.00577	0.283	0.463**	0.172	-0.291	-0.293	-0.236	-0.311**	-0.369*	-0.0830
	(0.221)	(0.197)	(0.223)	(0.175)	(0.240)	(0.179)	(0.362)	(0.144)	(0.203)	(0.175)
Smoke	0.157*	0.274***	0.203**	0.0713	-0.155*	0.110	0.0841	0.107	0.0315	0.151*
	(0.0879)	(0.0880)	(0.0989)	(0.0948)	(0.0801)	(0.0930)	(0.0844)	(0.0840)	(0.0784)	(0.0898)
Age	52.89***	41.36***	61.06***	46.04***	49.27***	-64.82***	31.28***	-39.64***	-0.252	12.49
	(9.410)	(10.15)	(10.58)	(9.368)	(8.172)	(10.43)	(9.616)	(9.983)	(8.809)	(10.05)
Age squared	-0.885***	-0.680***	-0.966***	-0.778***	-0.823***	1.034***	-0.522***	0.634***	0.00303	-0.204
	(0.152)	(0.164)	(0.171)	(0.151)	(0.132)	(0.168)	(0.155)	(0.160)	(0.142)	(0.162)
Kids	-1.431***	-1.374	1.087	-0.274	0.692*	2.609	-1.318***	-0.632	-1.352***	-1.866***
	(0.396)	(1.499)	(1.588)	(0.402)	(0.366)	(2.092)	(0.393)	(1.921)	(0.327)	(0.511)
# family comp.	-0.357	-0.367	0.162	-0.412	0.312	-0.282	0.215	-0.121	0.0221	-0.371
	(0.299)	(0.301)	(0.340)	(0.318)	(0.266)	(0.355)	(0.323)	(0.337)	(0.267)	(0.337)
# family comp. sq.	0.0549	0.0686	-0.0204	0.0830*	-0.0515	0.0381	-0.0450	-0.00506	-0.0122	0.0600
	(0.0497)	(0.0481)	(0.0569)	(0.0497)	(0.0411)	(0.0545)	(0.0542)	(0.0564)	(0.0440)	(0.0563)
Temporary Employee	-0.203	-0.452**	-0.101	-0.251	-0.0655	-0.106	-0.386**	-0.154	-0.464***	-0.139
	(0.218)	(0.218)	(0.241)	(0.236)	(0.168)	(0.214)	(0.176)	(0.196)	(0.149)	(0.229)
Temporary other arrangem.	0.205	0.103	0.479	0.0481	-0.0630	-0.0165	-0.316	0.238	-1.776***	-0.0301
	(0.250)	(0.303)	(0.345)	(0.430)	(0.331)	(0.416)	(0.372)	(0.466)	(0.307)	(0.297)
North-East	1.406	-1.123	-2.003	3.317***	0.201	-1.815	-1.441	1.706	-2.893*	0.273
	(1.486)	(0.848)	(1.633)	(0.727)	(0.922)	(1.442)	(1.525)	(1.512)	(1.517)	(0.586)
Centre	-1.563	-0.0708	-0.851	-0.138	-0.616	-1.863***	-1.556	0.266	-1.875*	0.311

	(1.031)	(1.000)	(1.322)	(1.448)	(1.087)	(0.649)	(0.981)	(1.328)	(1.035)	(1.010)
South-Islands	0.739	2.267***	2.162***	1.569***	0.144	0.536	0.0327	0.756	1.651***	1.712
	(0.704)	(0.679)	(0.724)	(0.547)	(1.137)	(0.586)	(0.706)	(0.560)	(0.297)	(1.227)
Secondary Education	-0.141	0.208	-0.0163	-0.163	0.0314	0.394*	0.221	0.184	0.161	-0.315
	(0.224)	(0.234)	(0.245)	(0.241)	(0.188)	(0.214)	(0.189)	(0.148)	(0.171)	(0.222)
Tertiary Education	-0.0462	0.252	-0.0861	-0.376	0.131	0.322	0.657**	0.0496	0.227	-0.526*
	(0.354)	(0.319)	(0.354)	(0.353)	(0.297)	(0.291)	(0.257)	(0.312)	(0.274)	(0.295)
Medium skilled	0.0960	0.0644	0.0960	0.00800	-0.124	-0.123	0.0290	-0.172*	0.103	-0.0133
	(0.0906)	(0.0854)	(0.0993)	(0.0980)	(0.0951)	(0.107)	(0.0958)	(0.0981)	(0.0750)	(0.0942)
Low skilled	-0.159	-0.0584	-0.0849	-0.324**	-0.317***	-0.554***	-0.222**	-0.406***	0.141	-0.438***
	(0.125)	(0.125)	(0.139)	(0.136)	(0.107)	(0.128)	(0.112)	(0.123)	(0.112)	(0.131)
Manufacturing	0.000516	0.194	0.0957	0.306	-0.00554	0.406	-0.385	-0.0769	0.213	-0.411
	(0.267)	(0.196)	(0.268)	(0.243)	(0.259)	(0.253)	(0.290)	(0.304)	(0.168)	(0.317)
Construction	-0.00808	0.184	-0.0610	0.225	-0.310	0.715**	-0.251	0.0251	0.179	-0.367
	(0.293)	(0.241)	(0.297)	(0.288)	(0.292)	(0.295)	(0.304)	(0.315)	(0.214)	(0.339)
Trade and food	-0.289	-0.114	0.0612	0.103	-0.296	0.336	-0.439	-0.0605	0.413**	-0.492
	(0.262)	(0.215)	(0.266)	(0.242)	(0.263)	(0.273)	(0.292)	(0.305)	(0.165)	(0.309)
Services	-0.157	0.0913	-0.0218	0.185	-0.238	0.468*	-0.460	-0.0398	0.364**	-0.401
	(0.269)	(0.193)	(0.268)	(0.246)	(0.259)	(0.259)	(0.285)	(0.303)	(0.159)	(0.316)
Constant	-101.8***	-82.32***	-119.2***	-88.47***	-96.03***	125.9***	-61.56***	76.90***	1.599	-21.43
	(18.11)	(19.51)	(20.31)	(17.97)	(16.20)	(19.98)	(18.44)	(19.35)	(17.26)	(19.35)
Observations	1,163	1,160	1,164	1,166	1,150	1,152	1,157	1,153	1,147	1,168
R-squared	0.119	0.133	0.104	0.132	0.102	0.131	0.155	0.155	0.217	0.124

Number of family components (and its square) and age (and its square) are count variables. All the other regressors are binary indicators. The reference individual is of normal weight, has a permanent contract in the agricultural sector, is high skilled, lives in the North-West, does not have kids, and has the lowest level of education. The group means of the time-varying regressors observed over the three waves are included in all regressions (the corresponding coefficient estimates are not reported in the table).

Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Table 4: Aspects of Job Satisfaction - Females sample - Probit OLS estimates

SATISFACTION	environment	organisation	duties	Content	protection	career	pay	skills	stability	overall
25<BMI<30	0.0793	-0.0456	0.262**	0.0152	0.0726	-0.155	0.0495	0.156	-0.0598	0.000607
	(0.128)	(0.132)	(0.116)	(0.127)	(0.106)	(0.103)	(0.123)	(0.121)	(0.112)	(0.105)
BMI≥30	-0.134	-0.211	-0.696***	-0.0284	0.0157	-0.543***	-0.0868	-0.0652	0.0823	-0.220
	(0.268)	(0.229)	(0.239)	(0.300)	(0.206)	(0.207)	(0.234)	(0.200)	(0.187)	(0.157)
Smoke	0.0447	0.0966	-0.0130	0.278***	0.133*	0.0541	0.106	0.0737	0.135*	0.209***
	(0.0808)	(0.0888)	(0.0781)	(0.0829)	(0.0782)	(0.0781)	(0.0828)	(0.0796)	(0.0751)	(0.0698)
Age	-	-	-	-	-	-	-	-	-	-
Age squared	0.00664	-0.000526	-0.00161	0.00287	0.0276***	-0.000939	-0.0412***	-0.0342***	0.00127	-0.00697
	(0.00437)	(0.00438)	(0.00433)	(0.00431)	(0.00422)	(0.00429)	(0.00439)	(0.00406)	(0.00418)	(0.00448)
Kids	-2.310***	4,060	1.216**	-231.9	-4.591***	-281.3	-4.953***	-4.151***	2.215***	0.231
	(0.531)	(7,922)	(0.514)	(8,014)	(0.502)	(6,861)	(0.510)	(0.485)	(0.501)	(0.448)
# family comp.	0.387*	-0.0527	0.236	-0.240	0.112	-0.323	0.0508	0.224	0.228	-0.0316
	(0.211)	(0.219)	(0.251)	(0.227)	(0.207)	(0.200)	(0.212)	(0.185)	(0.200)	(0.177)
# family comp. sq.	-0.0509*	-0.00628	-0.0241	0.0197	-0.0241	0.0311	-0.0188	-0.0328	-0.0442	-0.00245
	(0.0303)	(0.0313)	(0.0355)	(0.0316)	(0.0288)	(0.0290)	(0.0297)	(0.0262)	(0.0281)	(0.0262)
Temporary employee	-0.293**	-0.192	-0.0636	0.126	0.147	-0.0773	0.0406	0.0565	-0.743***	-0.268**
	(0.143)	(0.168)	(0.144)	(0.130)	(0.152)	(0.143)	(0.154)	(0.157)	(0.143)	(0.133)
Temporary other arrangem.	-0.396	-0.529	-0.0768	-0.160	-0.565**	-0.942***	-0.568**	-0.410	-1.116***	-0.811***
	(0.321)	(0.340)	(0.288)	(0.344)	(0.280)	(0.301)	(0.273)	(0.302)	(0.324)	(0.291)

North-East	2.379***	0.0773	1.362***	1.271***	1.471***	-0.635	0.657**	0.508	0.419	-0.291
	(0.454)	(0.937)	(0.475)	(0.251)	(0.470)	(0.609)	(0.256)	(0.350)	(0.822)	(0.238)
Centre	1.138*	0.543	0.443	0.197	0.559	-1.095	-0.110	0.908	-0.270	-0.566
	(0.674)	(0.698)	(0.470)	(0.471)	(0.600)	(1.244)	(0.882)	(0.708)	(0.888)	(0.533)
South-Islands	0.799	-0.0451	0.134	0.795**	-0.315	0.106	0.228	0.562	0.127	-0.497
	(0.673)	(0.542)	(0.370)	(0.353)	(0.496)	(0.528)	(0.465)	(0.527)	(0.584)	(0.409)
Secondary education	-0.0326	0.0402	-0.207	0.0292	-0.0365	0.0625	-0.0663	0.405**	0.442*	0.469**
	(0.188)	(0.233)	(0.206)	(0.195)	(0.221)	(0.210)	(0.221)	(0.201)	(0.239)	(0.237)
Tertiary education	-0.0203	-0.192	-0.467*	-0.231	-0.292	-0.0135	-0.251	0.241	-0.0119	0.0647
	(0.234)	(0.274)	(0.263)	(0.256)	(0.257)	(0.270)	(0.292)	(0.250)	(0.302)	(0.281)
Medium skilled	-0.0887	-0.00850	-0.0707	-0.236***	0.209***	-0.146**	0.0466	-0.326***	-0.0268	-0.107*
	(0.0698)	(0.0723)	(0.0725)	(0.0731)	(0.0780)	(0.0722)	(0.0727)	(0.0754)	(0.0726)	(0.0643)
Low skilled	0.0149	0.0298	0.0129	-0.162	0.155	-0.0833	-0.126	-0.366*	-0.335*	-0.446**
	(0.189)	(0.240)	(0.162)	(0.174)	(0.177)	(0.183)	(0.201)	(0.193)	(0.181)	(0.176)
Manufacturing	-0.190	-0.261	0.501	0.855***	0.197	0.606**	0.118	0.462	-0.298	0.0901
	(0.219)	(0.261)	(0.324)	(0.266)	(0.296)	(0.253)	(0.259)	(0.312)	(0.308)	(0.360)
Construction	0.468*	0.103	0.860*	1.351***	0.914***	1.529***	0.633*	0.930**	0.207	0.716*
	(0.239)	(0.314)	(0.458)	(0.377)	(0.337)	(0.350)	(0.330)	(0.429)	(0.357)	(0.396)
Trade and food	0.00680	-0.252	0.542*	0.841***	-0.00729	0.693***	0.0754	0.312	0.0327	0.265
	(0.186)	(0.198)	(0.321)	(0.254)	(0.284)	(0.242)	(0.243)	(0.310)	(0.293)	(0.341)
Services	0.00707	-0.122	0.453	0.914***	0.0749	0.760***	0.102	0.346	-0.0196	0.252
	(0.170)	(0.177)	(0.316)	(0.248)	(0.276)	(0.237)	(0.240)	(0.313)	(0.302)	(0.336)
Constant	1.486	1.766	0.226	-1.541	-2.790	1.724	3.364	0.274	2.662	2.539
	(1.954)	(1.995)	(2.020)	(1.968)	(2.084)	(2.142)	(2.134)	(2.250)	(1.845)	(1.867)
Observations	1,721	1,728	1,722	1,730	1,705	1,691	1,713	1,710	1,709	1,735
R-squared	0.098	0.090	0.109	0.148	0.125	0.122	0.135	0.117	0.181	0.179

See the notes to Table 3. Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 5: Gross income (logs) - OLS estimates

VARIABLES	Total sample	Males	Females
25<BMI<30	0.0440	0.0433	0.0240
	(0.0284)	(0.0333)	(0.0513)
BMI≥30	0.0149	-0.0293	0.0633
	(0.0661)	(0.0577)	(0.113)
Smoke	0.0212	0.00290	0.0314
	(0.0263)	(0.0372)	(0.0416)
Age	-1.971**	-8.095**	
	(0.968)	(3.725)	
Age squared	0.0272	0.128**	-0.0122***
	(0.0181)	(0.0600)	(0.00236)
Kids	-0.176	0.225	-2,862
	(0.266)	(0.166)	(4,350)
# family comp.	-0.0876	-0.0674	-0.170*
	(0.0712)	(0.107)	(0.0948)
# family comp. sq.	0.0139	0.0151	0.0186
	(0.0112)	(0.0179)	(0.0135)
Temporary employee	-0.0126	-0.0389	0.00376
	(0.0531)	(0.0578)	(0.0970)

Temporary other arrangem.	-0.0783	-0.139	-0.0845
	(0.125)	(0.171)	(0.198)
North-East	-0.400**	-0.161	-0.530***
	(0.168)	(0.502)	(0.137)
Centre	-0.431	0.0864	-0.530
	(0.301)	(0.343)	(0.385)
South-Islands	-0.343**	-0.386***	-0.163
	(0.154)	(0.142)	(0.265)
Secondary education	0.00399	-0.0830	0.161
	(0.0672)	(0.0813)	(0.116)
Tertiary education	-0.0727	-0.170	0.106
	(0.103)	(0.133)	(0.163)
Medium skilled	-0.0104	0.0355	-0.0742*
	(0.0287)	(0.0463)	(0.0394)
Low skilled	0.00623	0.0685	-0.174*
	(0.0413)	(0.0492)	(0.0982)
Manufacturing	0.0203	-0.0147	0.0862
	(0.0573)	(0.0621)	(0.121)
Construction	-0.00631	-0.0415	-0.0467
	(0.0744)	(0.0804)	(0.157)
Trade and food	-0.106*	-0.141**	-0.0958
	(0.0582)	(0.0673)	(0.115)
Services	-0.0532	-0.0306	-0.111
	(0.0560)	(0.0597)	(0.112)
Male	0.227***		
	(0.0380)		

Constant	11.75***	23.74***	8.503***
	(2.109)	(7.264)	(0.954)
Observations	2,919	1,175	1,744
R-squared	0.207	0.240	0.157

See the notes to Tables 2 and 3.

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

THE POLICY TRILEMMA AND THE FUTURE OF THE EUROZONE

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Abstract
The paper aims at estimating the existence of a trilemma in the Eurozone, i.e. to assess to what extent the net capital flows, the volatility of bond yields and the fiscal stance are strictly linked to each other constraining countries' ability to manage the internal policy goals. The existence of constraints on policy alternatives is estimated for 11 Eurozone countries from 2002 till 2012. The sample is then divided into pre- (2002-2008) and post-crisis (2009-2012) periods. A further division between the PIIGS and the non-PIIGs is then applied. The results show the validity of the trilemma for the whole Euro area and for the whole period but with some distinction between the pre- and post-crisis periods and between the PIIGS and the non-PIIGS countries. The existence of the trilemma underlines the presence of national constraints and suggests, for the future existence of the Eurozone, to push towards centralized fiscal policy instruments.

Keywords: Eurozone trilemma, policy goals, capital flows, fiscal stance, bond yields
JEL classification: E61, F41, C21, C23.

1. Introduction

The economic policy theory, within the framework of the Mundell-Fleming model (Mundell 1963, Fleming 1962), told us that it is impossible to have simultaneously exchange rate stability, free capital mobility and monetary policy independence. National governments have to choose between two of these three objectives since by definition, they result to be incompatible.

The European countries, when the Euro area was created, decided to give up monetary independence, share a common currency, i.e. an irrevocably fixed exchange rate regime, and to let capitals move freely across countries. For the Eurozone member states, the evaluation of alternative goals is no longer available, unless they consider the exit from the currency area as a possible alternative.

However, in the Eurozone the so called "impossible trinity" can be articulated in a different manner. The 2007 financial crisis and the subsequent sovereign bond crisis, in presence of free capital mobility, gave rise to a great financial instability. The national governments, in order to counteract the increase in bond yields, were forced to implement fiscal retrenchments. The subsequent decline in the output growth and the self-fulfilling effects on deficit and debt prevented single countries to comply with the Stability and Growth Pact (SGP) parameters. Those who had unsound public finance subscribed the *fiscal compact,* forcing themselves to be disciplined in regard to the use of public expenditure as a stabilization instrument, transforming fiscal policy from a policy instrument into a policy objective.

The events following the crisis provided a new perspective from which national policies alternatives can be examined: it was made clear that the Eurozone countries can no longer share with other member states all three objectives of financial integration, financial stability, and fiscal

independence, i.e. in the absence of monetary policy autonomy and a shared fiscal policy there is a "Eurozone trilemma"(Obstfeld, 2013).

In the "old" trilemma it was up to the policy makers to choose which instrument to privilege, while in the Eurozone, the ability to use fiscal policy does not result from autonomous choices but from the financial market stability and the degree of capital mobility. Therefore, choosing to share a common currency means to be - in case of financial instability - unable to use fiscal policy for internal objectives, unless perfect capital mobility is given up, in contrast with the building pillars of the Euro-area.

The use of the trilemma alternatives, and the trade-off between them, was first estimated by Aizenmann et al. (2008 and 2013) and then applied to single countries by other authors (Hutchison et al 2012 for India and Yu Hsing, 2012 for Greece). They applied the methodology to the "old trilemma" and concluded that the "the weighted sum of the trilemma policy variables adds up to a constant, validating the notion that a rise in one trilemma variable should be traded-off with a drop of the weighted sum of the other two" (Aizenman, 2008 p.4).

Following Aizenman et al. (2008 and 20013) methodology and Obstfeld(2013) theoretical model, the paper aims at estimating the validity of the European trilemma, i.e.to assess to what extent the degree of capital mobility, the volatility of bond yields and the fiscal stance are strictly linked to each other, constraining countries' ability to manage the internal policy goals.

The trilemma appears to be a powerful interpretative instrument to be used to evaluate policy alternatives in the Eurozone both in the pre- and post-crisis periods. To find a measure of the trade-offs among policy alternatives three indicators are constructed: the first regarding fiscal stance, i.e. the ability to have a balanced public budget, the second regarding the stability of long term interest rates on government bonds and the third measuring the *de facto* degree of capital mobility. Through a very simple, but rather new, empirical method it is estimated if - for 11 Eurozone countries from 2002 till 2012 - the weighted sum of these three indexes adds up to a constant. The sample is then divided into the pre- (2002-2008) and post-crisis (2009-2012) periods. A further division between the peripheral (Portugal, Ireland, Italy, Greece and Spain or

the PIIGS) and the non-peripheral (France, Germany, Belgium, Austria, the Netherlands and Finland) countries is then applied. The results show the validity of the trilemma for the whole Euro-area and for the whole period, but with some distinction between the pre- and post-crisis periods and between the PIIGS and the non-PIIGS countries. The existence of the trilemma evidences the presence of national constraints and suggests, for the future existence of the Eurozone, to push towards centralized fiscal policy instruments.

The paper is organized as follows: the next paragraph provides the theoretical underpinning and the algebraic procedures to build-up the indexes and tomeasure the Eurozone trilemma dimensions. The third section contains the empirical analysis and section 4concludes and provides some further reflections.

2. The measures of the Eurozone trilemma dimensions

The policy model adopted by a great part of advanced economies before the great turmoil of the financial crisis was based on: 1) the separation between fiscal and monetary policy; 2) fiscal policies to be managed within a general criterion of spending constraint; and3) monetary policy with the purpose of maintaining constant the price growth. In Europe two elements were added: a) a single monetary policy and b) fiscal policy based on a strict budgetary discipline left to the management of individual states.

The existence of a single monetary policy without a counterbalance on the side of fiscal authority gave rise, especially after 2007, to asymmetrical effects on growth and self-fulfilling processes of divergences. These divergences have been particularly evident especially on the side of public accounts and balance of payment accounts. As a matter of fact, after the 2007 financial crisis, single European countries fell broadly into two groups according to their ability to respect fiscal criteria and to maintain sound public finance. The prevailing view has been to connect the countries' economic vulnerability with the unsustainability of public sector accounts. Moving on from this standpoint, the basic policy prescription was to impose the "fiscal retrenchment" in order to prevent speculative attacks and to preserve the financial stability of the whole Currency

Union. It was the profligacy of the peripheral countries, so the argument ran, that was causing a lack of credibility in the Single Currency, without which there could be no long-term growth[6].

This approach has been associated with an increasing attention devoted to external imbalances among the EMU countries, conceived as a co-presence of current account deficit and capital outflows. The Single Currency was built upon a shaky equilibrium determined, before the international financial crisis, in the short-run by the compensatory role of capital flows, but undermined by the absence of a realignment mechanism of the real exchange rate. When the crisis reduced the GDP growth rates and induced the increase of public deficit to stabilize both output and the banking system, the national balance of payments became relevant again and registered the unwillingness of financial markets to finance additional private and public debt despite the increasing returns. The identification of the underlying causes of both internal and external imbalances, besides the lack of fiscal discipline, would guarantee the structural homogeneity inside the EMU and the proper functioning of the monetary policy (EEAG 2012)[7].

Whatever the root causes and the prevailing interpretation given to the European crisis, no one would doubt that it is through the interaction among fiscal policy stance, interest rates on government bonds and capital movements that national policies are constrained and preventedfrom reaching internal policy goals. In order to capture these three imbalances dimensions in each EMU country the following indicators are proposed: 1) the first regarding fiscal stance, i.e. the ability to use deficit spending to target internal policy goals; 2) the second aiming at capturing the instability of long term government bond yields, and 3) the third measuring a "*de facto*" degree of capital mobility. The countries considered are 11 EMU

[6]This contrasts with the "Keynesian view" according to which fiscal restrictions further increase the deficit/GDP and debt/GDP ratios because of the positive value of the fiscal multiplier. These two contrasting views have re-appeared in recent publications: on the one hand that stability needs to be restored through severe fiscal retrenchment (Neumann 2012). On the other hand, that public investment programs need to be implemented to compensate for the output gap (De Long and Summers 2012). The debate on the effectiveness of austerity measures is synthetically reported in Corsetti (2012).

[7] For a more critical view about the role of fiscal retrenchment and a greater importance assigned to external imbalances see Alessandrini et al., 2012; Cesaratto 2012; De Grauwe and Yuemei, 2012; Gros 2012.

countries: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Spain, and Portugal, which have been almost from the beginning (Greece entered in 2002) in the Currency Union (Luxemburg has been excluded for its peculiar features). We use quarterly data from the Eurostat ranging from 2002Q1 till 2012Q4. The co-movements of these three indicators will catch up the interaction between internal and external imbalances.

The first indicator captures the degree of policy autonomy in managing the fiscal stance, therefore, the variable chosen is the "net lending/net borrowing under excessive deficit procedure" – as the Eurostat calls it - expressed in term of GDP. The deficit/GDP ratio, from the beginning of the time interval, had more or less a common trend, since the countries – despite some exceptions during slowdowns – were forced to remain inside the SGP parameters. Having a quick look at the Eurostat descriptive statistics[8], not presented here for the sake of discussion flow - the trend has been, until 2008 and for the amounts allowed by the fiscal rules, countercyclical, since fiscal policy was widely used as a stabilization instrument. After 2008 the negative shock of the financial crisis caused the deficit increases greater in those countries with a wider exposure to the financial turmoil. Some countries used fiscal resources to recapitalize banks. In 2009 the financial crisis in Europe became a sovereign bond crisis, forcing some countries in subsequent years to implement structural public balance adjustment programs in the attempt to grant the long-run sustainability of public debt. As a matter of fact, on the side of public debt in terms of the ratio with the GDP there was a general common path until 2007-08 despite the different initial levels. After that date, a much greater increase was registered in Portugal, Ireland, Greece, Spain and Italy, whose initial debt level was high even before the crisis. Four out of the five PIIGS countries were well above the threshold of 90% suggested by Reinhart and Rogoff (2010) as that compromising growth. However, despite its low initial level of debt, Spain was not excluded from being considered as a peripheral country of the Eurozone.

[8]The annual statistics on the variable considered are not presented here. However, they are available on the Eurostat website.

In order to capture to what extent public accounts followed a common trend and the ability of each country to use fiscal policy as stabilization instrument, the following indicator is proposed:

$$FS_{i,t} = \frac{corr(\text{def}, \text{EU})_{i,t} - (-1)}{1-(-1)} \quad (1)$$

Where $corr(\text{def}, \text{EU})_{i,t}$ measures the degree of correlation of each country deficit with the average deficit of 12 Eurozone countries at time t. To transform the degree of correlation in an index ranging from zero to one it is normalized with the standard procedure in presence of negative values.

When the index is equal to 1, the fiscal stance follows that of the average value of all twelve countries and they are supposed to be – since the deficit is expressed in terms of GDP – countercyclical. When on contrary, it is equal to zero, the countries implement pro-cyclical fiscal policies, reducing the deficit when output falls and increasing it when output rises. It is possible, therefore, to affirm that the greater the index, the lower the country necessity or aptitude to follow the EU fiscal policy prescriptions, and the lower the index the higher is the necessity to follow the EU fiscal prescriptions. This explanation is reinforced by the fact that no country would implement fiscal policy restrictions and severe adjustment programs if it is not strictly necessary

With the aim of capturing the financial stability of public bonds the path of 10 years government bond yields is considered. It needs to be noted that from 2002 and until 2008 the long-term bond yields were almost the same. As predicted in the Mundell-Fleming model, capitals migrated from one country to another according to the interest rates differential, under the protective umbrella of confidence in the common currency. Until the 2007 financial crisis, the difference between saving and investment was actually considered a good opportunity for capital coming from surplus countries to flow towards deficit ones in order to gain better returns. Public bonds were considered to be safe and the spreads between them were almost negligible.

Once the crisis hit aggregate demand and revealed the differences among the Eurozone countries, financial markets assigned a different weight to the group of countries on the basis of their ability to repay debts. The countries with a current account deficit experienced outflows of capital and increase in interest rates (Canale and Marani 2014). The resulting real effects gave impetus to capital flight and the countries concerned found themselves entangled in a spiral of downward growth (Panicoand Purificato 2013). From the second half of 2009 until 2012, there was a period of great turbulence on long-term cost of public finance. After that – as a consequence of the monetary policy action and the creation of the European Stability Mechanism - the yields started to decline, pushing the public debt funding condition towards a common trend. However, fiscal policy for peripheral countries remained an objective rather than an instrument[9].
The indicator proposed is the following:

$$BY_{i,t} = 1 - \frac{corr(i, \mathrm{EU})_{i,t} - (-1)}{1 - (-1)} \tag{2}$$

where $corr(i, \mathrm{EU})_{i,t}$ is the degree of correlation between the i-th country 10 years government bonds and the average value of the 12 European countries at time t. It measures the degree of financial stability on public bonds and is constructed in a very similar - but complementary - way as the indicator of fiscal stance. When the index is equal to 1 it means that bond yields in each country move separately from the average value of the all other countries – correlation is -1 - , so that it is characterized by a great instability in this convergence criterion. In the opposite way it assumes the value of zero when the correlation is 1 as it is expected when bond yields move together with the other ones.

[9]After the year 2012 a new phase began, characterized by a lower financial instability, a greater fiscal discipline and greater capital mobility. To evaluate this change in the trade-offs among these policy alternatives a big number of observations would be required. Since they are not available, the paper stops the empirical investigation at the year of switch.

The third indicator describes the evolution of the net financial accounts in each country in the period considered. Despite the factthat the financial account of the balance of payments registers all the capital movements, not only those regarding the public debt, and across the intra euro borders, it provides a *de facto* measure of the degree of capital mobility and helps to describe how much it influences the governments funding conditions. In this paper it is used a "de facto" measure as in Hutchinson et al (2012) in contrast to the "de jure" measure adopted in Aizenman et al. (2008 and 2013). This approach derives from the circumstance that, from a juridical point of view, since 1993 capitals in the Eurozone have been free to move across countries. However, the countries have not been registering the same degree of financial account openness.
The indicator used in our empirical estimates is the following:

$$KAO_i = \frac{K_{i,t} - K_{i,\min}}{K_{i,\max} - K_{i,\min}} \tag{3}$$

Where $K_{i,t}$ is the net flow of the financial account as a percentage of GDP for the i-th country at time t. To identify an index lying between zero and, 1 it is normalized as usual subtracting its minimum value $K_{i,\min}$ and dividing the result by the maximum range in the time span considered $K_{i,\max} - K_{i,\min}$.

This index assumes the value of zero when the current value is equal to the minimum value, while it assumes the value of 1 when the difference assumes its maximum value. It shows that it is not relevant if the country has a net positive or negative value of the net financial account, but rather assigns importance to the value of the difference between them. The greater the difference, the greater is the capital mobility in each country. Furthermore, since the index is expressed as a percentage of the maximum distance between flows during the whole time interval, the differences among countries in regard to the absolute values of outflows and inflows of capitals

are not taken into account. This specification allows measuring the condition of each country separately and paving the way to the panel estimation of the trilemma.

3. Estimating the trilemma

In the panel estimation 11 EMU countries are considered: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Spain, and Portugal, which have been almost from the beginning (Greece entered in 2002) in the Currency Union (Luxemburg has been excluded for the peculiar features). We use quarterly data from the EUROSTAT ranging from 2002Q1 till 2012Q4. Then countries are divided in two sub-groups: the PIIGS countries (Portugal, Ireland, Italy, Greece and Spain) and the non-PIIGS countries (Germany, France, the Netherlands, Austria, Finland and Belgium). This distinction represents a simplification; however, it has a communicative value, despite the fact that the differences among single countries cannot be taken into account. Nevertheless, this division in groups reduces the risks of a spurious regression[10].

In order to evaluate how much binding the trilemma is, the following equation is estimated:

$$1 = a_j FS_{i,t} + b_j BY_{i,t} + c_j KAO_{i,t} + \varepsilon_t \tag{4}$$

according to which the weighted sum of the indexes described above adds up to 1. In equation (4) the coefficients to estimate a, b and c are indexed with the letter *j* which refers to each group considered: all the EMU countries (11 excluding Luxemburg) that were in the Currency Union from the beginning, the PIIGS countries and the non-PIIGS countries. The three indexes FS, BY and KAO are referred to the i-th country in each quarter considered t.The results of the estimates are presented in Table 1.

[10] A cointegration analysis cannot be implemented to reduce the risks of a spurious regression since the methodology used does not allow for testing a long-run relationship of dependence among variables. As a matter of fact the indicators, to make the trilemma binding, need to vary in opposite direction in a compensative way.

For the whole period, for the whole group of countries, and for the two sub-groups of the PIIGS and thenon-PIIGS countries the trilemma is binding. There is a linear relationship among the three indicators as the significance of the coefficients in the first column of table 1 describes.

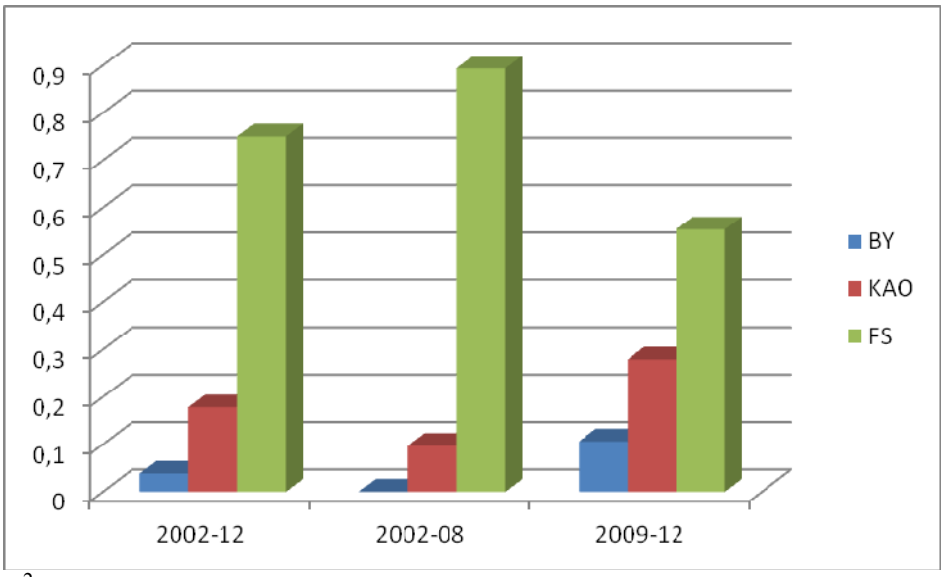
Table 1. Trilemma indexes in Eurozone

	Period								
Group of countries	**2002-2012**			**2002-2008**			**2009-2012**		
	FS	**BY**	**KAO**	**FS**	**BY**	**KAO**	**FS**	**BY**	**KAO**
Obs.	484			308			176		
11 EMU countries	1.016***	0.139***	0.362***	1.142***	0.001	0.196***	0.833***	0.539***	0.574***
Avg.value of the indicator	0.737	0.274	0.490	0.782	0.318	0.493	0.660	0.196	0.485
Obs.	220			140			80		
PIIGS Countries	0.898***	1.093***	0.443***	0.558***	0.31***	1.013***	0.846***	1.661***	0.559***
Avg.value of the indicator	0.698	0.077	0.578	0.746	0.080	0.601	0.616	0.071	0.541
Obs.	264			168			96		
No PIIGS countries	1.014***	0.281***	0.161***	1.037***	0.28***	0.016	0.827***	0.684***	0.380***
Avg.value of the indicator	0.770	0.438	0.417	0.812	0.517	0.404	0.696	0.301	0.438

The second column, regarding the period 2002-2008, shows something different, since the coefficient of some indicators appears to be non-significant. In fact, in the 2002-2008 time-span for the 11 EMU countries the indicator describing the stability of bond yields is not binding for the trilemma. The same happens for the non-PIIGS countries for the indicator of the degree of capital mobility. This fact reveals that in the period preceding the crisis there was something the markets did not perceive, a circumstance that overexposed some countries in the next period to a greater adjustment path.

For the period 2009-2012 the trilemma turns back to be binding, showing that after the financial turmoil the fiscal stance, bond yields and capital movements are strictly interlinked constraining

countries ability to reach internal policy goals. This circumstance can be clarified if we look at the contribution of different indicators to the trilemma. Dividing the coefficient of each indicator for its average value for the period or sub-periods, the results presented in figures 1, 2 and 3 are obtained. Summing the three contributions, a value very near to 1 should be obtained. It can be interpreted also as the R^2 of the regression.



R^2: 2002-12=0.96;2002-08=0.99; 2009-12=0.93.

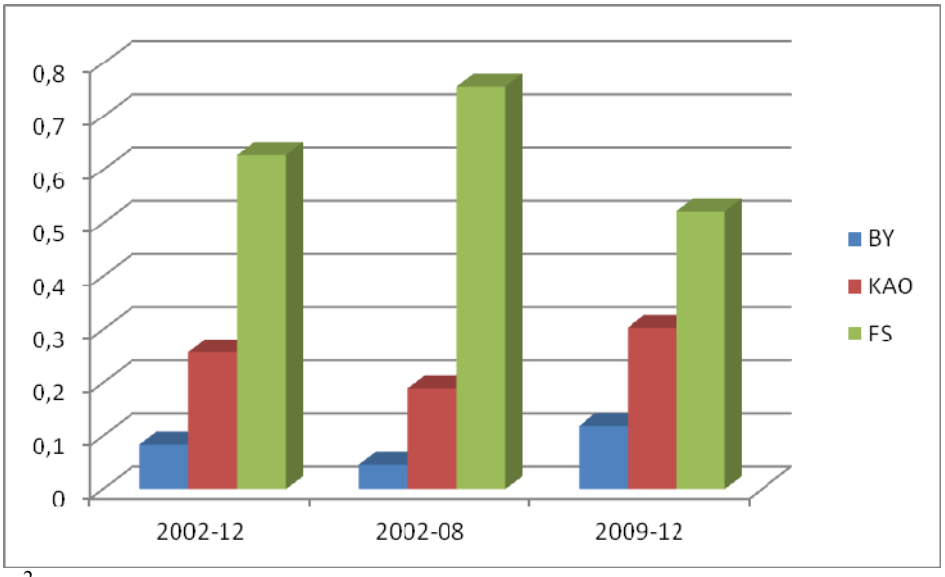
Figure 1. 11 EMU countries: contribution to the trilemma

Figure 1 shows the contribution to the trilemma for the entire period and for the two sub periods for all countries. The indicator representing the fiscal stance is always of the greatest importance since it is represented always by the highest column in the graph. However, in the first time interval it is almost near to 1 and the other indicators, especially the one regarding financial stability, are very close to zero. It is worth noting that for the 2002-08 period, the indicator of interest rates stability is not significant, as a proof that the trilemma is not binding or that the relationship is not linear. It is supposed to be the result of the perception of the currency area as a consolidated economic area rather than a sum of national entities.

During the years 2009-2012, the fiscal stance index gets reduced in favour of greater capital mobility and a lower financial stability. During this period some countries were forced to implement fiscal retrenchments to stop capital outflows and grant the reduction of spreads on government bond yields. As a proof of the validity of the trilemma, the value of R^2 is very near to 1.Figure 2 shows the same results for the PIIGS group of countries.

The indicators vary in the same direction as in the previous case. However, especially in the last time span, the indicator of fiscal stance indicates more restrictive and pro-cyclical fiscal policies in favour of greater capital mobility and a lower financial stability. This time – it is worth noting – the coefficients are always significant. R^2 again is very near to 1.

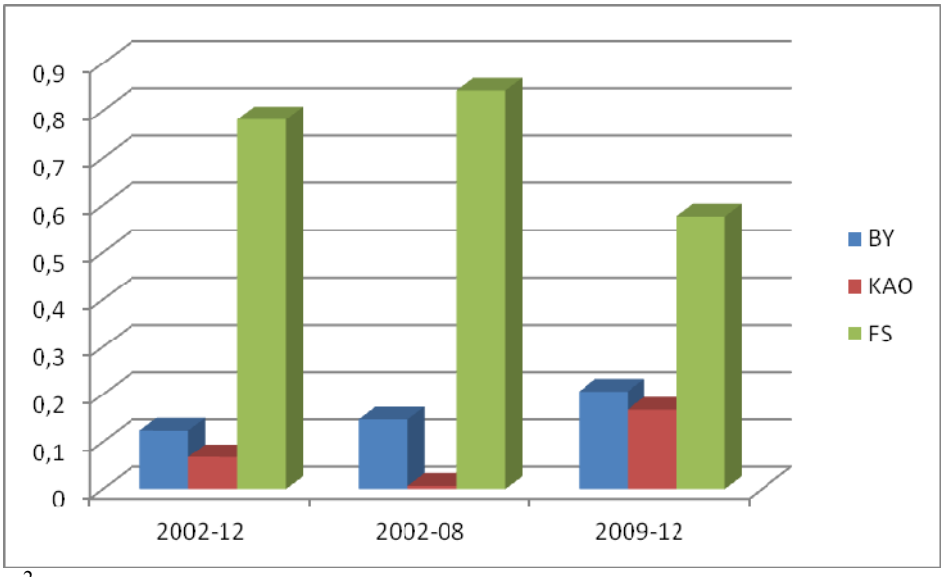
Finally, figure 3 shows the contribution to the trilemma of the indicators for the non-PIIGS countries. Again, the relative levels of the indicators are very similar to those of the previous figures. This depends also on the circumstance that in the non-PIIGS group of countries there are also those like France or Belgium, which despite not being considered peripheral, have some problems in managing public accounts and external equilibrium. As table 1 shows, the indicator representing capital mobility for the period 2002-2008 is not significant. These results further confirm the observation presented for the same time span for all countries (figure 2) for long term bond yields.



R^2: 2002-12=0.96;2002-08=0.99; 2009-12=0.94

Figure2. PIIGS countries: contribution to the trilemma

In the years 2009-2012, the indicator of fiscal stance reduces in favour of a greater degree of capital mobility and bond spreads moving in an opposite direction in respect to the average. Since the indicator of the stability of bond yields describes the degree of co-movements in respect to the average, it can be concluded – confronting the BY bar of figure 2 with that of figure 3 - that the PIIGS countries contributed to the average value of long term interest rates more than the non-PIIGS group of countries.



R^2: 2002-12=0.97;2002-08=0.99; 2009-12=0.95

Figure 3. Non-PIIGS countries: contribution to the trilemma

4. Conclusions

Till 2008, financial markets considered the Eurozone countries government debts as perfect substitutes and the common currency as a guarantee for future reimbursements. After the crisis, the national states became relevant once again and some of them have been involved in a self-fulfilling spiral of capital outflows and interest rate increase. This paper shows the existence of a European trilemma, i.e. that the degree of capital mobility, the volatility of bond yields and the fiscal stance are strictly interlinked, constraining the countries' ability to manage the internal policy goals. Therefore, this trilemma appears to be a powerful interpretative instrument to be used for the evaluation of policy alternatives in the Eurozone both in pre- and post- crisis periods. There are two scenarios which may occur: the first one, in which single states are asked to make adjustments on their own. In particular the peripheral countries have to bear the whole cost of rebalancing the currency area, while the core ones – in spite of having profited from the weakness of the Euro – remain at best as passive onlookers. The alternative route relies on the premise that

fiscal retrenchment and real devaluation further depress internal demand making it even more difficult to repay debts. This leads to the concluding consideration that the Eurozone asymmetries cannot be realigned without shared policy action and without taking into account the systemic shock coming from the crisis.

As a matter of fact, the existence of the trilemma evidences the presence of national constraints and suggests, for the future existence of the Eurozone, to push towards centralized fiscal policy instruments. In this context, a quantum leap towards a political union would be required.

It is clear that Europe is built upon a strong contradiction the crisis has explicitly revealed: the absence of common institutions in the presence of a common market. This contradiction can be seen also from a broader trilemma perspective as suggested by "the globalization paradox" (Rodrik 2011): countries cannot have at the same time globalization, democracy and autonomous management of economic policy. When a democracy faces globalization, it cannot use autonomously policy instruments to pursue its targets. A democracy can autonomously pursue its policy objectives if globalization is subject to constraints. Constraining globalization and closing national borders, for a small not self-sufficient country, means to lose the power to pursue its objective, i.e. the degree of democracy.

A reflection on these contradictions comes from Acemoglu and Robinson (2013): the choice of policy instruments adequate to solve the current crisis in Europe has to go through the assessment of the possible future political balance. If economic policy is too unbalanced towards actions that lead to unequal distribution of income in the name of the correction of market failures, it gets results weakening democracy and market mechanisms themselves on which it is based.

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ETHNIC IDENTITY AND LABOUR MARKET OUTCOMES OF IMMIGRANTS IN ITALY

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Abstract

The paper explores the relationship between ethnic identity and labour market outcomes of immigrants in Italy. Using an IV strategy to deal with endogeneity concerns, we find that the probability of being employed, both regularly or irregularly, is higher for integrated immigrants. Interestingly, our analysis shows that assimilated foreigners have no better chances of being employed than separated ones. Therefore, these results seem to suggest that public policies supporting foreigners' assimilation to the majorities' culture might not be effective if not combined with policies aimed at maintaining the customs and traditions of the minorities.

Keywords: Ethnic identity, Acculturation, Labour market outcomes, IV

JEL *classification*: F22, J15, Z13

1 Introduction

In the last decades the phenomenon of immigration in Italy has grown at impressive rate. According to recent data published by the Initiatives and Studies on the Multiethnicity (ISMU) Foundation, at the beginning of 2014 the number of foreigners living in Italy either legally or illegally was about 5.5 million, increasing of about 600 thousand with respect to the previous year. The rapid expansion has not occurred uniformly throughout the country, implying that large communities of ethnic minorities have concentrated in the urban areas of some specific regions in the North and Central Italy. Therefore, the establishment of these enclaves has generated concerns about the way immigrants settle in local areas and whether this settlement is realized through a process of integration with the local communities or through a conflicting process as in other European countries.

The issue of immigrants' integration in Europe is attracting an increasing interest among researchers. Many studies have focused on the notion of ethnic identity, i.e., "the aspect of the acculturation process that focuses on the subjective sense of belonging to a group or culture and that becomes salient when immigrants come to a new society" (Phinney, 1990). Analysing how the individual's ethnic identity forms and the way it changes when people get in touch with other cultures is becoming a crucial point in order to understand the social and economic inclusion of immigrants in the host country. There is a growing evidence on the influence that ethnic identity exerts on foreigners' economic outcomes, especially in the labor market. A number of studies, as for example those related to Germany, the UK, Sweden, USA or Canada, have shown that the people that develop a high sense of belonging to the culture and the community of the destination country outperform the people that are firmly anchored to the own culture of origin while rejecting that of the host country. (see, e.g., Drydakis 2012; Bisin *et al.* 2011; Nekby & Rodin 2010; Battu & Zenou 2010a,b; Constant & Zimmermann 2008; Pendakur & Pendakur 2005; Mason 2004). However, the empirical evidence for the Italian case is scant. Few studies have focused on the immigrants' sense of identification to the host country (De Palo *et al.*, 2006), on

the economic performance explained by variables other than the ethnic identity (Mazzanti *et al.*, 2009), and on the wage gap between foreigners born abroad and those born in Italy (Faini *et al.*, 2009).

The objective of this paper is to investigate the relationship between immigrants' ethnic identity and the economic performance they realize on the labor market in Italy. To measure ethnic identity, we use a two-dimensional indicator based on the individual's sense of belonging to both the host and the home countries' culture, as in Berry (1997) - who classifies immigrants as integrated, assimilated, separated and marginalized. In particular, our empirical analysis explores the role of the ethnic identity indicator in predicting foreigners' probability of being employed. In the attempt to provide a causal interpretation to the results of our analysis, we implement an IV strategy to properly address the endogeneity problems coming from the simultaneity in the relationship between ethnic identity and the employment status of immigrants. In particular, we use the respondent's use of the Italian language at home and her opinion on the freedom to profess religions publicly and in private as instruments for our endogenous variables. There are not many other studies on this topic that try to solve the endogeneity issues. (Islam & Raschky, 2015), for instance, use the genetic distance between the host and the home countries as instruments for ethnic identity. They find a negligible role payed by the ethnic identity to explain the immigrants' labour market performance in Canada.

Using cross-sectional data collected by the *ISMU* Foundation in 2009 we find that the probability of being employed, either regularly or irregularly, for integrated immigrants is 25% higher than that for separated immigrants, while we do not find statistically significant differences between assimilated and separated foreigners in their probability of being employed. The results we obtain are very interesting because they seem to suggest that, in spite of the evidence and the attitude actually prevailing in Europe, the policies that support immigrants' complete assimilation to the host country, neglecting or even hindering the worship of own culture of origin, might not be effective.

The paper is structured as follows. In the next sections we describe the data, the empirical strategy and the results. The last section concludes.

2 Empirical framework

In this section we explain our empirical analysis. To investigate the relationship between immigrants' ethnic identity and their labour market outcomes, we first use an OLS estimation method. We measure the respondent's ethnic identity using the Berry's classification (Berry, 1997) that groups immigrants as integrated, assimilated, separated and marginalized, according to their level of self-identification with both the host and the home country. Therefore, immigrants with a high self-identification with the culture of both the host and the home country are classified as "integrated", while a strong identification with the country of destination joint with a low sense of belonging to the country of origin identifies people as "assimilated". The reverse case is defined as "separated", typical of foreigners firmly tied to the home country's values and customs but with low feeling toward the host country culture and traditions. Finally, the lack of self-identification with both countries describes "marginalized" immigrants.

To avoid endogeneity concerns due to the omission of individual characteristics that are related to both ethnic identity and labor outcomes, we add a large number of covariates in our regression. In particular, we introduce the age, the level of education, the civil status, the religion, the number of years spent in Italy at the time of the interview and, finally, the migrant's knowledge of the Italian language. Moreover, we add nationality fixed effects to capture different attitudes toward labour and identity that depend on the cultural aspects prevailing in the home country. To control for local labor market features, we include Italian province fixed effects and dummies for the economic productive sectors. This also allows us to take into account cross-provinces differences in natives' attitude toward immigrants and any other differences linked to local jurisdiction and environment.

A typical challenge in measuring the economic performance of foreigners in the host country is to account for the network effect that usually immigrants exploit to find a job. It is very common

that foreigner people move from the home country to a given destination country after some other relatives or friends have already settled there. Through the network they may benefit from hospitality at arrival and from receiving information about labor opportunities. And this could facilitate them in finding a job, even if they do not integrate or assimilate. So the lack of variable accounting for the network effect could result in downward biased estimates of the effect of ethnic identity on labor market outcomes. Unfortunately, we do not have this specific information in the data, hence we try to address the issue by using a proxy, i.e., an interaction term between dummies for immigrants' nationality and dummies for Italian regions.

A major concern in using an OLS estimation strategy is to incur in some endogeneity problems, as the reverse causality between the status of being employed and the ethnic identity, due to the influence that the former variable could exert on the latter one: actually, the immigrant's satisfaction toward the host country increases if she is employed. To deal with this source of endogeneity we use an IV approach and exploit both the use of the Italian language at home and the immigrant's opinion on the freedom to profess religion as instruments for the status of integrated and assimilated foreigner, respectively. We expect that both the instruments affect the immigrant's attitude toward the host and home country, so her ethnic identity, but do not directly influence the probability of being employed. The fact that the immigrants prefer to speak the language of the destination country also at home, i.e., when they are not forced to do it, is a signal of their openness to the new culture and suggest that they feel very comfortable with the new country. Instead, the immigrant's opinion on the freedom to profess religion seems to be more related to the sense of belonging the home country. We expect that people living in a country that allows anyone to freely profess their religion feel themselves really integrated, just for the fact that the host country respect their culture and traditions. So, the costs associated to the high self-identification with the home country are low, and this could reduce the need for assimilating to the host country (that is higher if the society rejects the own origin's culture). Therefore, the immigrant's opinion on the freedom to profess religion should be positively correlated with the integration status and negatively associated with the assimilation to the country of destination.

To estimate the impact of ethnic identity on the probability of being employed, while addressing the aforementioned endogeneity problems, we use different estimation strategies. First, we use the two stage least square (2SLS) estimation method and estimate a linear probability model. We then use the two stage residual inclusion (2SRI) estimation method - as in (Terza *et al.*, 2008) - that allows to account for non linearities in the model, hence producing more precise estimates. However, we cannot rule out the possibility that the instruments might still be endogenous, so we are cautious in supporting a causal interpretation of the results we obtain. Regardless of this, our findings contribute to the existing research on the field and add information to the debate on the development of the immigration in the Italian case.

2.1 Data and descriptive statistics

Data are collected by the ISMU Foundation between October 2008 and February 2009. Respondents are 12049, both men or women, coming from EU and non-EU countries, aged 18 or older and living in 32 Italian provinces[11]. There are many advantages of using this dataset. One is the higher number of observations with respect to the data collected by other official institutions. Also, given the main goal of the ISMU Foundation to support studies that allow a complete and real understanding of the landscape of immigration in Italy, the survey collects not only the official information but also that regarding the irregular phenomenon. Moreover, to the best of our knowledge, this is the first survey that specifically focuses on the immigrants' integration in Italy, including proper information on the foreigners' feeling of belonging to the host country and their sense of identity. In addition to the specific questions on the immigrants' ethnic identity, the survey provides information on the respondents' socio-cultural and politico-economic conditions, allowing us to deeply examine the complex phenomenon of immigration in Italy.[12]

[11] The provinces are dislocated in 13 Regions: Piemonte, Lombardia, Trentino- Alto Adige, Veneto, Emilia-Romagna, Toscana, Marche, Abruzzo, Lazio, Campania, Molise, Puglia and Sicilia.
[12] A detailed description of the data is available in (Cesareo & Blangiardo, 2009)

To obtain our measure of ethnic identity we use two questions of the survey that capture respondent's sense of self-identification with the host and home country. To the questions "How much do you feel to belong to the host country?" and "How much do you feel to belong to the home country?" respondents can choose among four options: "Far Too Little", "Little", "Enough" and "Very Much". We create 4 dummies: a dummy identifying integrated immigrants, which is equal to one if the respondent answers "Enough" or "Very Much" to both questions and zero otherwise; a dummy for assimilated immigrants equal to one if the respondent answers "Enough" or "Very Much" to the former question and "Far Too Little" or "Little" to the latter. The dummy for separated immigrants corresponds to the reverse case, in which the variable takes value one if the respondent report as "Far Too Little" or "Little" her sense of self-identification with the host country and as "Enough" or "Very Much" her sense of self-identification with the home country; finally, the dummy for marginalized immigrants identifies the case in which the respondent answers "Far Too Little" or "Little" to both questions.

According to the summary statistics in Table 1, almost 50% of the people in the sample is *Integrated*, while slightly more than 40% is *Separated*. Less than 10% of the sample is *Assimilated* and, as expected, a very low percentage (less than 3%) is *Marginalized*. Due to the very small fraction of immigrants in the last category, we group separated and marginalized in a single class and use it as the reference category. We therefore compare the economic outcomes realized by both integrated and assimilated immigrants with respect to those realized by the control group. In particular, our dependent variable is the immigrant's employment status, measured by a dummy that takes value one if the respondent is employed either regularly or irregularly, and zero otherwise. We select only respondents that, at the date of the interview, work or are potentially job-seekers (85% of the sample), and exclude those in retirement age, housewives and students (in other words, those that declare not to be in a professional situation). In doing so, we restrict the sample to 10168 observations, of which about 44% is represented by women and 56% by men.

Not surprisingly, immigrants living in Italy are younger than native people; they are 36 on average and mostly married (over 50%). Surprisingly, instead, the percentage of those with at least a high school degree is about 60% (of this 60%, those with a BA degree or a higher level of education are the 17%). According to our data, 48% of the sample declares to be Christian and 39% to be Muslim. People belong to 128 different nationalities: the most of foreigners comes from Eastern Europe (especially from Albania, Romania and Ukraine) from Northwest Africa (especially from Morocco and Senegal) and, finally, from Asia (especially from Cina, India and Bangladesh).

The respondents usually spend many years in Italy (they say to have been living in Italy for 8.4 years on average) and this explain their high level of knowledge of the Italian language (on average they reach a score of 3.5 in a scale ranging from 1 to 5). The statistics on the productive sector show that the most of foreigners are employed in the family services sector (about 30% of those who are working), followed by those working in the commercial sector (21%) or in industry (18%) as employees, confirming the gap between the level of education and expertise of the immigrants living in Italy and the *low-skills* jobs they are able to find (overeducation phenomenon).

2.2 OLS and PROBIT estimates

To investigate the relationship between immigrants' ethnic identity and their labour market outcomes, we first estimate by OLS the following equation:

$$Employed_{ijz}=\beta_0+\beta_1 Ethnic_{ijz}+X_{ijz}\delta+City_j+Nationality_z+\varepsilon_{ijz} \quad (1)$$

where the subscript i, j and z indicate the individual, the Italian city where currently lives and the nationality of origin, respectively. The dependent variable, *Employed*, indicates the respondent's probability of being employed either regularly or irregularly. *Ethnic* is a vector of dummies for the immigrant's status of integrated, assimilated and either separated or marginalized (the latter being used as the reference category). The*X* vector contains all the individual control variables,

while *City* and *Nationality* serve as fixed effects at the province and nationality level, respectively.

The estimates are reported in Table 2. Results in column 1 show a positive association between the probability of being employed and the immigrant's status of integrated. However, we find no significant difference between assimilated and separated foreigners in their employment status. The sign and the magnitude of the two coefficients do not change when we add individual covariates (column 2), but the effect of integrated decreases, as expected. The only variables that seem to explain the foreigners' status of worker are the time spent in Italy and the knowledge of the local language (both positively related to the probability of being employed). There are not statistical differences between men and women and, not surprisingly, we find no impact of education. Results in column 3 show that the integration coefficient remain fairly stable when we include in the specification the interaction dummies between immigrant nationality and Italian region with the intent to capture the network effect. Given that *Employed* is a binary indicator, in the last two columns we present the estimates from a probit specification (we report the coefficients in column 4 and the marginal effects in column 5, respectively). Results in column 5 are very similar to the OLS estimates, thus suggesting that they are robust to misspecification of the model as a linear regression.

2.3 IV estimates

A major corcern implementing an OLS estimation strategy, as already described above, is the endogeneity issue. First of all, endogeneity may arise from a potential reverse causality between the status of being employed and the ethnic identity: the immigrant's self-identification with the host country might depend on whether she is or not employed. To deal with this problem, we use an IV approach and employ both the immigrant's opinion on the freedom to profess religion (in a scale from 1 to 5) and the use of the Italian language at home (in a scale from 1 to 5) as instruments for the immigrant's status of integrated and assimilated, respectively. We estimate the following structural equation:

$$Employed_{ijz}=\beta_0+\beta_1 Ethnic_{ijz}+X_{ijz}\delta+Province_j+Nationality_z+\varepsilon_{ijz} \quad (2)$$

$$Ethnic_{ijz}=\gamma_0+\gamma_1 Z_{ijz}+X_{ijz}\lambda+Province_j+Nationality_z+\eta_{ijz} \quad (3)$$

where equation 3 is the first-stage regression and Z_{ijz} is the vector of instruments introduced above.

We first show results obtained using a 2SLS estimation strategy and then move to discuss those obtained by the 2SRI procedure. With regard to the relevance of the instruments, the first-stage results in Table 3 highlight a positive relationship between the *Use of Italian language at home* and the immigrant's status of integration (column 2) or assimilation (column3). Instead, the *Freedom to religion*, is positively correlated with *Integrated* (column 2) but negatively associated with *Assimilated*, in line with our prior. The second-stage results are reported in column 1 of Table 3 and show that, when estimating by 2SLS to account for endogeneity concerns, the coefficients for *Integrated* and *Assimilated* fail to achieve significance at conventinal levels, thus suggesting that both integrated and assimilated immigrants do not systematically differ with respect to their probability of being employed from separated immigrants. However, using a 2SLS estimator might not be ideal in our case as both the dependent and the endogenous variables in the model are binary. Therefore, estimating a linear probability model might lead to imprecise estimates pf the impact of ethnic identity on employment status. To deal with this problem, we follow Terza *et al.* (2008) and use the two stage residual inclusion (2SRI) procedure. The 2SRI estimator might be thought as an extension of the 2SLS estimator for non linear models, where in the second stage regression the endogenous variables are not replaced. Instead, the first-stage residuals are included as additional regressors. This allows to control for all the unobservables that are correlated to both the endogenous variables and the outcome. The results obtained by 2SRI are shown in Table 4. In particular, columns 3 reports the second-stage estimates obtained from our baseline specification and column 6 those from a specification in which we account for network effects (our preferred specification). Results show that the impact

of integration on employment's status is stronger than before and significant at 1%. In particular, the probability of being employed for an integrated immigrant is 25% higher than the that for her separated counterpart. Yet, we find no significant impact of assimilation on employment status.

3 Conclusions

Nowadays the issue of the immigrants' integration in Europe represents a priority in the political agenda of the European Community. Many studies recently carried out in several European countries, such as Germany and UK, seem to show that the phenomenon of integration, i.e. the self-identification with the culture, the lifestyle and the customs of the country of destination improves the social and economic inclusion of immigrants. However, evidence about the Italian case is missing. This paper represents one of the first studies on the relationship between ethnic identity and labour market performance of the foreigners in Italy.

Using a measure of ethnic identity as described in Berry (1997) we show that the probability of being employed of integrated immigrants (i.e. those with a great sense of belonging to either the host or the home country) is higher than that of separated ones (i.e. those strongly anchored to their origin's culture but with a contemporaneously low self-identification with the country of destination). Surprisingly, we do not find evidence of a better labor market performance for assimilated people, as usually showed in previous studies. Our results are robust to different estimation methods. In particular, to deal with the endogeneity due to the simultaneity in the relationship between the immigrants' ethnic identity and their employment status we use an IV strategy estimated by the 2SRI method that is more appropriated in case of non linear models.

Although there might be some other issues to deal with, as for example a potential heterogeneous effects by gender- that we will analyze in future research-, this paper shows very interesting results: it seems to suggest that public policies supporting foreigners' assimilation to the majorities' culture might not be effective, in terms of improving their economic and social inclusion, if not combined with policies aimed at maintaining the customs and traditions of the minorities.

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Tables and Figures

Table 1: Summary statistics

0.80

Variable	Obs	Mean	Std. Dev.	Min	Max
Employed	9885	0.805261	0.39602	0	1
Integrated	9885	0.486798	0.499851	0	1
Assimilated	9885	0.064138	0.24501	0	1
Separated	9885	0.423672	0.494165	0	1
Marginalized	9885	0.025392	0.157321	0	1
Male	9846	0.562259	0.496134	0	1
Age	9846	36.56206	9.802445	18	78
Years in Italy	9819	8.404624	6.053737	0	49
Single	9885	0.36085	0.480271	0	1
Married	9885	0.526252	0.499336	0	1
Widower	9885	0.026606	0.160937	0	1
Divorced	9885	0.076176	0.265293	0	1
No education	9672	0.719603	0.258435	0	1
Compulsory school	9672	0.336125	0.472407	0	1
High school	9672	0.417494	0.493171	0	1
BA Degree +	9672	0.174421	0.379491	0	1
Christian	9592	0.484988	0.499801	0	1
Muslim	9592	0.392515	0.488336	0	1
Buddhist	9592	0.033257	0.179316	0	1
Hinduist	9592	0.014804	0.120774	0	1

Other religion	9592	0.015221	0.122437	0	1
No religious	9592	0.059216	0.236041	0	1
Knowledge of the Italian language	9824	3.426277	1.017962	1	5
Freedom of religion	9599	4.605896	0.938409	1	5
Use of Italian at home	9481	2.553423	1.526461	1	5
Agricultural sector	9642	0.039722	0.195316	0	1
Industrial sector	9642	0.163866	0.370174	0	1
Commercial sector	9642	0.188861	0.391419	0	1
Firm services sector	9642	0.092201	0.289324	0	1
Family services sector	9642	0.24943	0.432705	0	1
Other sector	9642	0.130782	0.337179	0	1

Table 2: Ethnic identity and employment status: OLS and PROBIT estimates

	(1) (OLS)	(2) (OLS)	(3) (OLS)	(4) (PROBIT) Coefficients	(5) (PROBIT) Marginal effects
Ethnic identity					
Integrated	**0.0713*** **	**0.0185***	**0.0198***	**0.196** **	**0.0184** **
	(0.0141)	(0.0101)	(0.0104)	(0.088)	(0.0083)
Assimilated	**0.0136**	**0.0151**	**0.0143**	**0.23**	**0.0216**
	(0.0303)	(0.0126)	(0.0143)	(0.143)	(0.0135)
Male		0.0156	0.0156	0.174*	0.0163*
		(0.0096)	(0.0111)	(0.0965)	(0.0089)
Age		0.0027	0.0032	0.0204	0.0019
		(0.0026)	(0.0029)	(0.0246)	(0.0023)
Age squared		-0.00003	-0.00003	-0.00021	-0.00002
		(0.00003)	(0.00004)	(0.00032)	(0.00003)
Years in Italy		0.0031***	0.0025***	0.0395***	0.0037***
		(0.0009)	(0.0009)	(0.0094)	(0.0009)
Compulsory school		-0.0099	-0.0076	-0.0931	-0.0087
		(0.0167)	(0.0193)	(0.131)	(0.0123)
High school		-0.0198	-0.0215	-0.215	-0.0201
		(0.0166)	(0.0199)	(0.133)	(0.0126)
BA degree +		-0.001	-0.007	0.016	0.0015
		(0.0182)	(0.0209)	(0.016)	(0.0015)

Italian language knowledge		0.0093*	0.0132**	0.082*	0.008*
		(0.0052)	(0.0052)	(0.0452)	(0.0042)
Other controls					
Religion		YES	YES	YES	YES
Marital status		YES	YES	YES	YES
Fixed effects					
Economic sectors		YES	YES	YES	YES
Migrants' nationalities		YES	YES	YES	YES
Italian Provinces		YES	YES	YES	YES
Nationalities*Italian regions			YES		
Observations	9885	9034	9034	8903	8903

Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. The dependent variable is a binary indicator that takes value 1 if the immigrant is employed either with a regular or irregular contract.

Table 3: Ethnic identity and employment status: IV (2SLS) estimates

	(1) (Second stage) (2SLS)	(2) (First stage) Integrated	(3) (First stage) Assimilated
Ethnic identity			
Integrated	**0.163**		
	(0.101)		
Assimilated	**0.171**		
	(0.152)		
Instruments			
Freedom of religion		**0.0270*** **	**-0.0137***
		(0.0103)	(0.0074)
Use of Italian language at home		**0.0278*** **	**0.0207*** **
		(0.0072)	(0.0040)
Male	0.0267**	-0.00747	-0.0085
	(0.0124)	(0.0231)	(0.0116)
Age	0.0019	0.00521	-0.0041
	(0.0031)	(0.0065)	(0.0033)
Age squared	-0.00002	-0.00006	0.00004
	(0.00004)	(0.00008)	(0.00004)
Years in Italy	0.00033	0.0082***	0.006***
	(0.0012)	(0.0022)	(0.001)
Compulsory school	-0.0083	0.0478	0.0023
	(0.0184)	(0.0376)	(0.0194)
High school	-0.0296	0.0667*	0.00583

	(0.0192)	(0.0385)	(0.0195)
BA degree +	-0.0162	0.0892**	-0.00453
	(0.0228)	(0.0436)	(0.0225)
Italian language knowledge	0.0004	0.0514***	0.0155***
	(0.0077)	(0.0122)	(0.0057)
Other controls			
Religion	YES	YES	YES
Marital status	YES	YES	YES
Fixed effects			
Economic sectors	YES	YES	YES
Migrants' nationalities	YES	YES	YES
Italian provinces	YES	YES	YES
Nationalities*Italian regions	YES	YES	YES
Observations	8453	9688	9688

Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. The dependent variable is a binary indicator that takes value 1 if the immigrant is employed either with a regular or irregular contract.

Table 4: Ethnic identity and employment status: IV (2SRI) estimates

	(1)	(2)	(3)	(4)	(5)	(6)
	(First stage)	(First stage)	(Second stage)	(First stage)	(First stage)	(Second stage)
	Integrated	Assimilated	2SRI	Integrated	Assimilated	2SRI
Ethnic Identity						
Integrated			**0.186*** **			**0.251*** **
			(0.075)			(0.093)
Assimilated			**0.032**			**-0.067**
			(0.071)			(0.0723)
Instruments						
Freedom of religion	**0.0613****	**-0.0962*****		**0.0787*****	**-0.0882****	
	(0.0265)	(0.0334)		(0.0289)	(0.0375)	
Italian language at home	**0.0757*****	**0.158*****		**0.0803*****	**0.176*****	
	(0.0189)	(0.027)		(0.0202)	(0.03)	
Residuals						
Integrated			**-0.169****			**-0.232****
			(0.076)			(0.0948)
Assimilated			**-0.014**			**0.080**
			(0.072)			(0.073)
Male	-0.0393	-0.0192	0.024***	-0.0232	-0.0635	0.0203*
	(0.0616)	(0.0834)	(0.009)	(0.065)	(0.0911)	(0.0122)
Age	0.0204	-0.0293	0.0006	0.014	-0.0336	-0.00015
	(0.0172)	(0.0224)	(0.0025)	(0.0181)	(0.025)	(0.00327)
Age squared	-0.0002	0.0003	-0.000006	-0.0001	0.0003	0.000008
	(0.0002)	(0.0003)	(0.00003)	(0.0002)	(0.0003)	(0.00004)

Years in Italy	0.0231***	0.0378***	0.002**	0.0238***	0.0530***	0.0021
	(0.0055)	(0.0073)	(0.001)	(0.0061)	(0.0085)	(0.0014)
Compulsory school	0.163	-0.137	-0.015	0.139	0.0482	-0.0095
	(0.103)	(0.156)	(0.014)	(0.108)	(0.176)	(0.0168)
High school	0.209**	-0.106	-0.034**	0.202*	0.0919	-0.0337**
	(0.104)	(0.153)	(0.015)	(0.11)	(0.169)	(0.0169)
BA degree +	0.301***	-0.256	-0.022			-0.0345*
	(0.116)	(0.172)	(0.018)			(0.0205)
Italian language knowledge	0.152***	0.146***	-0.004	0.150***	0.175***	0.0007
	(0.033)	(0.047)	(0.006)	(0.034)	(0.053)	(0.0073)
Other controls						
Religion	YES	YES	YES	YES	YES	YES
Marital status	YES	YES	YES	YES	YES	YES
Fixed effects						
Economic sectors	YES	YES	YES	YES	YES	YES
Migrants' nationalities	YES	YES	YES	YES	YES	YES
Italian Provinces	YES	YES	YES	YES	YES	YES
Nationalities*Italian regions				YES	YES	YES
Observations	9650	9467	8214	9195	7776	6455

Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. The dependent variable is a binary indicator that takes value 1 if the immigrant is employed either with a regular or irregular contract. The estimates in column 3 and 6 are marginal effects.

ON MATRIX-EXPONENTIAL DISTRIBUTIONS IN RISK THEORY

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Abstract

In this paper, a particular class of matrix-exponential distributions is described, also with respect to its use in risk theory, namely phase-type distributions. Phase-type distributions have the important advantage of being suitable for approximating most of other distributions as well as being mathematically tractable.

After a review on phase-type distributions and their properties, a possible use in risk theory is illustrated. Modelling both interarrival claim times and individual claim sizes with this class of distributions an explicit formula for the probability of ultimate ruin is given.

Keywords

Matrix-exponential distribution, Phase-type distribution, Ruin probability, Markov chain.

1. Introduction

A phase-type distribution is a distribution of the lifetime of a terminating Markov process with finitely many states and time homogeneous transition rates.

The family of phase-type distributions has gained widespread attention in the area of stochastic modelling, particularly when Markov processes are involved, since they are one of the most general classes of distributions permitting a Markovian interpretation.

There are several reasons to use phase-type distributions. First of all, because they are quite flexible in terms of their possible shapes and because their inherent mathematical and numerical tractability.

Moreover, phase-type distributions are dense in the set of all distributions, so that - in principle - one can replace any (non-phase-type) distribution with a suitable phase-type approximation. It should be taken into account that, since they have exponentially decreasing tails, they can not be used for large or extreme value problems.

One of the most useful features of this class of distributions is that they allow for the use of matrix-analytic methods in stochastic models. Using these methods, numerical integrations arising in the study of many stochastic models are replaced by matrix operations that develop naturally in the analysis of structured Markov chains, being matrix exponentials nowadays easy to calculate. Many results using phase-type methodologies have been generalized into the broader class of matrix-exponential distributions, with a rational Laplace transform.

A short bibliographic review could begin with Erlang (1909), but the major contribution is due to Neuts (1981, 1995). Phase-type distributions are used in many different fields of applications, so there is a large number of papers about this topic. Concerning risk theory, Asmussen (2000, 2003), Asmussen and Bladt (1996) and Bladt (2005) have given many results using phase-type

methodologies. More recently, among others, we can mention Hipp (2006), Ahn and Badescu (2007) and Jang (2007).

The paper is organized as follows. In order to introduce the phase-type distributions in section 2 we recall the fundamentals of continuous time Markov processes with finite state spaces. In section 3 we describe the phase-type distributions, giving some examples in section 4. The last section 5 contains some applications in risk theory.

2. Markov jump processes

Consider a continuous time stochastic process $\{X(t)\}_{t\in\Re_0^+}$ taking on values in a set of non-negative integers (state space).

The process $\{X(t)\}_{t\in\Re_0^+}$ is a continuous time Markov chain if for all s,t≥0 and nonnegative integers i, j, x(u), 0≤u<s,

$$\text{Prob}\ \{X(t+s)=j \mid X(s)=i,\ X(u)=x(u),\ 0\le u<s\} = \text{Prob}\ \{X(t+s)=j \mid X(s)=i\}\ .$$

In other words, a continuous time Markov chain is a stochastic process having the Markovian property that the conditional distribution of the future state at time t+s, given the present state at s and all past states, depends only on the present state and is independent of the past.

For our purposes, we consider a finite state space E={1,2,…,n}. Let T_1, T_2, … denote the times where $\{X(t)\}_{t\in\Re_0^+}$ jumps from one state to another, being T_0=0.

Then the discrete time process $\{Y(n)\}_{n\in N}$, where $Y(n)=X(T_n)$ is a Markov chain describing the visited states with transition matrix $\mathbf{Q} = \{q_{ij}\}_{i,j\in E}$, where q_{ij} is the probability that process goes from state i to state j.

If $Y(n)=i$, $\tau_i=T_{n+1}-T_n$ is the amount of time that the process stays in state i before making a transition into a different state; then for all $s,t \geq 0$

$$\text{Prob}\{\tau_i>s+t \mid \tau_i>s\} = \text{Prob}\{\tau_i>t\} .$$

Hence, the random variable τ_i is memoryless and must be exponentially distributed with a certain parameter λ_i.

So, a continuous time Markov chain is a stochastic process that moves from state to state in accordance with a (discrete time) Markov chain, but it is such that the amount of time it spends in each state, before proceeding to the next state, is exponentially distributed. In addition the amount of time the process spend in state i, and the next state visited, must be independent random variables.

Since $\lambda_i dt$ is the probability that the process leaves state i during the infinitesimal time interval [t,t+dt), it follows that

$$\lambda_{ij} = \lambda_i q_{ij} \qquad (i\neq j)$$

is the intensity of jumping from state i to state j.

Define the intensity matrix or infinitesimal generator of the process as

$$\mathbf{\Lambda} = \{\lambda_{ij}\}_{i,j\in E} \ ,$$

where

$$\lambda_{ij} = \lambda_i \, q_{ij} \qquad (i \neq j) \ ,$$

$$\lambda_{ii} = -\sum_{h \neq i} \lambda_{ih} \qquad (i=j) \ .$$

Denote by q^t_{ij} the probability that a Markov chain, presently in state i, will be in state j after an additional time t, that is

$$q^t_{ij} = \text{Prob} \ \{X(t+s)=j \mid X(s)=i\} \ ,$$

and by $\mathbf{Q}^t = \{q^t_{i,j}\}_{i,j\in E}$ the corresponding transition matrix.

Then

$$\mathbf{Q}^t = \exp(\mathbf{\Lambda} t) \ ,$$

where the exponential of a p×p matrix $\mathbf{\Lambda}$ is defined by the series expansion $\exp(\Lambda) = \sum_{n=0}^{\infty} \frac{\Lambda^n}{n!}$.

Let f_{ii} be the probability that, starting in state i, the process will ever reenter state i.

Defining with $f_{ii}^{n} = \mathrm{Prob}\{X(n) = i;\ X(k) \neq i,\ k = 1,\ldots,n-1 \mid X(0) = i\}$ (with $f_{ii}^{0}=0$) the probability that starting in i the first transition into i occurs at time n, it follows that

$$f_{ii} = \sum_{n=1}^{\infty} f_{ii}^{n} \ .$$

If $f_{ii}=1$, the state is *recurrent*, otherwise it is *transient*.

If state i is recurrent then, starting from state i, the process will reenter state i infinitely often with probability 1.

If state i is transient then, starting in state i, the number of periods in which the process is in state i has a geometric distribution with finite mean $1/(1-f_{ii})$.

Equivalently, state i is recurrent if $\sum_{n=1}^{\infty} q_{ii}^{n} = \infty$ and transient if $\sum_{n=1}^{\infty} q_{ii}^{n} < \infty$.

So, a transient state will only be visited a finite number of times (hence the name transient) and in a finite state Markov chain not all states can be transient.

A special case of a recurrent state is if $q_{ij}=0$ for all $i \neq j$, implying $\lambda_{ij}=0$ for all j, (or $q_{ii}=1$) then i is *absorbing*.

3. Phase-type distributions

A phase-type distribution of order p is defined as the absorption time distribution in a finite state Markov process with p transient states and one absorbing state.

Let $\{X(t)\}_{t\in\Re_0^+}$ be a Markov jump process on a finite state space $\tilde{E}=E\cup\{p+1\}$, $E=\{1,2,\ldots,p\}$, where states 1, …, p are transient and state p+1 is absorbing. This implies that the intensity matrix of $\{X(t)\}_{t\in\Re_0^+}$ can be written in block partitioned form as:

$$\mathbf{\Lambda}=\begin{pmatrix}\mathbf{T} & \mathbf{t}\\ \mathbf{0}' & 0\end{pmatrix}$$

where **T** is a p×p dimensional matrix, **t** and **0** are two vectors, with dimensions p×1.

Since the intensity matrix of a non terminating Markov process has rows that sum to zero, it is:

$$\mathbf{t}+\mathbf{Te}=0 \Leftrightarrow \mathbf{t}=-\mathbf{Te} \qquad \text{where } \mathbf{e}=(1, 1, \ldots, 1)'$$

The interpretation of vector **t** is as the exit rate (exit from the transient subset of states E) vector, since the intensities t_i are the intensities by which the process jumps to the absorbing state.

Now we define the initial probabilities as $\pi_i=\text{Prob}\{X_0=i\}$, $i\in E$, and $\text{Prob}\{X_0=p+1\}=0$ meaning that the process cannot initiate in the absorbing state.

So, the vector $\boldsymbol{\pi}'=(\pi_1,\ldots,\pi_p)$ describe the initial distribution of $\{X(t)\}_{t\in\Re_0^+}$ over the transient states only.

Definition

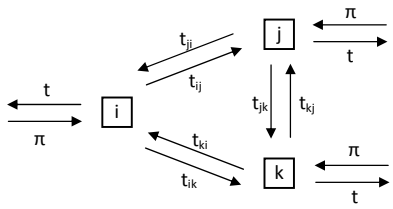
The distribution of the absorbing time τ

$$\tau = \inf \{t\geq 0 \mid X_t=p+1\}$$

is said to be a phase-type (PH) distribution with representation $(\boldsymbol{\pi}, \mathbf{T})$

$$\tau \sim \text{PH}\ (\boldsymbol{\pi}, \mathbf{T})$$

of order p.



The phase diagram of a phase type distribution with 3 phases, E={i,j,k}

Recalling that the matrix-exponential $e^{\mathbf{\Lambda}}$ is defined by the standard series expansion:

$$e^{\Lambda} = \sum_{n=0}^{\infty} \frac{\mathbf{\Lambda}^n}{n!}$$

it is possible to show the following basic analytical properties of the phase-type distribution $\tau \sim PH(\boldsymbol{\pi}, \mathbf{T})$:

Theorem 1

The density function is: $f(x) = \boldsymbol{\pi}' \exp(\mathbf{T}x)\mathbf{t}$.

Theorem 2

The distribution function is: $F(x) = 1 - \boldsymbol{\pi}' \exp(\mathbf{T}x)\mathbf{e}$.

Theorem 3

The n-th moment is: $E(\tau^n) = \int_0^{\infty} x^n dF(x) = (-1)^n n! \boldsymbol{\pi}' \mathbf{T}^{-n} \mathbf{e}$.

The moment generating function is: $E(e^{s\tau}) = \int_0^{\infty} e^{s\tau} dF(s) = \boldsymbol{\pi}'(-s\mathbf{I} - \mathbf{T})^{-1}\mathbf{t}$

(with $\mathbf{I}_{p\times p}$) .

Theorem 4

The Laplace-Stieltjes transform is: $\hat{F}[s] = \int_0^{\infty} e^{-s\tau} dF(s) = \boldsymbol{\pi}'(s\mathbf{I} - \mathbf{T})^{-1}\mathbf{t}$ (with $\mathbf{I}_{p\times p}$) .

From theorem 2 derives that a phase-type distribution is light-tailed, since the tail of a phase-type distribution is exponentially decreasing.

Recalling that one of the advantages of using a phase-type distribution is that any distribution on positive axis can be well approximated by a phase-type distribution, from the last property it follows that for heavy-tailed distribution more attention is required.

4. Examples of phase-type distributions

By convenient choices of parameters, it is possible to obtain different distributions like exponential, Erlang, hiperexponential and Coxian.

Example 1

The random variable X~exp(λ) can be seen as a PH($\boldsymbol{\pi}$,$\mathbf{T}$) with

$$\boldsymbol{\pi} = (1) \text{ and } \mathbf{T}=(\lambda)$$

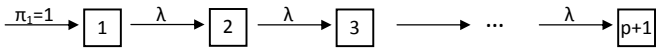
So, the class of exponential distribution is the class of phase-type distributions with p=1.

Example 2

The random variable $S_p = \sum_{k=1}^{p} X_k$, where $X_k \sim \exp(\lambda)$ are i.i.d., has an Erlang distribution. The density function of S_p is obtained by a convolution of p exponential densities with the same parameter λ

$$f(x) = \lambda^p \frac{x^{p-1}}{(p-1)!} e^{-\lambda x} \quad ,$$

and can be represented by the following phase diagram



Then, the distribution of S_p can be interpreted as a PH($\boldsymbol{\pi}$,$\mathbf{T}$) with:

$\boldsymbol{\pi}$'=(1, 0, …, 0), corresponding to E={1, …, p}

$$\mathbf{T}=\begin{pmatrix} -\lambda & \lambda & 0 & \cdots & 0 & 0 \\ 0 & -\lambda & \lambda & \cdots & 0 & 0 \\ \vdots & & \ddots & & & \vdots \\ \vdots & & & \ddots & & \vdots \\ 0 & 0 & 0 & \cdots & -\lambda & \lambda \\ 0 & 0 & 0 & \cdots & 0 & -\lambda \end{pmatrix} \qquad \mathbf{t}=\begin{pmatrix} 0 \\ 0 \\ \vdots \\ \vdots \\ 0 \\ \lambda \end{pmatrix}.$$

If $S_p=\sum_{k=1}^{p} X_k$ has a generalized Erlang distribution, i.e. X_k~exp(λ_k), then S_p~PH($\boldsymbol{\pi}$,**T**) with

$$\mathbf{T}=\begin{pmatrix} -\lambda_1 & \lambda_1 & 0 & \cdots & 0 & 0 \\ 0 & -\lambda_2 & \lambda_2 & \cdots & 0 & 0 \\ \vdots & & \ddots & & & \vdots \\ \vdots & & & \ddots & & \vdots \\ 0 & 0 & 0 & \cdots & -\lambda_{p-1} & \lambda_{p-1} \\ 0 & 0 & 0 & \cdots & 0 & -\lambda_p \end{pmatrix} \qquad \mathbf{t}=\begin{pmatrix} 0 \\ 0 \\ \vdots \\ \vdots \\ 0 \\ \lambda_p \end{pmatrix}.$$

Representations of the Erlang random variable are by no means unique, because the X_k's can be summed in any order. So, alternative representations can be obtained permuting the states.

Example 3

Let X_k~exp(λ_k), with k=1, …, p, independent random variables. The hyperexponential distribution H_p is defined as a mixture of the p exponential distributions, with density:

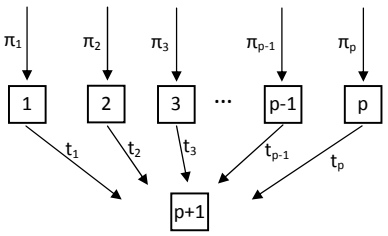
$$\sum_{k=1}^{p}\alpha_k\lambda_k e^{-\lambda_k x} \qquad \text{where } \alpha_k>0 \text{ (k=1, …,p) and } \sum_{k=1}^{p}\alpha_k = 1 .$$

Then, H_p~PH($\boldsymbol{\pi}$,**T**) with representation

$\boldsymbol{\pi}'=(\pi_1, \pi_2, \ldots, \pi_p)$

$$\mathbf{T}=\begin{pmatrix} -\lambda_1 & 0 & 0 & \cdots & 0 & 0 \\ 0 & -\lambda_2 & 0 & \cdots & 0 & 0 \\ \vdots & & \ddots & & & \vdots \\ \vdots & & & \ddots & & \vdots \\ 0 & 0 & 0 & \cdots & -\lambda_{p-1} & 0 \\ 0 & 0 & 0 & \cdots & 0 & -\lambda_p \end{pmatrix} \qquad \mathbf{t}=\begin{pmatrix} \lambda_1 \\ \lambda_2 \\ \vdots \\ \vdots \\ \lambda_{p-1} \\ \lambda_p \end{pmatrix},$$

and the phase diagram is:



Example 4

Let $X_k \sim \exp(\lambda_k)$, with k=1, …, p, independent random variables. The Coxian distribution is defined as the sum S_N of a random number N (N=1, …,p) of X_k.

The Erlang distribution is a special case of a Coxian distribution.

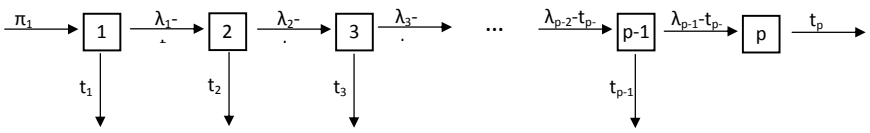
The class of Coxian distributions is interpreted as the class of phase-type distributions with representation:

$\boldsymbol{\pi}'=(1, 0, \ldots, 0)$, corresponding to E={1, …, p}

$$\mathbf{T} = \begin{pmatrix} -\lambda_1 & \lambda_1 - t_1 & 0 & \cdots & 0 & 0 \\ 0 & -\lambda_2 & \lambda_2 - t_2 & \cdots & 0 & 0 \\ \vdots & & \ddots & & & \vdots \\ \vdots & & & \ddots & & \vdots \\ 0 & 0 & 0 & \cdots & -\lambda_{p-1} & \lambda_{p-1} - t_{p-1} \\ 0 & 0 & 0 & \cdots & 0 & -\lambda_p \end{pmatrix}$$

$$\mathbf{t} = \begin{pmatrix} t_1 \\ t_2 \\ \vdots \\ \vdots \\ t_{p-1} \\ \lambda_p \end{pmatrix},$$

and phase diagram



5. Phase-type distributions in risk theory

Phase-type distributions can be used in risk theory to model interarrival times as well as claim sizes.

Let Z_n ($n\geq 1$) be a sequence of nonnegative independent random variables representing the interarrival times, or the time between the (n-1)th and n-th event (claim). Z_n have common distribution function $F(\cdot)$ and density $f(\cdot)$.

If $S_0=0$ and $S_n=\sum_{k=1}^{n} Z_k$ ($n\geq 1$) it follows that S_n is the time of the n-th claim. The number of claims by time t is $N(t)=\max\{n \mid S_n\leq t\}$. The counting process $\{N(t)\}_{t\in\Re_0^+}$ is called a renewal process.

For applications in ruin theory, it is important to obtain the renewal density g(x) of $\{N(t)\}_{t\in\Re_0^+}$, which is the probability of a claim during the infinitesimal time interval [x, x+dx). Denoting by G(x) the renewal distribution function, it is

$$G(x)=\sum_{n=1}^{\infty} F^{*n}(x) \qquad\qquad g(x)=G'(x)=\sum_{n=1}^{\infty} f^{*n}(x)$$

The explicit calculation of the renewal density is usually not simple, but if $F(\cdot)$ is phase-type the problem has an analitically tractable solution.

It is possible to prove that if the interarrival times are phase-type with representation ($\boldsymbol{\pi}$,**T**), it follows that the renewal density is:

$$g(x) = \boldsymbol{\pi}' e^{(\mathbf{T}+\mathbf{t}\boldsymbol{\pi}')x}\mathbf{t} \ .$$

In fact, let $\{X^{(k)}(s)\}_{s\in\Re_0^+}$ be the Markov process governing the phase-type distribution of Z_k and define $\{J(s)\}_{s\in\Re_0^+}$ by joining the processes $\{X^{(k)}(s)\}_{s\in\Re_0^+}$:

$$\{J(s)\} = \{X^{(1)}(s)\}, \quad s \in [0, Z_1)$$

$$\{J(s)\} = \{X^{(2)}(s - Z_1)\}, \quad s \in [Z_1, Z_1 + Z_2)$$

$$\{J(s)\} = \{X^{(3)}(s - Z_1 - Z_2)\}, \quad s \in [Z_1 + Z_2, Z_1 + Z_2 + Z_3)$$

…..

$$\{J(s)\} = \{X^{(n)}(s - Z_1 - Z_2 - \cdots - Z_{n-1})\}, \quad s \in \left[\sum_{k=1}^{n-1} Z_k, \sum_{k=1}^{n} Z_k\right).$$

$\{J(s)\}_{s\in\Re_0^+}$ is a new Markov jump process on space state E with two types of transitions from i to j. One way is to jump following the process $\{X^{(k)}(s)\}$, at the rate $t_{ij}\in\mathbf{T}$, and the other way corresponds to a transition from $\{X^{(k)}(s)\}$ to the next $\{X^{(k+1)}(s)\}$ at rate $t_i\,\pi_j$. Hence, the intensity matrix of $\{J(s)\}_{s\in\Re_0^+}$ is $\mathbf{T}+\mathbf{t\pi'}$ and the transition matrix of $\{J(s)\}_{s\in\Re_0^+}$ is $\exp(\mathbf{T}+\mathbf{t\pi'})$s.

At time x the process $\{J(s)\}_{s\in\Re_0^+}$ develops through some process $\{X^{(k)}(s)\}_{s\in\Re_0^+}$. There is a renewal at time x if the phase-type process $\{X^{(k)}(s)\}_{s\in\Re_0^+}$ makes a transition to the absorbing state during [x, x+dx), so by the law of total probability the expression of the renewal density at x is

$$g(x) = \boldsymbol{\pi}' e^{(\mathbf{T}+\mathbf{t\pi}')x}\mathbf{t}\,.$$

▪

Consider the classical Cramèr-Lundberg continuous time risk model that could be regarded as a particular case of a renewal (Sparre Andersen) model.

Let N(t) be the number of claims from an insurance portfolio. It is assumed that N(t) ($t\geq 0$) follows a Poisson process with mean λ. The individual claim sizes, U_1, U_2, ... independent of N(t), are positive, independent and identically distributed random variables with $P(x)=\Pr\{X\leq x\}$ distribution function and $p(x)=dP(x)$ individual claim amount probability density function.

The insurer's surplus process at time t ($t\geq 0$) is

$$W(t) = u + ct - \sum_{j=1}^{N(t)} U_j$$

where u=W(0)≥0 is the insurer's initial surplus, c the premium rate per unit time.

The time of ruin T is the first time that the surplus becomes negative defined by

$$T = \inf\left\{t \,\middle|\, W(t) < 0\right\},$$

with T=+∞ if W(t)≥0 for all t≥0 (i.e., if ruin does not occur).

The probability of ultimate ruin as function of the initial surplus u is

$$\psi(u) = \Pr\left\{T < +\infty \,\middle|\, W(0) = u\right\}.$$

In literature it is well known that obtaining an explicit formula for ψ(u) is not simple. In fact, only for particular distributions of individual claim amount it is possible to find an exact solution.

The class of phase-type distributions is the one within computationally tractable exact forms of the ruin probability ψ(u) can be obtained.

In the hypotheses of phase-type distribution for individual claim size with representation ($\boldsymbol{\pi}$,$\mathbf{T}$)

$$P(x) = 1 - \boldsymbol{\pi}' e^{\mathbf{T}x}\mathbf{e} \qquad p(x) = \boldsymbol{\pi}' e^{\mathbf{T}x}\mathbf{t}$$

it is possible to show that

$$\psi(u) = \boldsymbol{\pi}'_{-} e^{(\mathbf{T}+\mathbf{t}\boldsymbol{\pi}'_{-})u}\mathbf{e} \ .$$

The i-th component of the vector $\boldsymbol{\pi}_{-}$ is the probability that a Markov jump process underlying the phase-type claims downcrosses level u in state i when the surplus process jumps to a level below u for the first time. Since there is a positive probability that $\{W(t)\}_{t\in\Re_0^+}$ never goes to a level below u, the distribution $\boldsymbol{\pi}_{-}$ is defective.

In this case, when the claims are phase-type, also the process underlying the descending ladder heights is a terminating phase-type renewal process with interarrival distribution PH($\boldsymbol{\pi}_{-}$, $\mathbf{T}$).

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SCHOOLS OF THOUGHT AND ECONOMISTS' OPINIONS ON THE ECONOMY

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In this paper we bring to data the hypothesis that differences in economists' opinions on the economy are related to differences in the school of thought they belong to. Our analysis is based on a unique dataset of survey responses from a representative sample of Italian economists. Two are our main results. First, differences in the school of thought predict differences in economists' opinions on economic issues, even controlling for individual, group or community characteristics, spatial and knowledge heterogeneity, and political orientation. Second, dichotomous categorizations such as Mainstream vs Non-Mainstream or Orthodox vs Heterodox have poor explicative power as for economists' disagreement on economic issues.

Keywords: School of thought, Economists' disagreement, Group identity, Economic policy, Italy

JEL Classification: A11, A13, C42

1 Introduction

The proclivity of human beings to gather together in communities is a key feature of human social behavior, as well as a fundamental component of human cognitive system. Humans tend to cluster in groups and in doing so they separate their own community from other communities. In this paper we analyze the role of communities in a special group of people involved in intellectual production: Economists. In particular, we evaluate whether differences in the School of Thought (SofT, hereafter) relate to differences in economists' opinions on economic issues. Our analysis is based on a representative sample of academic Italian economists answering to a large set of questions concerning their views on the functioning of the economy and about the effectiveness of different economic policies. The main result of the analysis is that differences in the SofT predict differences in economists' opinions even after controlling for several individual and community or group characteristics, spatial and knowledge heterogeneity and political orientation. Moreover, we also show that dichotomous categorizations (e.g. Mainstream vs Non-Mainstream, Orthodox vs Heterodox) have poor explicative power in terms of economists' disagreement.

The empirical literature on the measurement of the disagreement among economists and on the identification of its determinants was pioneered by Kearl et al. (1979). Using a survey of U.S. based economists, they find that consensus was higher on microeconomic issues rather than macroeconomic ones, and on positive rather than on normative issues. After them, many other surveys followed (De Benedictis and Di Maio (2011) for a synthesis of the literature). Most of them confirm that economists express consensual opinions more often that what one might expect (Alson et al., 1992).

Several different sources of disagreement have been considered in the literature. The first one is *spatial heterogeneity*. Frey et al. (1984) find significant differences in the opinions of economists

belonging to different countries.[13] They attribute these differences, among other reasons, to differences in history and culture associated with geography. The second one is *knowledge heterogeneity*, related to differences in the research fields or research topics of the economists included in the sample. The results show that these differences do influence economists' opinions on economic issues (see Fuchs, 1996). The third one is *heterogeneity in individual characteristics*. Here the evidence is mixed. Fuchs et al. (1998), surveying labor and public policy economists active in top US departments, find that individual characteristics are correlated to differences in the opinion about policy prescriptions. On the contrary, Caplan (2001) shows that disagreement among a large sample of US economists is not related to their individual characteristics. The fourth possible source of disagreement is *heterogeneity in individual political orientation*. Also in this case, the evidence is mixed: while some studies argue that economists' political orientation is an important source of variation with respect to their opinions on economic policies (Klein and Stern, 2006; De Benedictis and Di Maio, 2011; Saint-Paul, 2011) others do not find empirical support for this view (Gordon and Dahl, 2013)

We contribute to this literature by adding the SofT to the list of the possible sources of disagreement among economists. Even though it seems a natural issue to explore, previous research did consider the possible relation between differences in opinions among economists and differences in the SofT they belong to.[14] In fact, the literature discussing the differences across SofTs is quite substantial, as it is the one on how the evolution of the various SofTs might impact on the profession (Frey and Frey, 1995). There are several detailed accounts of the numerous debates among economists belonging to different SofTs concerning both theory and policy in the last century (Gide and Rist, 1909; Hutchinson, 1953; Blaug, 1980; Screpanti and Zamagni, 2005; Dow, 2007). Famous examples of these confrontations are the *Methodenstreit*

[13] The existence of small but significant differences between American and European economists has been confirmed by Frey and Eichenberger (1993), Mueller (1995) and Aiginger et al. (2001).

[14] The only possible exception is Alston et al. (1992) which document different opinions between members of the American Economic Association (AEA) and members of the American Association for Evolutionary Economists (AFEE).

between the German Historical School and the Austrian School at the end of the 19th Century (Anderson et al., 2002) or the Capital Controversy between the two Cambridge at the end of the 1960s (Harcourt, 1972). The proclivity of economists to *group and separate* from other economists reaches our days with the debate on the macroeconomics of the current economic crisis being the most recent example.

What is indeed novel in our analysis is in fact the attempt to empirically validate the assertion that SofTs are meaningful communities with respect to economists' opinions on the economy. To best of our knowledge, this is the first paper that makes a bridge between the insights coming from the history of economic thought and the literature on economists' disagreement, and it is the first attempt to quantify the role of the SofTs in determining differences in economists' views on the functioning of the economy and on their opinions on the effectiveness of different economic policies.

The paper proceeds as follows. In section 2, we describe the survey and its characteristics. In section 3, we describe the econometric model and we discuss the empirical results. Section 4 concludes.

2 The survey, the sample and the schools of thought in the Italian academia

Our data come from an *ad-hoc* on-line survey we circulated in 2007 among Italian economists.[15] Four hundred and ninety-six economists responded, a reply rate of 33%.[16] To make our sample representative of academic economists employed in Italian universities, we excluded Italian

[15] The details of the survey design can be found at https://sites.google.com/site/micdimaio/surveyofitalianeconomists.

[16] To give a comparison, the response rate in previous surveys are: 27% in Klein and Stern (2007), 31% in Fuller and Geide-Stevenson (2003), 34% in Alston et al. (1992).

economists working abroad, post-docs and non-academics and we post-weight the data according to the three strata (gender, academic position and region of work) that we could observe in the Italian Minister of University and Research (MIUR) dataset. The final sample includes 335 respondents.

To minimize errors and misinterpretations, we asked respondents to self-report the SofT they belong to by choosing from a given list of SofTs.[17] The list of SofTs is reported in Table 1. The list is very similar to the one in Axarloglou and Theoharakis (2003): The main difference is that we also included the Eclectic category. Moreover, all the SofTs discussed in Colander et al. (2003) are included in our list.[18]

Table 1: **The distribution of Italian economists across schools of thought**

SCHOOL OF THOUGHT	Number of respondents	%
Eclectic	95	28.35
Neoclassical/Mainstream	59	17.61
I do not refer to any specific SofT	56	16.71
Keynesian/Post-Keynesian	36	10.74
Keynesian/Neo-Keynesian	27	8.06
Institutionalist/Neo-Institutionalist	23	6.87
Evolutionary	17	5.07
Marxist/Sraffian/Neo-Marxist	13	3.88

[17] Fifteen economists provided their own definition of their school of thought. We reclassify them according to similarity to other SofTs.

[18] While we are well aware of the distinction discussed in Colander et al. (2003) between Mainstream and Neoclassical approach, we preferred to consider the two together, to minimize the possible confusion by the respondents who were not informed about the content of the debate.

Behavioral	5	1.49
Regulationist	3	0.89
Austrian/Neo-Austrian	1	0.29
Total	335	100

NOTE: The table includes the responses to the question: *How would you define your methodological orientation/school of thought?*

Table 1 reports the distribution of Italian economists across SofTs. Results show that 28.4% of the economists in our sample defines themselves as Eclectic. The other larger group is the Neoclassical/Mainstream (17.6%) and then the "I do not refer to any specific SofT" group (hereafter No-school) (16.7%). If we sum this latter group and Eclectic we see that almost half of the sample is not categorized in any of the traditional SofTs. Next, there are Keynesian/Post-Keynesian and Keynesian/Neo-Keynesian which are 10.7% and 8.1%, respectively. Our sample also features Institutionalist (6.8%), Evolutionary (5%), Marxist/Sraffian (3.8%), Behavioralist (1.5%), Regulationist (0.9%) and Austrian/Neo-Austrian (0.3%) economists. These data indicate that the Italian academia is characterized by the presence of a substantial variety of SofTs even if their size is significantly different.

3 Schools of thought and economists' disagreement

To test our hypothesis we focus on the two core questions of the questionnaire. The first one is: *Is* X *a cause of the unfavorable performance of the Italian economy?*, followed by a list of forty broad economic issues such as *The adoption of the Euro* or *Labor Union behavior*. The second question is: *Can* Y *be effective in sustaining economic growth?*, where y is one of the eighteen

economic policies, such as the opportunity *To proceed with more liberalizations* or *Funding academic research*. The complete list of x and y, that from now on we will call *Causes* and *Economic Policies*, respectively, is included in the Appendix.[19]

For each *Cause* and each *Economic Policy*, we estimate the following regression model:

$$opinion_i = \alpha_i SofT_i + \mathbf{c_i}\beta_\mathbf{c} + u_i, \quad (1)$$

where $opinion_i$ is the opinion of individual i, $SofT_i$ is the categorical variable indicating the SofT of individual i, $\mathbf{c}_i$ is a vector of individual level control variables and u_i is the error term.

We estimate a multinomial logit version of model (1) where the dependent variable $opinion_i$ is a categorical variable with four ordered outcomes coded as follows: Strongly Disagree=1; Partially Disagree=2; Partially Agree=3; Strongly Agree=4.[20] The vector $\mathbf{c_i}$ includes a set of control variables related to *individual characteristics* (AGE, GENDER, MIGRANT,[21] WORRY,[22] OPTIMISM), *community heterogeneity* (REGION OF BIRTH, UNIVERSITY BA, ACADEMIC POSITION), *spatial heterogeneity* (REGION OF WORK), *knowledge heterogeneity* (MASTER, PhD, FIELD OF RESEARCH, ITALY,[23]) and *political orientation* (MARKET and RIGHT[24].).

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[19] All the propositions (*Causes* and *Economic Policies*) that we included in the list are the ones discussed in the academic literature on the performance of the Italian economy during the last 15 years. This selection procedure was chosen to minimize any possible bias in choosing which issues to include in the list. De Benedictis and Di Maio (2011) discuss the details on the methodology employed to select the essays from which the *Causes* and *Economic Policies* have been extracted.

[20] Respondents could also select the option 'No opinion'. Those cases (very limited: One or two depending on the specific economic policy) were excluded from the sample.

[21] This covariate takes value 1 if the respondent is working in a different region with respect to her/his birthplace, and 0 otherwise.

[22] This covariate measures the respondent's level of worry about the perspectives for the Italian economy.

[23] This covariate measures the respondent's degree of knowledge about the Italian economy.

Finally, to account for the possibility that the respondent's opinions are influenced by the peers with whom she/he interacts on an everyday basis we cluster standard errors at the level of the University where the respondent is employed.

3.1 Results

As a clear-cut test of the importance of the SofT as a determinant of economists' opinions, for each of the 58 propositions we run a likelihood test ratio between model (1) and the same model excluding the variable $SofT_i$. Results indicate that the test rejects the null hypothesis in favour of the inclusion of $SofT_i$ in 27 out of 40 *Causes*. In the case of *Economic Policies*, this happens in 12 cases out of 18. This indicates that, even controlling for a large number of covariates from individual characteristics to political opinions, the belonging to a different SofT plays an important role in explaining differences in economists' opinions.

While the number of propositions for which $SofT_i$ is significant indicates whether the SofT plays any role in explaining economists' disagreement, it is also important to know on which issues differences in opinions between economists are related to differences in their SofT. The full list of *Causes* and *Economic Policies* for which $SofT_i$ is significant are reported in tables 2 and 3. While several aspects of the results could be emphasized, for brevity here we focus only on few of them.

First, Mainstream economists are quite different from other economists. In fact Mainstream economists differ from economists belonging to other SofTs more than other economists differ among them. This is indicated by the fact that when $SofT_i$ is significant the sign is the same for

[24] These covariates measure the degree of pro-market and right-wing orientation of the respondent respectively.

all SofTs (but for *Causes* 3, 14 and 28 and for *Economic Policy* 14), meaning that the disagreement between other SofTs and Mainstream is in the same direction.

Second, the degree of disagreement between Mainstream and other SofTs is heterogeneous. For instance, only looking at the *Economic Policies* included in Table 3, Neo-Keynesian, Institutionalist, and No-School disagree with Mainstream economists in only 4 cases, Eclectic in 5 cases, Evolutionary in 6 cases, Post-Keynesian in 7 and Marxist in 9 cases. From this rough metric, one can see that Neo-Keynesian and Institutionalist are the most similar to Mainstream economists while Marxist are the most dissimilar concerning economic policies.

Looking at the specific propositions, we can highlight some other interesting results. As for *Causes*, it is apparent that the strongest differences between the SofTs concern the role that the *Quality and quantity of infrastructure*, the *Low level of domestic competition*, the *Bureaucratic impediment to private entrepreneurship*, the *Low human capital supply*, the *Labor Union behaviour* and the *Low efficiency of the Public Administration and of the bureaucracy* play in determining the current difficulties of the Italian economy. Mainstream economists give these *Causes* a much more important role in being responsible for the current difficulties of the Italian economic situation than economists belonging to all other SofTs do. On the contrary, the *European Commission economic policy*, the *ECB monetary policy*, the *Small firms' size* the *Persistence of the Italian North-South economic divide* and the *Type of policies adopted to reduce the public debt* are all *Causes* that economists belonging to other SofTs consider more important in explaining the economic difficulties of Italy than Mainstream do.

As for *Economic Policies*, we see that the largest disagreement between Mainstream and other SofTs emerges with respect to the evaluation of the effectiveness of policies such as *Proceed with more liberalizations*, *Make the labor market more flexible* and *Reduce Labor Union power*. In all these cases, the disagreement is largest between Mainstream and Marxist, Post-Keynesian and Evolutionary economists. Finally, looking at which economic policies other SofTs evaluate to be more effective than Mainstream do, we find that these are: *Reduce precarious jobs* for Eclectic,

Evolutionary, and No-School economists, *Create and strengthen firm-territory link* for the Institutionalist, *Funding academic research* for Neo-Keynesian, *Increase investments in physical infrastructures* for Post-Keynesian and *Increase public investment in strategic sectors* for Marxist economists. These results confirm once again the high heterogeneity among economists belonging to the various SofTs in terms of their opinion on the effectiveness of the different economic policies.

***Tabella 2: Causes* - Ordered Probit Regressions**

Cause [a]	*Eclectic*		*Inst*		*Neo-Keyn*		*Post-Keyn*		*Marxist*		*Evolutionary*		*No-school*	
Dumping and unfair international competition	-0.589	**	0.511		0.844	*	-0.297		-1.574	**	-0.694		0.096	
Low attraction of FDI	-0.434		-0.213		0.219		-0.953	**	-2.080	***	-0.764		-0.029	
Adoption of the Euro	-0.959	**	0.149		-0.547		-0.437		-0.606		-0.546		-0.213	
European Commission economic policy	-0.337		0.698		-0.175		0.280		1.711	**	0.199		-0.142	
BCE monetary policy	-0.390		0.987	**	0.760		0.569		1.935	**	0.440		0.324	
Primary commodity world price dynamics	-1.210	***	-0.283		-0.359		-0.261		-0.805		-0.867	*	-0.719	**
Difficult international political	-1.570	***	-0.531		-0.652		-1.135	***	-0.772		-0.421		-0.875	**

situation														
Small firms' size (more difficult the adoption of new technologies)	-0.200		-0.200		0.804	*	0.230		0.847		0.564		0.262	
Small firms' size (more difficult the innovation activity)	0.216		0.119		1.156	***	0.727	*	-0.520		0.484		0.143	
Low risk propensity of entrepreneurs	-0.837	**	-0.485		-1.370	***	-0.775	**	-0.416		-0.114		-0.864	**
Excessive protection of large domestic firms	-0.632	**	-0.287		-0.877	**	-0.330		0.944	*	-0.858		-0.790	**
Quantity and quality of infrastructures	-0.592	*	0.089		-0.829	*	-0.288		-1.231	*	-1.164	**	-0.928	**
Quality of immaterial infrastructures (justice, authority, etc.)	0.730		-0.330		-0.747		-2.178	***	-3.254	***	-2.070	**	-2.170	***
Low competition level, the existence of barriers to entry	-0.625		-0.827	**	-1.031	**	-1.118	**	-3.268	***	-1.675	**	-0.828	*
Bureaucratic impediments to private entrepreneurship	-0.616	**	-0.720	*	-0.450		-0.438		-1.650	***	-1.069	**	-0.697	*
Difficulties in gaining access to credit	-0.767	**	-0.138		-0.321		0.014		-0.594		-0.125		-0.051	
Persistence of the Italian North-South economic divide	-0.033		0.397		0.067		0.362		1.152	**	-0.055		-0.153	
Mezzogiorno [b] issue (crime)	-0.219		0.139		0.237		0.538		0.195		-1.027	**	-0.697	**
Mezzogiorno [b] issue (infrastructures)	0.130		-0.159		0.302		1.043	**	-0.284		-0.865	**	-0.374	

Low labor market flexibility	-1.392	***	-0.215		-0.515		-1.334	***	-7.260	***	-0.578		-0.372	
Demographic dynamics	-0.843	***	-0.193		-0.149		-0.512		-1.518	***	-0.880	*	-0.902	***
Low human capital supply	-1.752	***	-1.422	***	-1.401	***	-1.144	**	-3.518	***	-2.074	***	-1.743	***
Labor Union behavior	-0.625	**	-0.428		-0.536		-0.886	*	-1.476	**	-1.289	**	-0.891	**
Public debt level and composition	-0.745	**	0.076		-0.044		-0.734	**	-2.086	***	-0.976	*	-0.520	*
Type of policies adopted to reduce public debt	-0.294		0.726	*	-0.158		0.172		1.153	*	0.314		0.266	
Low efficiency of the Public Administration	-0.439		-0.438		-0.741	*	-0.975	**	-1.464	*	-2.092	***	-1.138	***
Low efficiency of the bureaucracy	-0.497		-0.313		-0.756	*	-0.829	*	-2.227	***	-1.293	**	-0.831	**

Notes: Weighted ordered probit regressions results. ***, **, * mean significant at the 1%, 5%, 10% respectively. [a] The dependent variable is the ordered response to the question: ***IS X A CAUSE OF THE UNFAVORABLE PERFORMANCE OF THE ITALIAN ECONOMY?*** Mezzogiorno refers to the Southern regions of the country. Controls included but which coefficients are not shown are: AGE, GENDER, MIGRANT, WORRY, OPTIMISM, REGION OF BIRTH, STUDIED ABROAD [1 AND 2], ACADEMIC POSITION, REGION OF WORK, MASTER, DOTTORATO/PhD, FIELD OF RESEARCH, ITALY, DEBATE, MARKET, SOCIAL MOBILITY and RIGHT. We include fixed-effects for the University where the respondent received her B.A (UNIVERSITY BA). Standard error are robust and clustered at the level of the University where the respondent is currently employed. Weights are used. More information on the controls and the weights are included in the text. The number in the first column corresponds to the number of the Proposition in the list of *Causes* as reported in the Appendix.

Table 3: ***Economic Policies*** **- Ordered Probit Regressions**

Policy proposal [a]	*Eclectic*		*Inst*		*Neo-Keyn*		*Post-Keyn*		*Marxist*		*Evolutionary*		*No-school*	
Proceed with more liberalizations	-1.675	***	-1.928	***	-1.560	**	-1.803	***	-2.601	***	-2.275	***	-1.045	**
Proceed with more privatizations	-0.760	**	-0.498		-0.041		-0.707		-1.507	*	-0.992	**	-0.044	
Increase bureaucracy (Public Administration) efficiency	0.032		-0.183		-0.285		-1.062	**	-0.529		-1.240	*	-0.627	
Create small and medium firms consortia	-0.313		0.235		0.582		0.838	**	1.497	**	0.242		0.489	
Create and strengthen firm-territory link	-0.332		0.947	**	0.192		0.043		-0.213		0.563		0.691	*
Increase public investment in strategic sectors	0.278		0.944	**	0.607		1.118	**	1.723	**	0.322		0.471	
Increase firms' investment in ICT	-0.523		-0.278		0.112		0.107		-1.761	**	0.409		-0.317	
Funding academic research	-0.094		-0.219		0.870	*	0.126		-1.295	**	-0.581		-0.346	
Increase investments in physical infrastructures	-0.340		0.628		0.086		1.330	***	0.116		-0.703		-0.460	
Make the labor market more flexible	-0.763	**	-0.279		-0.958	**	-0.821	**	-2.737	**	-1.086	**	-0.362	
Reduce precarious jobs	0.420	*	0.641		-0.438		0.682		1.054	*	1.572	**	0.873	**
Reduce Labor Union power	-0.997	***	-0.852	**	-1.270	**	-1.384	***	-1.909	***	-1.622	**	-1.250	***

Notes: Weighted ordered probit regressions results. ***, **, * mean significant at the 1%, 5%, 10% respectively. [a] The dependent variable is the ordered response to the question: *Can y be effective in sustaining economic growth*? . Controls included but which

coefficients are not shown are: AGE, GENDER, MIGRANT, WORRY, OPTIMISM, REGION OF BIRTH, STUDIED ABROAD [1 and 2], ACADEMIC POSITION, REGION OF WORK, MASTER, DOTTORATO/PhD, FIELD OF RESEARCH, ITALY, DEBATE, MARKET, SOCIAL MOBILITY and RIGHT. We include fixed-effects for the University where the respondent received her B.A (UNIVERSITY BA). Standard error are robust and clustered at the level of the University where the respondent is currently employed. Weights are used. More information on the controls and the weights are included in the text. The number in the first column corresponds to the number of the Proposition in the list of *Economic Policies* as reported in the Appendix.

3.1.1 Robustness checks

As a first robustness check, we expand the number of controls included in $\mathbf{c}_i$ by adding a dummy variable that takes value 1 if the respondent has a DEGREE in economics and 0 otherwise. We also include the interaction between DEGREE and AGE to control for the possibility that agreement between economists on a specific economic policy is due to the fact that respondents studied economics in the same historical period and thus have had been exposed to the same teaching materials. Including these additional controls do not change our results.

As a second check, we test the possibility that what really makes a difference as for explaining the disagreement among economists is just that they belong or not to any SofT. To test for this, we estimate our model (1) where instead of $SofT_i$ we include a dummy variable taking value 1 if the respondent does belong to any school of thought and 0 otherwise. The results (not reported, but available upon request) show that for no *Causes* and for only 4 *Economic Policies* the dummy variable is significantly different from zero. Next, we run our main specification excluding from the sample all the economists belonging to the No-school category. We find that our previous results do not change: The $SofT_i$ variable turns out to be significant for 27 *Causes* out of 40 and for 12 *Economic Policies* out of 18. Together, these results indicate that it does not make a difference in terms of her/his opinions if the respondent belongs or not to a SofT, what matters is rather which is the SofT he/she belongs to.

3.2 Mainstream, Non-mainstream or Heterodox: Does it make any difference?

As we have seen, economists belonging to different SofTs have different opinions on the economy. Yet different SofTs are sometimes grouped as to form two opposing fronts such as Mainstream vs. Non-mainstream or Orthodox vs. Heterodox, etc. While these dichotomies are common ways of grouping SofTs (and economists), are they also somehow informative? For

instance, how much does the dichotomy Mainstream vs Heterodox account for differences in economists' opinions? Indeed there are some doubts about the usefulness of such categorizations. Colander et al. (2003) argue that beyond the rejection of the orthodoxy there is no single unifying element that characterizes Heterodox economics.[25] Moreover, George (2007) notes that while modern economics has a tightly defined orthodoxy, the heterodoxy is highly fragmented. Yet Dow (2007) argues that, even if the dualism of orthodoxy vs. heterodoxy is too simplistic, it still may be useful. The following analysis, using the same data we used in the previous section, gives a quantitative contribution and helps to qualify this specific debate.

Obviously, the most critical element of the following empirical analysis is the way we group SofTs under a common label like Mainstream, Heterodox, etc. Since there is neither a unique nor a consolidated taxonomy, we consider different alternatives, that we summarize in table 4. The first group we define is *Mainstream* (M). This group includes only economists declaring to belong to the Neo-classical/Mainstream SofT. We label its complementary group *Non-Mainstream* (N-M). It includes all the SofTs in our list but the Neo-classical/Mainstream one: Eclectic, Institutionalist, Post-Keynesian, Neo-Keynesian, Marxist/Sraffian, Austrian, Evolutionary, Regulationist, Behavioralist. Finally, we have a residual group made of economists declaring to be Eclectic or No-school. A second possible definition of mainstream economists, labeled *MainstreamLarge* (ML), is the one that includes both Neo-classical/Mainstream and Neo-Keynesian economists. In this case, the complementary group is *Non-MainstreamLarge* (N-ML), including Marxist/Sraffian, Institutionalist, Evolutionary, Austrian, Post-Keynesian, Regulationist, Behavioralist.[26] The residual group is the same as in the previous case. As for the last categorization, for mainstream we use the same definition as before, namely *MainstreamLarge* (ML). The definition of the complementary category is instead directly derived from the JEL classification system where Current Heterodox

[25] For a discussion on the elements that define an heterodox school of thought and for a brief historical account of heterodox schools see also Backhouse (2000) and Coats (2000).

[26] This group closely resembles the definition of heterodox as in Prychitko (1998). Dow (2000) defines as heterodox SofTs the Post-Keynesians, the Institutionalist school, the Neo-Austrian school, Behavioralists, Social economics, Feminist economics. For a thoughtful discussion of the concept of heterodox economics see also Lee (2008).

Approaches (JEL-B5) are defined to be Institutionalist, Marxist/Sraffian, Evolutionary, Austrian. We call this group *HeterodoxJEL* (HJEL). Finally, the residual group is made of No-school, Eclectic, Post-Keynesian, Regulationist, Behavioralist.

Table 4: **Groups definitions**

	Mainstream group	**Other-than-Mainstream group**	**Residual group**
1	***Mainstream***(*M*) Neo-classical/Mainstream	***Non-Mainstream*** (*N-M*) Institutionalist, Neo-Keynesian, Marxist/Sraffian, Austrian, Regulationist, Behavioralist, Post-Keynesian, Evolutionary	No-school, Eclectic
2	***MainstreamLarge*** (*ML*) Neo-classical/Mainstream Neo-Keynesian	***Non-MainstreamLarge*** (*N-ML*) Institutionalist, Marxist/Sraffian, Austrian, Regulationist, Behavioralist, Post-Keynesian, Evolutionary	No-school, Eclectic
3	***MainstreamLarge*** (*ML*) Neo-classical/Mainstream Neo-Keynesian	***HeterodoxJEL*** (*HJEL*) Institutionalist, Marxist/Sraffian, Austrian, Evolutionary	No-school, Eclectic, Post-Keynesian Behavioralist, Regulationist

3.2.1 Results

Since the groups definitions described in table 4 are among the most commonly used to describe the divisions within the profession, we now assess the ability of these categorizations to capture systematic differences in economists' opinions on the economy. For each categorization (1, 2 and 3 in table 4), we estimate a set of 58 weighted ordered probit regressions using model ??. The only difference is that we regress the dependent variable

$opinion_i$ on the corresponding categorical variable ($N\text{-}M_i$, $HJEL_i$ and $N\text{-}ML_i$) defined in table 3 rather than on $SofT_i$. In all 3×58 regressions we include the same set of controls $\mathbf{c}_i$ used in Section 3.1.

Figure 1 displays in a single plot the information on the effects of the main variables of interest ($N\text{-}M_i$, $HJEL_i$ and $N\text{-}ML_i$) (full results are available upon request). The dots in Figure 1 represent the point estimates of the different regressions: Black circles for the estimates of the (58) ordinal regression models that includes the categorical variable $N\text{-}M_i$, white circles for the ones including $HJEL_i$, and gray circles for the ones including $N\text{-}ML_i$. Horizontal segments depict 95% confidence intervals. When the confidence interval crosses the zero vertical line (that visualizes the null hypothesis), the corresponding coefficient is not statistically significant at $p < 0.05$. The y-axis reports all the propositions included in tables 2 and 3. The other propositions are not considered because for them the variable capturing the influence of the SofT is already not significant when using the polytomous variable $SofT_i$.

Figure 1 shows that the number of propositions for which the point estimate is statistically significant for each of the possible definitions of the Other-than-Mainstream group (i.e. *N-M, HIJE, N-ML*) is quite small with respect to case of $SofT_i$. Interestingly, in only even cases the point estimate is significant for all the three definitions of Other-than-Mainstream group. To understand how the point estimates plotted in Figure 1 are related to the results shown in tables 2 and 3, let us take the *Cause - Dumping and unfair international competition* as an example. Estimates reported in table 2 show that four SofTs express a significantly different opinion with respect to the Mainstream on this *Cause*. In particular, Neo-Keynesians show a more favorable opinion than Mainstream economists as for *Dumping and unfair international competition* being a cause of the difficulties of the Italian economy. On the contrary, Eclectics, Evolutionary economists and especially Marxists show more negative opinion on its importance. Consider now the categorical variable $N\text{-}M_i$ as defined in table 4. Figure 1 shows that the opinion of the Non-Mainstream are not significantly different from the Mainstream on this proposition. This results follows from the fact that since the SofTs that are

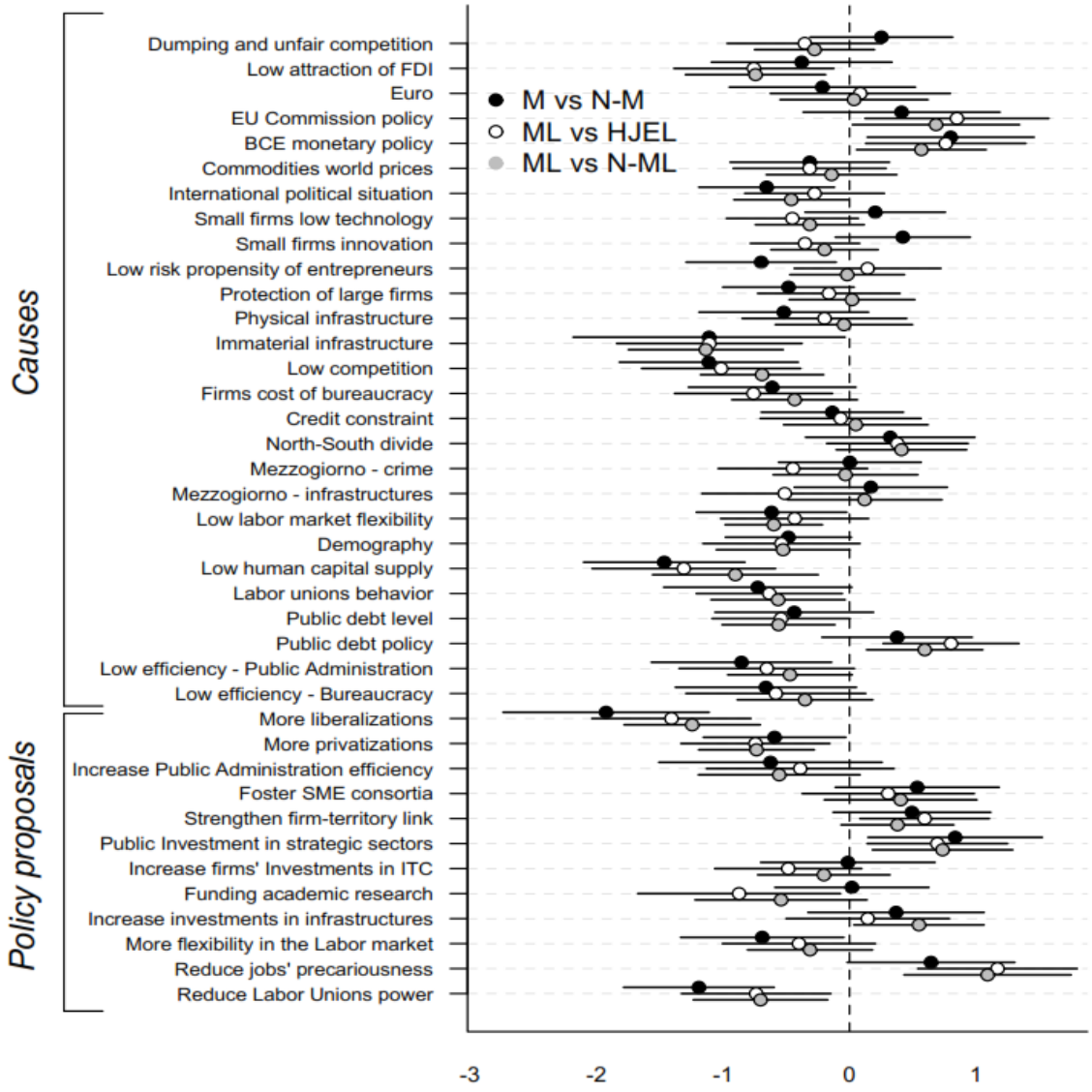
grouped together in the N-M macro-category are expressing *different* opinions, the average opinion of the group turns out not to be statistically different from the one of Mainstream (even if the opinion of each SofT was significantly different from that of Mainstream). Moreover, since Neo-Keynesians and Institutionalists are the more numerous their opinion prevails, as it is shown by the black circle being at the right of the zero vertical line in Figure 1. When $HJEL_i$ is used, Mainstream are grouped together with the Neo-Keynesian. Figure 1 shows that the opinions of economists in the HJEL and in the M-L groups are not significantly different. The reason is that the macro-category M-L is less homogeneous than Mainstream and thus the differences between SofTs as resulted in table 1 now disappear. Also note that since a more negative stance is now prevalent among individuals in the HJEL group this shows up in the aggregate, as it is visualized by the white circle in figure 1 bing on the left of the vertical line. As for the third macro-category N-ML the result does not change much. However, since Post-Keynesians do not express a significantly different opinion from Mainstream on this proposition (see 1), the point estimate of the variable $N\text{-}ML_i$ is closer to zero than it was for $HJEL_i$, as shown by the gray circle in Figure 1.

In general, our example shows that when we aggregate in a common macro-category SofTs expressing *different* opinions, we lose power in explaining differences in individual opinions, because we are increasing within-group differences and reducing between-group differences. On the contrary, when we aggregate SofTs expressing *similar* opinions we obtain the opposite. The evidence in Figure 1 shows that in our analysis the first case is more common. To conclude we note that the way one groups together different SofTs is crucial for the explicative power of these aggregates with respect to economists' opinions. Our results show that categories like Mainstream, Non-Mainstream and Heterodox, in spite of the ease of using them for representing debates as the confrontation of polar positions, have limited significance in explaining the differences in individuals' opinions. We interpret this evidence as an indirect confirmation of the view presented in Colander et al. (2003).

4 Conclusions

This paper is a novel contribution to the literature on the determinants of economists' disagreement. Using survey responses from a representative sample of Italian economists, we have shown that differences in the school of thought predict differences in economists' opinions on economic issues, even controlling for individual, group or community characteristics, spatial and knowledge heterogeneity, and political orientation. Next we have shown that grouping different schools of thought as to form dichotomous categories (i.e. Mainstream versus Heterodox) reduces substantially their explicative power. Together these results provide robust evidence of the fact that the school of thought crucially influences the economist's view on the economy and that differences in the school of thought significantly contribute to explain economists' disagreement.

Figure 1: Mainstream vs Other-than-Mainstream groups: Regression results



Notes: Weighted ordered probit regressions results for categorical variable $N\text{-}M_i$, $HJEL_i$ and $N\text{-}ML_i$. The reference category is always the correspondent definition of mainstream (as in table 4). Controls (the same ones as in tables 2 and 3) are included but coefficients are not shown. We include fixed-effects for the University where the respondent received her B.A (UNIVERSITY BA). Standard error are robust and clustered at the level of the University where the respondent is currently employed. More information on the controls and the weights are included in the text. Relevant point estimates are plotted using black circles (N-M), white circles (HJEL), and gray circles (N-ML). Horizontal segments depict 95% confidence intervals. Propositions are indicated on the y-axis. We shortened the title of each proposition for visual reason.

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Appendix

This Appendix contains the list of the *Causes* (Table 5) and of the *Economic Policies* (Table 6) included in the questionnaire.

Table 5: The 40 *Causes*

Number	*Cause*
1	Italian international trade specialization
2	Higher international competition in goods and service markets
3	Dumping and unfair international competition
4	Set and quality of exported goods
5	Low attraction of FDI
6	Low firm propensity to internationalization
7	Adoption of the Euro
8	European Commission economic policy
9	BCE monetary policy
10	Primary commodity world price dynamics
11	Difficult international political situation
12	Small firms' size (more difficult to gaining access to credit)
13	Small firms' size (more difficult the internationalization activity)
14	Small firms' size (more difficult the adoption of new technologies)
15	Small firms' size (more difficult the innovation activity)
16	Ownership structure of Italian firms
17	Role of the family in firm governance
18	Low risk propensity of entrepreneurs
19	Excessive protection of large domestic firms

20	Dynamic of investment in ICT
21	Quantity and quality of infrastructures
22	Quality of immaterial infrastructures (justice, authority, etc.)
23	Low competition level, the existence of barriers to entry
24	Bureaucratic impediments to private entrepreneurship
25	Difficulties to gaining access to credit
26	Persistence of the Italian North-South economic divide
27	Mezzogiorno issue (crime)
28	Mezzogiorno issue (infrastructures)
29	Productivity reduction caused by the labor market reform
30	Low labor market flexibility
31	Wage compression effect of 'concertazione'
32	Demographic dynamics
33	Low human capital demand
34	Low human capital supply
35	Increasing number of immigrant workers
36	Labor Union behavior
37	Public debt level and composition
38	Type of policies adopted to reduce public debt
39	Low efficiency of the Public Administration
40	Low efficiency of the bureaucracy

Table 6: The 18 *Economic Policies*

Number	**Policy proposal**
1	Proceed with more liberalizations
2	Proceed with more privatizations
3	Increase bureaucracy (Public Administration) efficiency
4	Change trade specialization
5	Improve quality of exported goods
6	Induce internationalization activity by domestic firms
7	Induce firms' size growth
8	Create small and medium firms consortia
9	Create and strengthen firm-territory link
10	Increase public investment in strategic sectors
11	Increase firms' investment in ICT
12	Funding private research
13	Funding public research
14	Funding academic research
15	Increase investments in physical infrastructures
16	Make the labor market more flexible
17	Reduce precarious jobs
18	Reduce Labor Union power

FDI LOCATION CHOICE ACROSS HUNGARIAN COUNTIES: THE ROLE OF LOCAL PUBLIC POLICIES

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Abstract

In this paper we investigated the determinants of foreign direct investments in Hungarian counties. Differently from previous studies, the role of local government social welfare expenditures and special economic regulations are also tested. The results underline the importance of local government interventions in attracting FDI. Market size, labour skills and agglomeration economies also drives FDI location choices.

JEL classification: C23, F21, R5

Key words: local government expenditure, special economic zones, FDI determinants, Hungarian counties.

Introduction

The present study analyses the determinants of FDI in the period 2001-2011 in Hungarian counties. Special emphasis is laid on the role of local public spending and the establishment of special economic zones which the literature has widely recognized as regional attractors for FDI (Görg *et al*., 2009; Cheng and Kwan, 2000; Shapiro *et al.,* 2007; Wang, 2013 amongst others). Hungary is an interesting case study because of its great success in attracting foreign investors compared to other transition economies. After the fall of the Communist government, the country launched a process of economic restructuring aimed at fostering economic growth and attracting transnational corporations. The consequent benefits in terms of positive spillovers, such as know-how and technology transfers, have played a major role in the Hungary's modernisation and its integration with Western markets. While the determinants of FDI location choices at the country level have been extensively explored, few studies have analysed Hungary at the sub-national level (Békès, 2005a, 2005b; Boudier-Bensebaa, 2005) and the fundamental role of public policies in attracting FDI still deserves further exploration. The present study fills this gap, including in the model two different variables that measure local government social welfare policies and the presence of industrial parks (*Ipari park*). Econometric results point to the importance of public policies in creating a favourable environment to attract FDI to Hungarian counties. This influence is highlighted by local government expenditure both on social policies and fiscal incentives. Market size, labour skills and agglomeration economies also play an important role in explaining FDI location choices.

The paper is structured as follows: the next section reviews the relevant literature, section 3 provides an overview of foreign direct investments in Hungarian counties and section 4 presents the data and the model. The results are reported in section 5 and section 6 concludes.

Literature review

Since the early 1960s, the determinants of FDI inflows have been extensively analysed (Blonigen, 2005; Faeth, 2009; Fetscherin *et al.*, 2010). Combining internalisation theory and traditional trade economics in the OLI eclectic paradigm, Dunning (1977, 1979) identified three sources of multinational firm advantages: ownership, location and internalisation. Given the aim of this study, the focus will be on the location advantages of FDI (UNCTAD, 1999; Villaverde and Maza, 2014) that were recently grouped under three headings: policy framework, business facilitation and economic determinants. Policy framework includes economic, political and social stability, rules regarding entry and operations, standards of treatment of foreign affiliates, policies on functioning and structure of markets, international agreements on FDI, privatisation, trade and tax policies. Business facilitation helps to create a favourable environment for FDI inflows and comprises investment promotion and incentives, reduction of costs related to corruption, administrative efficiency, social amenities such as bilingual schools, and post-investment services. Finally, economic determinants can be further split into market-seeking, resource/asset-seeking and efficiency-seeking determinants. The first sub-group includes market demand and market size as well as market structure and

accessibility and consumer preferences. The second comprises natural and human resource endowment, infrastructure quality, technological know-how, innovation activity and other created assets (*e.g*. brand names). Efficiency-seeking determinants in terms of the cost of resources and assets listed in the second sub-group, adjusted for productivity for labour resources as well as other efficiency-saving advantages like the establishment of regional corporate networks, may further explain differences in FDI attractiveness across countries.

The State can play a fundamental role in promoting attractiveness for foreign investors by conditioning the regulatory and FDI-related institutional environment using different policy instruments (Bellak *et al*., 2010). While the great bulk of the economic literature which analyses the behaviour of multinational firms has emphasised the importance of reducing tax rates and tax burdens to improve the investment climate for foreign companies (De Mooij and Ederveen, 2003), few studies underline the importance of government expenditure activity in driving investment attractiveness. Kim *et al*. (2003) found a positive and significant effect of industry promotion expenditures on new manufacturing FDI plants in the US. Görg et al. (2009) studied the role of social expenditure and its interaction with corporate taxation in determining the destination of foreign direct investment flows. They found that government social welfare policies can be positively valued by multinationals because they contribute to create a safer, more stable environment. Following the positive view of benefit taxation, which concerns the correspondence between taxes paid and the benefits of public spending received, others conclude that the decisions of foreign investors can be affected by net benefits accruing to business in the forms of provision of goods and services (De Simone *et al*., 2013).

Research on the determinants of FDI location choice has covered different geographical areas. Industrialised countries like the USA were the first to be analysed, with studies then extended to countries like China, India and Brazil which experienced a significant growth rate in recent years (Coughlin *et al.*, 1991, Wei *et al.,* 1999, Cheng and Kwan, 2000; Luo *et al*. 2008; Wang *et al.,* 2016). In Europe, together with established developed countries like Italy (Iammarino and Santangelo, 2000; Basile, 2004), the UK (Fallon and Cook, 2010; Dimitropoulou *et al*., 2013), Germany (Spies, 2010), Portugal (Guimaraes *et al.*, 2000) and Spain (Villaverde and Maza, 2012), increasing attention has been devoted to the study of transition economies. Central and Eastern countries in Europe have, indeed, experienced a significant boost in their attractiveness for foreign enterprises since they embarked on their transition to the market economy and "represent a useful laboratory to test hypotheses about the determinants of FDI" (Bevan and Estrin, 2004). The literature has widely emphasised the role played by FDI in generating economic transformations and structural changes of such emerging economies during their transition process (Bevan and Estrin, 2004; Pavlinek, 2004; Hanousek *et al*., 2011 amongst others).

There are numerous studies which have dealt with location determinants of foreign direct investments in CEECs in general. Following Bellak *et al*. (2008), such analyses can be grouped into macro-level studies (*e.g.* Kinoshita and Campos, 2003; Bevan and Estrin, 2004; Carstensen and Toubal, 2004; Gorbunova *et al*., 2012) and sectoral, regional and firm-based studies (Resmini, 2000; Buch et al., 2005; Pusterla and Resmini, 2007).

As regards analyses at the sub-national level, most studies have analysed the case of Poland (Chidlow *et al*., 2009; Cieslik, 2013) and Romania (Hilber and Voicu, 2010; Raluca

and Alecsandru, 2012). These studies highlight the important role of firm size, geographic location, agglomeration economies, economic region size, human capital, labour market conditions, infrastructures, R&D expenditure and fiscal incentives like the establishment of Special Economic Zones in attracting FDI. The Hungarian case is not as well covered. Some studies only performed a descriptive analysis to show the drivers of investment attractiveness (Zbida, 2010) or the spatial distribution of FDI in Hungarian regions and counties (Zbida, 2010, Kiss, 2007). Fazekas (2003), in a labour market perspective, analysed the possible determinants of FDI and the regional distribution of domestic firm employment. The author finds that the concentration effects of jobs in foreign enterprises are stronger than those in domestic firms and are influenced by geographical location, such as proximity to Western portals, and the education level of the local labour force. Békès (2005a, 2005b) studied the location choices of foreign firms in the manufacturing sector within Hungarian counties in a New Economic Geography framework. The analyses showed the importance of industry clustering and agglomeration externalities as well as wages and local infrastructures. Local taxes and municipal tax allowance policies also affected firm location. In particular, Bekes (2005b) sought to detect the presence of special industrial areas by including in the model a dummy variable. However, his findings were mostly insignificant. Boudier-Bensebaa (2005) investigated the location determinants of foreign investors using a regional data set from the Hungarian Central Statistical Office for 20 counties from 1991 to 2000. The author found that manufacturing density, labour market and demand conditions are significant in explaining MNE location choices but, nevertheless, failed to consider the role of public policies in attracting FDI.

Foreign direct investment in Hungary: a regional overview

Since the 1990s, Hungary has experienced a continuous boost in its foreign investment inflow attractiveness: representing little more than 1.5% of national GDP in 1990, in the last decade such investments have reached more than 70% of domestic product (UNCTAD, 2014). Fluctuations in foreign capital invested were particularly evident in the early years of the economic transition when the privatisation process was still ongoing (Kiss, 2007). In the 1990s the country launched a huge liberalisation and privatisation process, aimed at developing strategic sectors by selecting investors on a case-by-case basis (Kaminski and Riboud, 2000). Foreign investments helped to shape Hungary's path of transformation in different ways (Swain, 1998). First, they enhanced the country's international credibility on financial markets and secured a shift away from a state-planned economy. Second, they played a fundamental role in industrial modernisation despite creating a "two-tier industrial relation system" (foreign investors vs. remnants of centrally planned industrial sectors). Finally, they contributed to uneven regional development as Western regions were favoured in investment location choices. The success that Hungary experienced in attracting foreign investors compared to other transition economies can be attributed to several factors: Hungary benefits from a strategic location at the crossroads of four main European transportation corridors for many international distribution centres (Tiner, 2010a, 2010b). Favourable labour market conditions in terms of wages and skills, an efficient banking sector and large R&D investments and a well-designed legal framework contributed to create a business-friendly environment for service and competitive processing industries, namely automotive, electronics, information technology, logistics, R&D and innovation. Moreover, Hungary

offered various FDI incentives including both financial and non-financial measures like cash transfers (either from the Hungarian government or from EU funds), training and job creation subsidies, a development tax allowance, a targeted investment promotion activity and the establishment of special economic zones (HIPA, 2013). Firm regional location has been conditioned by the establishment of tax-free zones which, implemented in the EU pre-accession period, instead contributed to increase regional polarization of FDI (Hunya, 2014). Most of the zones were later replaced by industrial parks (*Ipari Park*) which spread rapidly from 1997 onwards when the government started the new development programme for industrial parks to smooth regional polarisation of FDI location. Firms that settled in an industrial park benefited from local authority assistance, tax allowances and infrastructure services.

According to data provided by the Hungarian Ministry of National Development industrial parks were unevenly distributed across counties both in 2001 and 2011, with most being located in Central Hungary. Between 2001 and 2011 a general increase in the number of industrial parks was observed at county level. While in 2001 five counties, namely Győr-Moson-Sopron, Heves, Nógrád, Tolna and Vas present up to five industrial parks, in 2011 only Nógrád and Tolna maintain a small number of *Ipari park*. Regional distribution of FDI also reveals uneven attractiveness among counties (Pavlinek, 2004; Boudier-Bansebaa, 2005)[2].

Thanks to its central position and high quality services, the majority of business transactions and activities are concentrated in the Budapest region (Tiner 2010a, 2010b; HITA, 2013). Outside the capital city, other regions display specific features which affect

their business attractiveness (Tiner, 2010a, 2010b). In 2001 Budapest received 53.89% of total FDI stock (equal to 3,338.4 billion HUF) while a county like Tolna accounted for only 0.35% (21.8 billion HUF). After ten years, the location of foreign investments still displays evident disparities across counties: Budapest in 2011 accounts for 48.97% of total FDI; Győr county has experienced a relatively significant boost (nearly 10%) in its investment attractiveness. This evidence may be partially attributed to the change in the industrial centre of gravity which has gradually moved from Veszprém and Borsod-Abaúj-Zemplén to Budapest and Northwest Hungary which benefit from a favourable location and strong historical ties to Austria. The result is that "the concentration of industrial activities and foreign direct investments in the capital region and in the northern part of Transdanubia leads to only very few spillovers to other regions" (Leibert, 2013, p. 113). Together with factor endowments and policy-specific attributes, disparities in attractiveness may reflect differences in the preferences of foreign investors towards a geographical location or different patterns of industrialisation (Kiss, 2007).

Methods and data

In order to analyse the determinants of foreign direct investment and the effects of local public policies in Hungarian counties the following general model was implemented:

$$FDI_{it} = \alpha + \beta X_{it} + \varepsilon_{it}$$

where the dependent variable (*FDI*) is the stock of foreign direct investment in each Hungarian county *i* (*i=1,…20*) at time *t* (*t=2000,……2011*), α is the constant term, X_{it} is a

(1,K) row vector of observations on the explanatory variables, and β is a (K,1) vector of fixed but unknown parameters[3]. The Hausman test (1978) was run to choose between the random and fixed effects model.

According to theoretical considerations and data availability, several explanatory variables were included in the model. Table 1 presents a description of the variables and their acronyms.

Tab 1. List of the explanatory variables and their acronyms

Variables	**Description**	**Acronyms**
Social welfare expenditure	County governments' social welfare expenditure/ Gross domestic product	SWE
Industrial parks	Number of industrial parks/number of enterprises with foreign direct investment	IP
Gross domestic product	Gross domestic product	GDP
Population	Resident population in each county	POP
Unit labour cost	(Average monthly gross wage x total employment)/Gross domestic product	ULC
National public roads	Length of roads per square kilometre	NPR

In order to detect the role of public policies in affecting foreign direct investment in Hungarian counties two measures were included: the ratio of local government social welfare expenditure to GDP at the county level (SWE), and the ratio of the number of industrial parks to the number of enterprises with foreign direct investment (IP). The inclusion of the first variable is consistent with the idea that the choice of FDI location is driven by local public expenditure benefits (Görg *et al.* 2009, amongst others). This type of local expenditure conveys useful information about social benefits: regular social support, reflecting the supply that each county provides in terms of public goods, services and redistribution, contributes to favour a more stable social and political environment. Furthermore, social benefits, by reducing income distribution inequality, discourage social conflict and create a propitious environment for FDI (Hacker 2002).

Regional policy can influence location choices of FDI and also promotes investment attractiveness by subsidising industrial parks (Hunya, 2014). Enterprises located in such parks can enjoy many advantages like infrastructure and support services from municipalities, tax incentives, favourable land use policy, property rights protection and labour discipline. In this model the *Ipari Park* variable takes on a twofold role: it conveys information on business facilitation policies, such as fiscal incentives provided at county level, and it is also an agglomeration measure which takes into account possible localization economies due to specialized clusters and technopoles. The literature underlines the role of agglomeration economies in attracting foreign investors. The presence of prior economic activity (Head and Rise, 1996; Cantwell and Iammarino, 2000) and spillover effects (Krugman, 1991; Cheng and

Kwan, 2000) influence a foreign firm's location choice. The presence of an industrial park is thus expected to encourage foreign investments and entrepreneurship.

Among the market-seeking determinants, the literature has demonstrated that market size is one of the main factors directly influencing foreign direct investment. Indeed, expected revenue of investment depends on demand, production and distribution capacity (Coughlin *et al*., 1991; Shapiro *et al*., 2008). Therefore, gross domestic product (GDP) and resident population (POP) are included in the model. They are expected to influence FDI stock with a positive coefficient.

Labour market conditions are another major element in FDI location choices. Among them, high labour costs, usually measured by wages, are considered a deterrent to FDI inflows (Coughlin *et al*., 1991). However, if labour productivity is low, low wages may not reveal low production costs (Carstensen and Toubal, 2004). On the basis of this consideration, the following productivity-adjusted unit labour cost (ULC) was included as a determinant of the FDI location decision:

$$ULC_{it} = \frac{W_{it} E_{it}}{GDP_{it}}$$

where *W* is the average monthly gross wage, *E* is total employment, and *GDP* is gross domestic product. Measuring also skill effects, the parameter of this variable may be positive, implying that firms are investing in superior technology requiring more skilled and better educated workers. The expected sign is thus uncertain (Deveraux and Griffith, 1998; Guimares *et al*., 2000; Boudier-Bensebaa, 2005).

It would also be interesting to test the effect of human capital endowments of Hungarian counties on foreign direct investment, but age-class data on the population are not classified in enough detail to construct the variables usually suggested by the literature.

As a measure of transportation infrastructure, the length of national public roads (NPRs) per square kilometre was considered. Reducing operating and distribution costs, such roads have been hypothesised as positively correlated with FDI location choices (Luo *et al.*, 2008).

It was not possible to consider the degree of openness and R&D expenditures among the FDI determinants due to the lack of data at sub-national level for the whole period. The data source is the Hungarian Central Statistical Office which collects all the macroeconomic data at local level except for the number of industrial parks collected by the Hungarian Ministry of National Development .

Results

This section presents the results of the econometric analysis (table 2).

Table 2. Econometric results: fixed effect model

Dependent variable: FDI stock		
Variables	**Coefficient**	**t- values**
Constant	-51.59**	-4.25
SWE	0.090*	1.81
IP	0.129*	1.76
GDP	1.22**	8.89
POP	2.69**	3.20
ULC	0.55*	1.72*
NPR	0.018	0.05
R^2 within	0.636	
R^2 between	0.575	
R^2 overall	0.57	
F statistics	56.65	
	(0.000)	
Hausman test	21.98	
	(p=0.001)	

p-values are in parentheses

** and ** indicate, respectively, significance at 10% and 1%*

The Hausman test rejects the null hypothesis, suggesting the adoption of a fixed-effects model.

The findings highlight the role played by the public authorities in attracting FDI in Hungarian counties. Local public social expenditure creates a favourable environment which is positively valued by foreign investors. Moreover, fiscal incentives, measured by the presence of *Ipari park*, further contribute to improve this advantageous context. The positive and significant parameter of *Ipary park* also indicates that the establishment of these special economic areas facilitates firms due to agglomeration economies.

Market size is an important determinant in explaining FDI location choices in Hungarian counties: GDP and population have a positive and significant impact on FDI, as indicated by the literature, underlining the influence of this market-seeking determinant.

Unit labour cost is positively related to FDI inflows. This is hardly surprising as the variable is not only a measure of labour cost, but also expresses skill endowments. This finding is consistent with the literature which, since Dunning (1993), has argued that efficiency-seeking product firms require an experienced labour force usually at higher wages. Some evidence in this direction has already been found for Hungarian counties (Boudier-Bensebaa, 2005, Békès, 2005a). Indeed, firms that decide to invest in Hungary belong to manufacturing and service sector. This result would be confirmed through estimation at sectoral level, but data on the sectoral wage at county level are not available.

Infrastructure endowments do not seem to affect FDI attractiveness as the corresponding parameter, albeit positive, is not significant. At present, for the sectoral composition of FDI in Hungary, the length of roads may not be a major determinant. It would

be interesting to investigate the role of information and communication technology, for example, but data are not disaggregated between individuals and firms.

Conclusions

This paper analysed the determinants of foreign direct investment in Hungarian counties by focusing on the role of public policies at the local level in attracting foreign investors.

An empirical model was estimated to analyse the impact of market size, labour market conditions, infrastructure endowments, social expenditure and policy incentives on FDI location at county level (NUTS3) in the period 2000-2011. The Hausman test suggests the adoption of a fixed effects model. Results show that redistributive local social welfare policies are positively valued by foreign investors. Agglomeration economies and special incentives, captured by the presence of industrial parks, have a significant and positive impact on FDI. Demand conditions also motivate foreign direct investment location choice, as expected. Unit labour cost, measuring skill endowment seems to encourage foreign investors. The latter results should be verified by including in the model some variables measuring workers educational attainments and/or with sectoral level analysis, but unfortunately related data are not available at county level. Finally, the infrastructure endowment parameter is not significant.

Further analyses, following the tax competition argument, could concern the revenue side of the public budget by analyzing the role of local business taxation in conditioning

investor behaviour. However, at present there are no data available for the whole period of our analysis.

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Notes

1. Budapest districts are marked in the maps as Pest county.

2. Disparities can also be found at sub-regional level, because most of the projects are located in larger towns: Hence, in 2009, the government launched the 'Investor-friendly settlements programme' to improve investment attractiveness at municipal and micro-regional level by directly supporting the activity of local authorities (Hunya, 2014).

3. All variables are expressed in logarithms.

WHAT CAN A CENTURY OF REGIONAL ECONOMIC GROWTH IN ITALY TELL US? VIEW FROM AN ALLOMETRIC PERSPECTIVE

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Abstract

We complement the study of regional growth convergence by applying a new approach based on allometry used in biology and zoology. We show that although Italian economic growth has generated a process of regional imbalance in which some local systems have developed complementarily to the delayed development of others, allometric convergence has occurred in macro areas. **Keywords**: Allometry, Economic Growth, Regional Convergence, Time-varying parameter model.

JEL Codes: C20, O11, O18, R11.

1. Introduction

In recent years an increasing number of studies have analysed the importance of a process of homogeneous regional growth rates in order to obtain substantial countrywide development. Given the scale and persistence of inter-regional disparities and sharp economic dualism, the Italian economy has been extensively studied. In particular, much empirical research has focused on the period 1960-1975 when the Italian regions experienced a period of significant convergence in income per capita. Later, however, despite decades-long economic policies implemented by the authorities to reduce the disparity among the Italian regions, the historical differences in the internal development of the Italian economy are still much in evidence today.

This paper complements the study of regional growth convergence by applying a new theoretical approach based on allometry. This approach has been used widely in biology and zoology and describes how the size of parts of an organism (in this case the regional growth rate of GDP per capita) is examined in relation to the size of the organism as a whole (the country's GDP per capita growth rate). Additionally, due to the lack of data availability, no analyses have been carried out on the regional convergence process using data prior to World War I. In this study we use a sample stretching from 1891 to 2007 (we extended the original dataset constructed by Malanima and Daniele, 2004, up to 2007). We apply a time-varying moment-based estimator proposed by Schlicht (1981 and 2005), and Schlicht and Ludsteck

(2006), thereby avoiding the problem of the initial values of the parameters, which are unknown. We find that Italian economic growth, differentiated in time and space, has generated a process of regional imbalance in which some local systems have developed complementarily to the delayed development of others. However, allometric convergence is found in macro areas, implying that macro areas are more homogeneous economic areas than the country as a whole. The paper is structured as follows: after the presentation of the formal model in the next section, section 3 describes the data and the estimation results. The final section concludes.

2. Empirical specifications

The allometric model is given by:

$$X_{j.t} = \beta X_{I,t}^{\alpha/\gamma} \qquad (1)$$

where

β is the constant term, $X_{j,t}$ is the GDP per capita growth rate of region j at time t, $X_{I,t}$ is the GDP per capita growth rate of Italy (the whole system) I at time t, the ratio α/ γ measures the relative growth of the whole country $X_{I,t}$ (system) in relation to the growth of the single

region $X_{j,t}$.

By transforming eq.(1) into logarithms a simple linear relationship is obtained:

$$\ln X_{j,t} = \ln \beta + \left(\alpha / \gamma \right) \ln X_{I,t} \qquad (2)$$

Setting $Z = \left(\alpha / \gamma \right)$, equation (2) becomes:

$$\ln X_{j,t} = \ln \beta + Z \ln X_{I,t} + \varepsilon_t \qquad (3).$$

In order to flatten out the fluctuation of the GDP growth rate, we applied the moving average to the series, calculated over a four-year period (MA(4)).

The novelty of the allometric approach is that we can analyse the growth path of a system in three ways: economic development when we have positive allometry; a diverging growth path when we have negative allometry; a steady-state growth path when there is isometric economic growth. From eq.(3) three hypotheses can be made about the coefficient *Z*. If $Z >$ l, the country (*i*) enjoys more rapid growth than the region (*j*), positive allometric growth *(economic development)*. If $Z <$ l, the country (*i*) has lower growth than the region (*j*),

negative allometric growth *(diverging economic growth)*. If $Z = 1$, country (*i*) and region (*j*) follow isometric economic growth *(the growth is steady-state)*.

First, Eq.(3) is estimated by the ordinary least squares method. The estimated value of Z will be verified under the hypothesis of equality to one through the t-student test. The next step is the "varying coefficients" (VC) method estimator. Following Schlicht and Ludsteck (2006) we consider a standard linear model:

$$X_{j,t} = a' X_{I,t} + u_t \qquad u_t \approx N\left(0, \sigma^2\right) \qquad t = 1,2,...T \qquad (4)$$

In the case in which the coefficients *a* are allowed to follow a random path, eq.(4) can be replaced by a system:

$$X_{j,t} = a' X_{I,t} + u_t \qquad u_t \approx N\left(0, \sigma^2\right) \qquad (5)$$

$$a_{t+1} = a_t + v_t \qquad v_t \approx N\left(0, \Sigma\right) \qquad (6)$$

with one signal equation (5), *n* state equations (6), one per time-varying parameter, and the variance-covariance matrix Σ assumed to be diagonal, that is

$$\Sigma = \begin{pmatrix} \sigma_1^2 & 0 & \cdots & 0 \\ 0 & \sigma_2^2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & \sigma_n^2 \end{pmatrix}$$

The VC method uses the minimization of the weighted sum of squares. In addition, under the assumption that the initial value of the coefficient is correct, Schlicht and Ludsteck (2006) show that the VC method and Kalman filter give very similar results.

3. Results

We focus on regional growth convergence in Italy using the allometric approach initially proposed by Coccia (2006) augmented with VC analysis. We employ regional GDP per capita calculated at constant 1951 prices[27]. The variables are expressed in logarithms. The sample runs from 1891 till 2007. Due to changes in the Italy's national borders (World Wars I and II) and political decisions to merge or divide internal regions, we consider 16 regions covering the whole country[28]. In Figure 1 all regions' GDP per capita are plotted: at the end of the 19th century the differences among the Italian regions were negligible; they started to increase

[27] The dataset until 2004 is provided by Daniele and Malanima (2007). We extended the original series until 2007 using data from the National Statistics Institute (ISTAT).

[28] The regions are grouped into three macro areas and labelled as follows. North: Lig (Liguria), Lom (Lombardy), Pie (Piedmont), Ven (Veneto); Centre: Abr (Abruzzo), Emi (Emilia Romagna), Laz (Lazio), Tos (Tuscany), Umb (Umbria); South: Bas (Basilicata), Cal (Calabria), Cam (Campania), Pug (Puglia), Sard (Sardinia), Sic (Sicily).

around 1915 and, apart from the period 1940-1945, they increased constantly. Figure 2 shows the growth rate of regional GDP per capita. Note the positive growth rate of the Italian regions during World War I (the opposite trend is found for World War II) and the negative growth at the beginning of the 1920s.

[Figure 1 about here]

Figure 1 Italian regions, GDP per capita

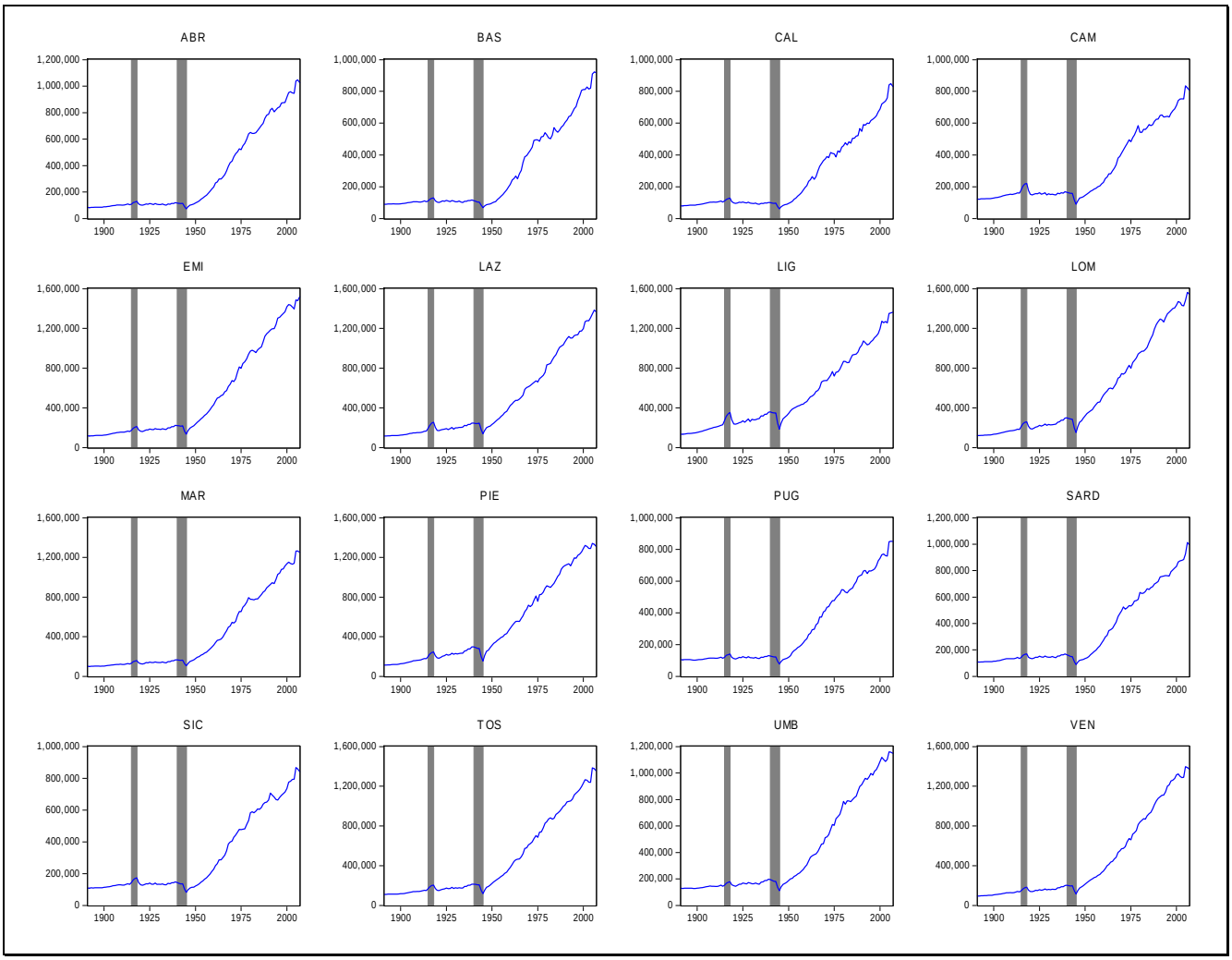
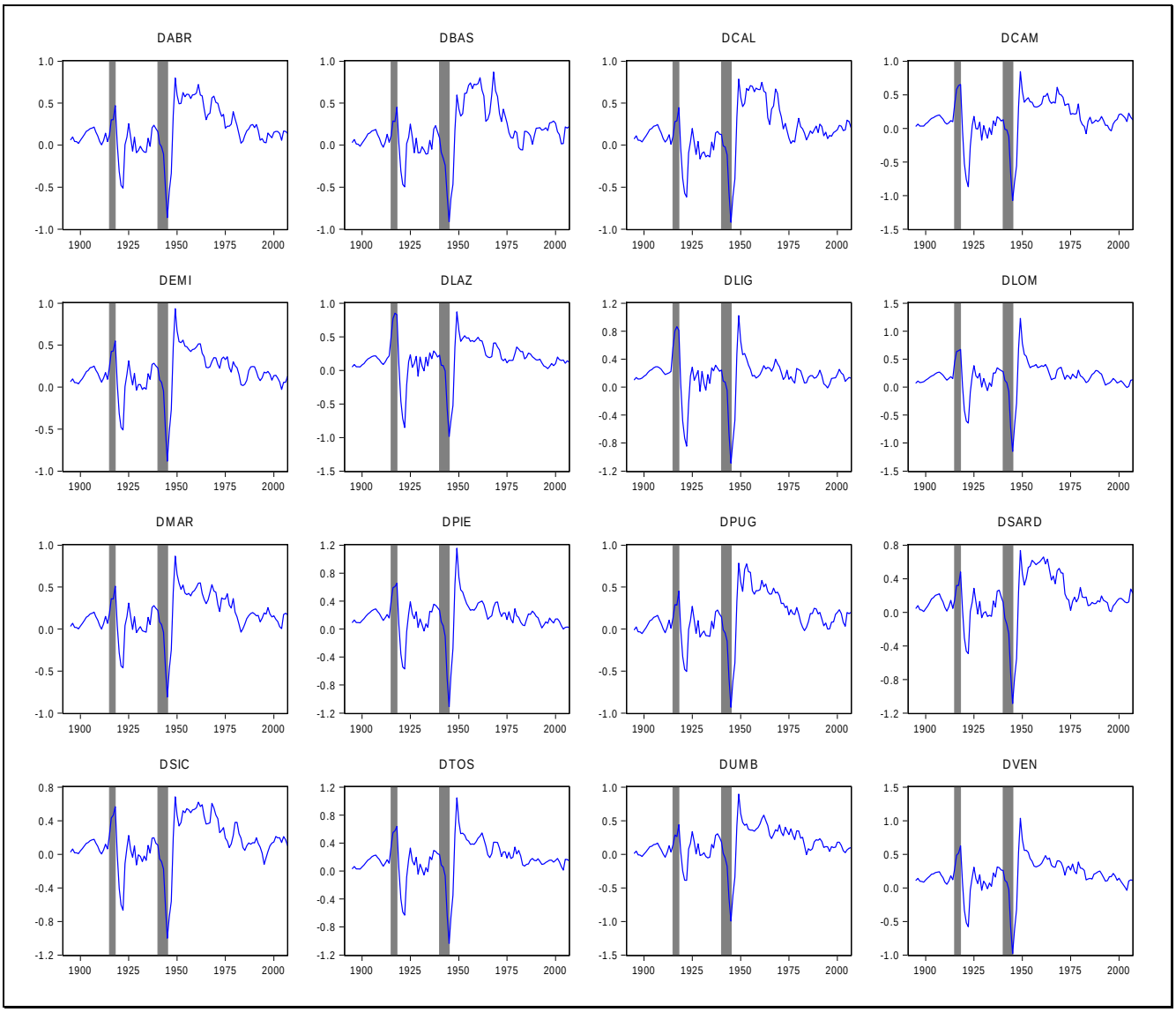


Figure 2 Regional GDP per capita growth rate



Empirical results are presented in Table 1, which shows (first column) the estimated parameters of equation (3) and the different types of regional growth in the Italian regions from 1891-2007: with a significance level of 5%, two regions have economic growth with positive allometry (Lombardy in the North and Campania in the South), five regions experience isometric growth and eight regions negative allometry. The results contradict the neoclassical convergence hypothesis that the poorest regions have higher growth than the richest.

Table 1 "Z" estimated parameters of equation (3)

REGIONS	***"Z" 1891-2007***	***H_0: Z=1 0.05***	***"Z" 1891-1940***	***H_0: Z=1 0.05***	***"Z" 1945-2007***	***H_0: Z=1 0.05***
PIEDMONT (PIE)	0.97	Isometry	0.99	Isometry /Allometry (+)	1.009	Allometry (+)
LOMBARDY (LOM)	1.03	Allometry (+)	1.07	Allometry (+)	1.04	Allometry (+)
VENETO (VEN)	0.94	Allometry (-)	0.90	Allometry (-)	0.97	Isometry
LIGURIA (LIG)	1.007	Isometry	1.29	Allometry (+)	0.93	Allometry (-)
EMILIA (EMI)	0.89	Allometry (-)	0.82	Allometry (-)	0.92	Allometry (-)
TUSCANY (TOS)	1.007	Isometry	0.99	Isometry	1.01	Isometry
UMBRIA (UMB)	0.88	Allometry (-)	0.63	Allometry (-)	0.94	Allometry (-)
MARCHE (MAR)	0.85	Allometry (-)	0.73	Allometry (-)	0.88	Allometry (-)
LAZIO (LAZ)	1.02	Allometry (+)	1.25	Allometry (+)	0.95	Isometry
ABRUZZI (ABR)	0.94	Allometry (-)	0.73	Allometry (-)	0.98	Isometry
CAMPANIA (CAM)	1.06	Allometry (+)	1.15	Allometry (+)	1.01	Isometry
BASILICATA (BAS)	0.94	Allometry (-)	0.69	Allometry (-)	0.97	Allometry (-)
PUGLIA (PUG)	0.93	Allometry (-)	0.72	Allometry (-)	0.98	Isometry /Allometry (+)
CALABRIA (CAL)	0.98	Isometry	0.80	Allometry (-)	1.00	Isometry
SICILY (SIC)	1.00	Isometry	0.91	Allometry (-)	0.99	Isometry /Allometry (+)
SARDINIA (SARD)	0.97	Allometry (-)	0.73	Allometry (-)	1.04	Allometry (+)

To further verify these results we replicate the estimation of equation (3) for two sub-samples. The third column of table 1 presents the results of the estimated parameters of equation (3) for the period 1891-1940. We added to equation (3) a dummy for the period 1915-18 (World War I in Italy). The results show better economic growth in northern and central regions (four out of five regions with positive allometry are from those areas) and worse in the south (five out of ten regions with negative allometry are now from the south). Once again, the neoclassical convergence hypothesis is not confirmed.

The fifth column of table 1 presents the results of the estimated parameters of equation (3) for the period 1945-2007. This period is characterized by the so-called Italian economic miracle (during the 1960s and early '70s) and substantial government intervention in the southern regions to boost growth. The results show better economic growth in the south (three out of the five regions with a positive allometric growth are now from that area), eight regions with isometric growth and five with negative allometry. Such results cannot be interpreted in terms of the neoclassical convergence hypothesis.

We then estimate equations 5 and 6 to check how the time-varying coefficient "*a*" (labelled '*Z*' in equation 3) for each region evolves over time. Figure 3 shows the behaviour of the allometric coefficients for the whole period. We grouped them for three macro areas: North, Centre and South.

Figure 3 Allometric convergence from country area analysis

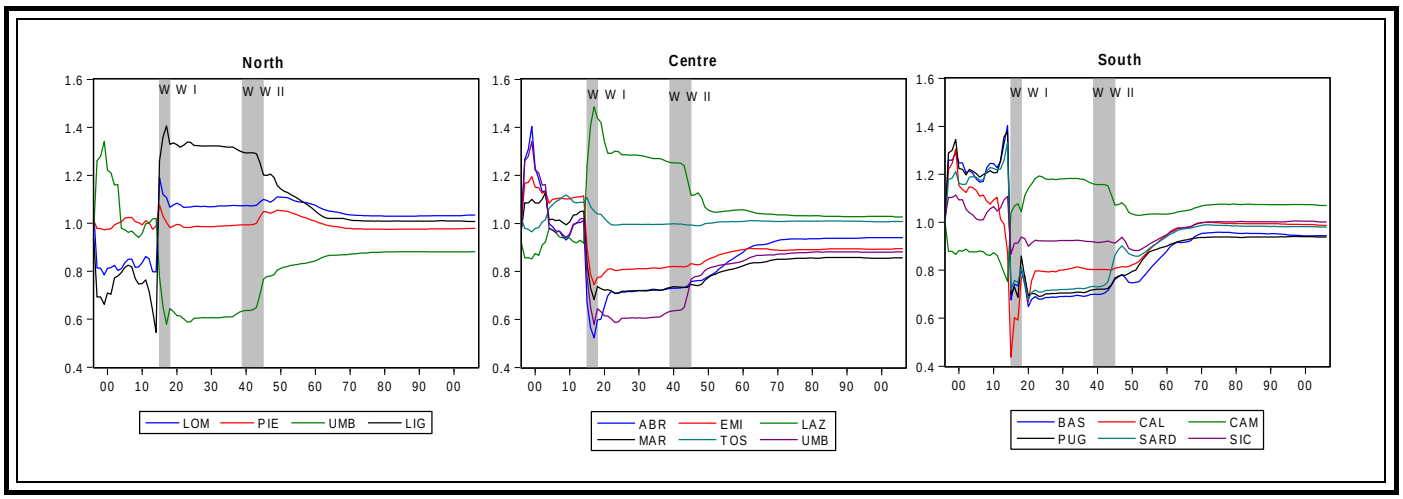


Figure 3 shows three singular results. First, before the 1920s there were no substantial differences in the allometric coefficients. Most of the southern and central regions were growing with positive allometry. However, the 1920s could be considered the breaking point in the coefficients. This may well be the result of economic policies implemented by previous governments in favour of more rapid economic growth in northern regions and special agreements made with southern landowners. Second, since the 1920s Italy's economy seems to have been dualistic, that is, there have been two different economies, one in the south and one in the north. However, our results show more dynamic growth paths among the regions in Italy. Finally, as also emerges significantly from Figure 3, although the three groups of regions do not show common convergence towards the Italy-wide growth rate, they present a

clear convergence path towards their own macro region. In order to make the last point unambiguous, we replicate the estimation of equations 5 and 6 for each macro area (North, Centre and South).

Figure 4 Allometric convergence upon macro area analysis

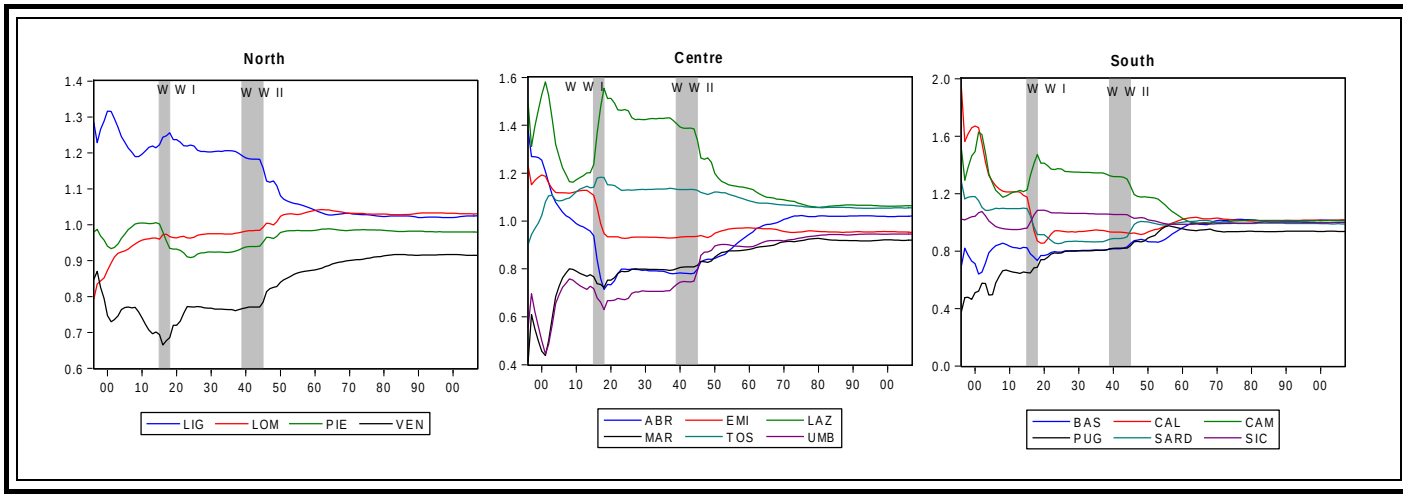


Figure 4 depicts the behaviour of the allometric coefficients for the whole period and for each macro area with respect to the average growth rate of the single macro areas. All the macro areas show clearly convergent paths; however, regions that belong to the south converge towards a considerably unique path of growth.

4. Conclusions

Using an evolutionary system approach with an allometric growth model we measured and evaluated the economic growth of territorial systems (Italian regions) in space and time,

compared to the macro system (Italy). This method shows that Italian economic growth, differentiated in time and space, has generated a process of regional imbalance in which the development of some local systems is complementary to the delayed development of the others. However, allometric convergence was found upon macro area analysis, suggesting that macro areas are more homogeneous in economic terms than the country as a whole.

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Decomposing the Wealth Effect on Consumption*

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Abstract

We decompose the wealth effect on consumption into its two components. First, we distinguish between exogenous and endogenous wealth changes (due to changes in prices or portfolio choice). Second, we distinguish between anticipated and unanticipated exogenous changes. We estimate the impact on consumption of the various components using microeconomic data on consumption, wealth, and subjective asset price expectations available from the 2008-10 panel of the Italian Survey of Household Income and Wealth. We estimate an overall wealth effect of about 3 cents per (unexpected) euro increase in wealth. This effect is driven primarily from a positive consumption response to house prices. The consumption response to anticipated changes in wealth is also large and significant, of the same magnitude as the response to unanticipated changes, and similarly driven by changes in housing wealth.

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1 Introduction

Whether and how much changes in wealth affect households consumption is crucial for understanding how asset prices impact the economy and to evaluate the role of monetary policy. The basic ideas and key theoretical links between wealth and consumption are typically described using the life-cycle permanent income model. According to this model, consumers accumulate and deplete their wealth in order to keep the marginal utility of consumption smoothed over time. In one version of the theory, interest rates are non-stochastic and income is the only source of uncertainty. It follows that changes in wealth reflect changes in earnings. In models with stochastic interest rates, however, households may experience an unexpected change in wealth even with constant income, due for example to asset price shocks, which will induce revisions in their optimal consumption plan. This is what is typically termed the "wealth effect".

There have been several attempts of estimating the wealth effect on consumption, using aggregate data (e.g., Lettau and Ludvigson, 2001 and 2004; Sousa, 2008) or household-level data (e.g. Dynan and Maki, 2001; Paiella, 2003; Juster et al., 2006). Cross-country comparative studies include Case et al. (2005 and 2011), Bertaut (2002) and Ludvig and Slok (2004). This research has partly being stimulated by the wide variability in asset prices of the last decades, in particular the stock market boom of the second half of the 1990s and its subsequent decline, as well as the house price boom and bust that culminated with the Great Recession of 2007-09.

Despite their explicit reference to the life-cyle permanent income model, most studies in the literature do not consider the distinction between anticipated and unanticipated changes in wealth. Another issue that is sometimes neglected in the empirical literature is the distinction between exogenous changes in wealth (due to asset price shocks) and endogenous changes (due to portfolio choice). In this paper we attempt to address both issues. To do so, we combine subjective asset price expectations from the 2008-10 Italian Survey of Household

Income and Wealth (SHIW) with ex-post price realizations to identify asset price shocks, which we then merge with data on beginning-of-period wealth to separate the unanticipated from the anticipated wealth variation. Italy is a particularly useful case to study, as household wealth is pretty high by international standards (the average wealth/income ratio is 8, compared to 6 in Germany and 5 in the US), real assets represent about 2/3 of total wealth, and debt (including mortgage debt) is low (about 80 percent of disposable income).

We argue that the "pure" wealth effect that is of interest in most of the literature is captured by the response of consumption to unanticipated wealth changes. In contrast, the response to expected wealth changes captures intertemporal substitution, not wealth effects. Since changes in asset prices reflect changes in the relative price of present vs. future consumption, the latter responds to both anticipated and unexpected wealth changes. This is unlike the distinction between anticipated and unanticipated income effects on consumption, where unanticipated income changes shift consumption but anticipated ones do not. We also isolate exogenous changes in wealth (due only to asset price shocks).

We report two main results. First, in our sample the overall wealth effect is around 1-3 cents per (unexpected) euro increase in wealth. This effect is driven primarily by a positive consumption response to house prices. In contrast, the effect of a variation in stock prices is statistically insignificant. Second, we find that the consumption response to anticipated changes in wealth is also large and significant, of the same magnitude as the response to unanticipated changes, and similarly driven by changes in housing wealth.

Our study is not the first to find evidence of a housing wealth effect exceeding the stock market wealth effect. Other studies finding similar results include Case et al. (2005, 2011), Bostic et al. (2009), Benjamin et al. (2004), and Campbell and Cocco (2007). Campbell and Cocco (2007) also distinguish between predictable and unpredictable changes and find that consumption responds to both.[1] They interpret the positive and significant effect

[1]Campbell and Cocco (2007) differs from our paper because they do not have access to subjective expectations data on house prices. To estimate the effect of predictable wealth changes on consumption they

of predictable wealth changes as an indication that house prices affect consumption by relaxing borrowing constraints, along the lines of the literature on the excess sensitivity of consumption to income changes. As argued above, however, a different interpretation is that a consumption response to anticipated changes in asset prices merely reflects intertemporal substitution. Another paper related to ours is Contreras and Nichols (2010), who distinguish between permanent and transitory shocks to housing returns and find that consumption responds to both, although the effect of permanent shocks is larger.

The rest of the paper is organized as follows. In section 2, we derive an estimation framework that allows us to distinguish between responses to anticipated and unanticipated changes wealth. In section 3 we describe the data and present our empirical strategy, while in Section 4 we report and discuss the results. Section 5 concludes.

2 Wealth effects and intertemporal substitution

Wealth effects on consumption are typically estimated by regressing consumption growth (or changes in consumption) on changes in wealth:

$$\Delta C_{it+1} = \alpha + \beta \Delta W_{it+1} + X'_{it+1}\gamma + \varepsilon_{it+1} \tag{1}$$

Differencing takes care of issues arising from omission of unobservable variables such as risk aversion or discount factor, which might vary systematically across the wealth distribution and contaminate estimation of the true relationship between consumption and wealth. There are several studies that take an equation like (1) as a starting point for a wealth effect analysis with micro data, such as Poterba (2000), Dynan and Maki (2001), Juster et al. (2006) and Christelis et al. (2011).

regress changes in consumption growth on house price growth and instrument house price growth with lagged values. To estimate the effect of unpredictable changes they regress consumption growth on the residual of their first-stage IV regression. Correctly separating anticipated from unanticipated wealth changes depends on the (strong) assumption that the econometrician conditions on the same information set as the individual.

Nevertheless, there are a number of problems with this regression. First, it is not clear that a regression of the change in consumption on the change in wealth measures the "wealth effect". In fact, changes in wealth arise from two different types of variation: (a) changes in the price of assets, for given portfolio composition, and (b) changes in portfolio composition, for given asset prices. To see this, note that in the presence of multiple assets, the consumer's budget constraint is defined by:

$$\begin{aligned} W_{it} &= \sum_j W_{it}^j = \sum_j p_t^j A_{it}^j \\ \sum_j W_{it+1}^j &= \sum_j R_{t+1}^j W_{it}^j + Y_{it+1} - C_{it+1} \end{aligned}$$

where W is end-of-period total wealth, Y and C are income and consumption, A^j are end-of-period shares of asset j with price p^j and gross return $R_{t+1}^j = \frac{p_{t+1}^j}{p_t^j}$, and W^j is wealth held in asset j. If there is a single asset, of course we have the usual constraint $W_{it+1} = R_{t+1}W_t + Y_{t+1} - C_{t+1}$.

We can decompose the change in wealth across two time periods as follows:

$$\begin{aligned} \Delta W_{it+1} &= \sum_j W_{it+1}^j - \sum_j W_{it}^j \\ &= \sum_j p_{t+1}^j \left(A_{it+1}^j - A_{it}^j\right) + \sum_j \left(p_{t+1}^j - p_t^j\right) A_{it}^j \\ &= \Delta W_{it+1}^E + \Delta W_{it+1}^X. \end{aligned} \tag{2}$$

The second equality comes from adding and subtracting $\sum_j p_{t+1}^j A_{it}^j$. ΔW_{it+1}^E is the change in wealth that results from portfolio shifts (and hence it is potentially endogenous), while

$$\begin{aligned} \Delta W_{it+1}^X &= \sum_j \left(p_{t+1}^j - p_t^j\right) A_{it}^j \\ &= \sum_j r_{t+1}^j W_{it}^j \end{aligned}$$

is the change in wealth that results from asset price changes (which is exogenous and not manipulable), and $r = R - 1$ is the net return.

What is commonly known as wealth effect is the response of consumption to exogenous changes in wealth (i.e., capital gains in housing or stocks). Hence, for the purpose of identifying the wealth effect, we rewrite (1) as:[2]

$$\begin{aligned} \Delta C_{it+1} &= \alpha + \beta \Delta W^X_{it+1} + X'_{it+1}\gamma + \varepsilon_{it+1} \\ &= \alpha + \beta \sum_j r^j_{t+1} W^j_{it} + X'_{it+1}\gamma + \varepsilon_{it+1} \end{aligned} \tag{3}$$

It is now worth noting that β in (3) captures two different effects. One is intertemporal substitution. If asset prices are expected to increase, consumers will modify their current consumption and saving decisions. The other effect is the actual wealth effect, i.e., the fact that unanticipated changes in asset prices induce households to modify their consumption. We can decompose the exogenous wealth increase to capture these two effects as:

$$\begin{aligned} \Delta W^X_{it+1} &= \sum_j \left(p^j_{t+1} - p^j_t\right) A^j_{it} \\ &= \sum_j \left(E_t p^j_{t+1} - p^j_t\right) A^j_{it} + \sum_j \left(p^j_{t+1} - E_t p^j_{t+1}\right) A^j_{it} \\ &= \sum_j E_{t-1} r^j_{t+1} W^j_{it} + \sum_j \left(r^j_{t+1} - E_t r^j_{t+1}\right) W^j_{it} \\ &= \Delta W^{XA}_{it+1} + \Delta W^{XU}_{it+1} \end{aligned} \tag{4}$$

where the second equality comes from adding and subtracting $E_t p^j_{t+1}$. Here ΔW^{XA}_{it+1} and ΔW^{XU}_{it+1} denote the anticipated and the unanticipated change in wealth, respectively. We can then rewrite equation (3) as:

$$\Delta C_{it+1} = \alpha + \beta_A \Delta W^{XA}_{it+1} + \beta_U \Delta W^{XU}_{it+1} + X'_{it+1}\gamma + \varepsilon_{it+1} \tag{5}$$

which allows for potentially different responses to anticipated and unanticipated wealth

[2] In some studies, researchers study the wealth effect associated to different types of assets, i.e., estimate:

$$\Delta c_{it+1} = \alpha + \sum_j \beta_j r^j_{t+1} W^j_{it} + X'_{it+1}\gamma + \varepsilon_{it+1}$$

where β_j measures the wealth effect associated to asset type j (housing, stocks, etc.).

changes. In this framework β_U captures the "pure" wealth effect on consumption. Regressions (1) and (3) may be unable to recover this parameter.

Unlike the distinction between anticipated and unanticipated income effects on consumption, where unanticipated income changes shift consumption but anticipated ones do not, in the wealth case both anticipated and unanticipated changes affect consumption. This can be seen clearly in an Euler equation framework:

$$\Delta C_{it+1} = \frac{1}{\gamma}\left(E_t r_{t+1} - \delta\right) + \xi_{it+1}.$$

Consumption responds both to expected changes in asset prices ($E_t r_{t+1}$), which determine the relative price of present and future consumption (the first term of 4), and to shocks to wealth induced by changes in prices (the second term of 4), which are included in the innovation term ξ_{it+1}. The parameter β_A in (5) is related to the effect of $E_t r_{t+1}$ on ΔC_{it+1}, while β_U is related to the effect of ξ_{it+1} on ΔC_{it+1}. As a consequence, estimation of a regression like (3) will yield a biased estimate of the wealth effect of consumption, with the sign of the bias depending on the magnitude of the wealth effect relative to the size of the elasticity of substitution.

3 Data

We use data from the Survey of Household Income and Wealth (SHIW), a representative survey of the Italian population. The SHIW is run bi-annually, and about half of the households are re-interviewed in the following survey. The survey collects detailed data on household consumption, income, wealth and portfolio composition, as well as demographic characteristics. We use the 2008 and 2010 surveys which include subjective expectation data on asset returns. Specifically, the survey collects individual expected returns for three broad asset classes: (a) safe assets; (b) stocks; and (c) housing. The survey technique that is used to obtain these expectations is similar to that discussed in Manski (2004), and consists of

eliciting information about two points of the subjective cumulative density function. For example, in the safe asset case household heads are first asked to report the chances that in a year's time the interest rate will be higher than today's, or Pr $\left(r^f_{t+1} > r^f_t | I_{it}\right)$ (where I_{it} is the respondent's information set at time t). Next, they are asked to report the chances that the rate will exceed today's rate by more than 1 percentage point (i.e., Pr $\left(r^f_{t+1} > r^f_t + 0.01 | I_{it}\right)$). In the stocks case, the two questions are Pr $\left(r^s_{t+1} > 0 | I_{it}\right)$ and Pr $\left(r^s_{t+1} > 0.1 | I_{it}\right)$. In the house price case, the question was asked only in 2010 and formulated slightly differently, as follows: Pr $\left(r^H_{t+1} < 0 | I_{it}\right)$ and Pr $\left(r^H_t < -0.1 | I_{it}\right)$.[3] The answers to these questions allow us to characterize the distribution of expectations of future asset returns at the individual level.

The subjective expectations questions were asked to the entire sample in 2008 and to a randomly selected subsample (about half of the overall sample) in 2010. On average, around 45% of household heads answer the first of the two questions. The rest reported a "do not know" answer. While the non-response rate is high, it is comparable to that obtained in other parts of the survey when asking questions involving a subjective judgement (such as lottery questions designed to measure risk aversion or intertemporal discounting). The high rate of non-response may be due to the complexity of the question. Non-responses may also reflect the fact that the subjective expectations questions were asked without preparing the respondents with a set of "warm up" questions. Finally, non-response may also reflect extreme uncertainty. Below, we present two sets of results: (a) we exclude the sub-sample answering "do not know", and (b) we impute expected returns using a model of expectation formation (as described in Section 3.1.3).

Table 1 reports the distributions of subjective expectations of asset returns, excluding cases where individuals responses imply a declining c.d.f., i.e., individuals who report

[3] The exact wording of the three questions is in the Appendix. Note that it is only in the safe asset case that people are asked to report expectations about future interest rates. In the two other cases, people are asked to report expectations about prices (of stocks and housing, respectively). We convert expectations about prices into expectations about returns using $R^j_{t+1} = \frac{p^j_{t+1}}{p^j_t}$.

$\Pr\left(r^f_{t+1} > r^f_t + 0.01|I_{it}\right) > \Pr\left(r^f_{t+1} > r^f_t|I_{it}\right)$ (15 percent of the total). For stocks and housing, we drop 6 percent and 10 percent of the sample, respectively. In Panel A of Table 1, we report the distribution of $\Pr\left(r^f_{t+1} > r^f_t|I_{it}\right)$ (first column) and of $\Pr\left(r^f_{t+1} > r^f_t + 0.01|I_{it}\right)$ (second column). Note that in the first column we report the unconditional distribution, while in the second column we report the conditional distribution, as the follow up question was only asked to those who answered the first question and did not report $\Pr\left(r^f_{t+1} > r^f_t|I_{it}\right) = 0$. When asked about the chances of an increase in interest rates, 25% of households assigned a positive chance. Of these, 12% gave a zero chance to the event of an interest rate increase of one percentage point or more. Panel B and C repeat the same analysis for stock market returns and house prices. When asked about a stock market gain, 28% of households assigned a positive chance to that event. When asked about housing, 31% of households expected a drop in prices.

Studies of probabilistic expectations have pointed out that responses to such questions exhibit rounding to focal values, such as 5%, 10% and 25%. In addition, there is commonly heaping in responses at values of 0%, 50%, and 100%. We observe a similar phenomenon in our data (see Figure 1, where we plot the response distribution to the question on a positive stock market return), even though it seems less severe than in other surveys.[4]

3.1 Empirical strategy

While the surveys we use include subjective expectations of asset returns which are rarely collected in survey data, the data have also some limitations. First, since we observe only two points of the cumulative density function, we need to impose distributional assumptions in order to recover the expected value of asset returns from the data; second, data are biannual; third, there is a timing discrepancy between the reported value of the stock of assets (which refers to the end of calendar years t and $t+2$) and expected returns (which are collected at the time of the interview, typically in the middle of calendar years $t+1$ and

[4]Response distributions for the other two asset classes look qualitatively similar.

$t+3$); finally, as remarked above, there is non-negligible non response on the subjective expectations questions.

We now discuss how we tackle these four issues. Whenever possible, we test for our assumptions or conduct robustness checks.

3.1.1 Distributional assumptions

The responses to the probabilistic expectations questions can be used to fit individual specific subjective distributions. To compute the first two moments of these distributions, we need to make assumptions about the underlying density. We assume that household's i expectations for the return on asset j are normally distributed with mean $E_t r_{t+1}^j$ and variance $var_t r_{t+1}^j$ (where $E_t x = E(x|I_{it})$ and $var_t x = var(x|I_{it})$). In practice, each household head in the sample is asked to report:

$$\begin{aligned}
\Pr\left(r_{t+1}^j > \alpha^j | I_{it}\right) &= \Phi\left(\frac{E_t r_{t+1}^j - \alpha^j}{\sqrt{var_t r_{t+1}^j}}\right), \\
\Pr\left(r_{t+1}^j > \beta^j | I_{it}\right) &= \Phi\left(\frac{E_t r_{t+1}^j - \beta^j}{\sqrt{var_t r_{t+1}^j}}\right)
\end{aligned}$$

where r^j denotes the return on financial asset j ($j = f, s$), and $\Phi(.)$ denotes the c.d.f. of the standard normal distribution. In the safe asset case, $\alpha^f = r_t^f$ and $\beta^f = r_t^f + 0.01$; in the stocks case, $\alpha^s = 0$ and $\beta^s = 0.1$. In the house price case, people are asked:

$$\begin{aligned}
\Pr\left(r_{t+1}^H < \alpha^H | I_{it}\right) &= 1 - \Phi\left(\frac{\alpha^H - E_t r_{t+1}^H}{\sqrt{var_t r_{t+1}^H}}\right), \\
\Pr\left(r_{t+1}^H < \beta^H | I_{it}\right) &= 1 - \Phi\left(\frac{\beta^H - E_t r_{t+1}^H}{\sqrt{var_t r_{t+1}^H}}\right)
\end{aligned}$$

and $\alpha^H = 0$ and $\beta^H = -0.1$.

We observe the probabilities on the left hand side from subjective reports, and α^j and β^j are either constant or depend on r_t^f which we set equal to the actual value observed in the

year of the interview. This hence becomes a system of two equations in two unknowns that can be solved for $E_t r^j_{t+1}$ and $var_t r^j_{t+1}$. Note that, in order to estimate ($E_t r^j_{t+1}$, $var_t r^j_{t+1}$), we can only use respondents who answer both questions on the expected return on asset j. If more than two questions were available, one could improve the precision of the estimates or fit more flexible distributions. Moreover, the system would be over-identified. One important question is whether the assumption of normally distributed returns is appropriate. This assumption is clearly strong, but as the actual distribution of the Italian FTSE MIB returns shown in Figure 2 suggests, it is not unreasonable.[5]

In the safe asset case, the identification of the reference return r^f is somewhat complex, as the survey question makes reference to no specific safe asset (it just refers generically to the "interest rate"). We assume that the reference return is the one that investors would earn on a basket composed of bank deposits and government bills and bonds, whose returns have moved in parallel until the end of 2010. We use the average before-tax return on deposits at the end of 2008 (1.7%) and the end of 2008 return on a basket of government bonds of different maturity (4.4%). For stocks and housing, no knowledge of returns in required as households are asked the probability of a gain (a loss for housing), and the probability that the gain (loss) is 10 percent or more.

3.1.2 Bi-annual data

The regression equation (5) assumes access to annual data. However, the SHIW data are collected every other year (2008 and 2010 in our specific case). Hence we observe consumption and wealth data for 2008 and 2010 ($C_{i,08}$, $C_{i,10}$, $W_{i,08}$ and $W_{i,10}$), and one-year ahead expected returns $E_{08} r_{09}$. We adapt our estimation framework to the timing of data collection. To see how we get the equivalent of equation (5) in the bi-annual data case, start by rewriting equation (3) for a single asset in terms of the frequency of our data (omitting controls for

[5] Dominitz and Manski (2011) also make a normality assumption.

brevity):

$$\begin{aligned}\Delta C_{i,10} &= \alpha + \beta r_{10} W_{i,09} + \varepsilon_{i,10} \\ \Delta C_{i,09} &= \alpha + \beta r_{09} W_{i,08} + \varepsilon_{i,09}\end{aligned}$$

Summing up the two equations (and assuming that asset holdings in 2009 are approximately equal to those in 2008, as we do not have any information about asset holdings in 2009),[6] we obtain:

$$\begin{aligned}C_{i,10} - C_{i,08} &= \tilde{\alpha} + \beta \left(r_{10} W_{i,09} + r_{09} W_{i,08}\right) + \varepsilon_{i,10} + \varepsilon_{i,09} \\ &= \tilde{\alpha} + \beta \left(p_{10} - p_{08}\right) A_{i,08} + \varepsilon_{i,10} + \varepsilon_{i,09} \\ &= \tilde{\alpha} + \beta \left(\left(1 + r_{09}\right)\left(1 + r_{10}\right) - 1\right) W_{i,08} + \varepsilon_{i,10} + \varepsilon_{i,09}\end{aligned}$$

which is the equivalent of (3).

We next distinguish between anticipated and unanticipated wealth effects and write:

$$\begin{aligned}C_{i,10} - C_{i,08} &= \tilde{\alpha} + \beta_U \left[\left(\left(1 + r_{09}\right)\left(1 + r_{10}\right) - 1\right) - E_{08}\left(\left(1 + r_{09}\right)\left(1 + r_{10}\right) - 1\right)\right] W_{i,08} \\ &\quad + \beta_A E_{08}\left(\left(1 + r_{09}\right)\left(1 + r_{10}\right) - 1\right) W_{i,08} + \varepsilon_{i,10} + \varepsilon_{i,09}\end{aligned}$$

Note that we do not observe $E_{08} r_{10}$, the two-year-ahead price or return expectation. Assume that individuals know that annual returns follow an AR(1) process, i.e.,

$$r_t = \rho r_{t-1} + \xi_t$$

We can estimate ρ from data, and use the law of iterated expectations to write:

$$E_{08} r_{10} = \rho E_{08} r_{09}$$

so that:

$$E_{08}\left(\left(1 + r_{09}\right)\left(1 + r_{10}\right) - 1\right) \approx \left(1 + \rho\right) E_{08} r_{09}, \tag{6}$$

[6] This is an assumption that may be acceptable for housing, business wealth, and for other financial assets in the presence of inertia or adjustment costs.

if the term $r_{09}r_{10}$ is negligible. Since ρ is pre-estimated, we bootstrap the standard errors. Hence our estimating equation becomes:

$$\begin{aligned} C_{i,10} - C_{i,08} &= \tilde{\alpha} + \beta_U \left[(r_{09} + r_{10}) - (1+\rho) E_{08} r_{09} \right] W_{i,08} \\ &\quad + \beta_A (1+\rho) E_{08} r_{09} W_{i,08} + \varepsilon_{i,10} + \varepsilon_{i,09} \end{aligned} \tag{7}$$

which is the equivalent of (5) adapted to the bi-annual data case.

3.1.3 Timing discrepancy

Interviews for the SHIW are typically conducted between January and October, while consumption and wealth refer to the previous calendar year. At the time of the interview, households report their expectations about asset returns over a one-year horizon. This means that while the ideal expectation of the return would be $E_{08:12} r_{09:12}$ (i.e., the expected 1-year return elicited at the end of 2008), we have instead $E_{09:m} r_{10:m}$, where m is the month of the interview. Expectations provided in the middle of year 2009 may contain new information (e.g., monetary policy intervention) released between the end of the previous calendar year 2008 and the time of the interview. This timing discrepancy may therefore induce a spurious correlation with the error term of (7). To address this issue we model expectation formation (as we illustrate below) and correct for the timing discrepancy. Our expectation formation model also allows us to impute expected returns to those who do not answer the survey questions.

Let $E_{09:m} r_{10:m}$ denote household i expectation of one year return r, with m denoting the month of the interview. We assume that subjective expectations of returns are a function of a set of demographic controls that are constant or evolve deterministically over time and of past actual returns, as follows:

$$E_{09:m} r_{10:m} = \gamma_0 + \sum_{\tau=1}^{T} \gamma_\tau r_{09:m-\tau} + \gamma_x X_i + \nu_i \tag{8}$$

We set $T = 6$. Predicted subjective expectations of annual returns at the end of 2008 are obtained using:

$$\widehat{E}_{08:12} r_{09:12} = \widehat{\gamma}_0 + \sum_{\tau=1}^{T} \widehat{\gamma}_\tau r_{08:12-\tau} + \widehat{\gamma}_x X_i, \tag{9}$$

where $r_{08:12-\tau}$ denotes the return in month 2008:12-τ. Clearly, the richer X_i, the greater the variability of predicted values.

In practice, we estimate the expectation model in (8) using subjective expectations of returns on stocks, and subjective expectations of returns on deposits and on bonds, available from the 2008 survey. The survey does not ask expectations of house prices. Hence, we retrieve this information from the 2010 survey to fit the expectation model and then predict expectations as of end of 2008. We assume that house price expectations depend on past prices in the province where the household lives, which we compute averaging self-reported house values from the SHIW. Predictions based on equation (9) are then used to compute the anticipated change in wealth. The difference between predictions as of end of 2008 and realizations in 2009 is used to compute the unanticipated change.

The estimating equation (7) now becomes:

$$\begin{aligned} C_{i,10} - C_{i,08} &= \tilde{\alpha} + \sum_k \beta_U^k \left[\left(r_{09}^k + r_{10}^k \right) - \left(1 + \rho^k \right) \widehat{E}_{08} r_{09}^k \right] W_{i,08}^k \\ &\quad + \sum_k \beta_A^k \left(1 + \rho^k \right) \widehat{E}_{08} r_{09}^k W_{i,08}^k + \varepsilon_{i,10} + \varepsilon_{i,09} \end{aligned} \tag{10}$$

where we have also allowed for the fact that we estimate the wealth effect for k different asset, where k = deposits and bonds, stocks, and real assets.[7]

3.1.4 Non-response

We approach the problem of non-response to the subjective expectations questions in two different ways. First, we analyze behavior of a reduced sample of households who respond to the subjective questions (the "Respondents" sample). Second, we impute expected returns

[7] As return on small firm shares, which are included in the real assets, we take the return on stocks. In fact, between 1995 and 2010, the return of small firm shares, based on the SHIW, tracked closely the return on the FTSE MIB, which is the stock market index of the main stock exchange in Italy.

to non-respondents using the estimates of expectation formation model discussed above (the "Whole sample"). Since non-response may be non-random, we correct our estimates for sample selection in the estimation of the expectation model in (8).

4 Empirical results

4.1 Heterogeneity of individual expectations

Table 2 reports the percentiles of the distributions of the estimated means and standard deviations of one-year ahead expectations of the returns on bank deposits, government bonds and stocks, from the 2008 survey, and housing, from the 2010 survey. When examining the findings it is helpful to have a sense of actual returns in the year preceding and following the elicitation of the expected returns. Hence, in the last two rows of the table, we report also ex-post return realizations in 2008 and 2009.

Estimates exhibit a high degree of heterogeneity. For bank deposits, the interquartile range of the expected return is about 200 basis points. Realized returns on deposits were 2.17% in 2008, and 1% in 2009, on average. Since the average expected return is 0.93%, most respondents expected returns to fall, relative to 2008. Their forecasts were indeed correct, and very close to the actual 1% return. Similar considerations apply to expectations of returns on government bonds. The average expected return was 3.6%, which is very close to the realized 3.54%. For stocks, the median expected return is -4.86%. In 2008, the Italian stock market experienced a dramatic loss, equal to almost 50 percent of its value. The decline continued until March 2009. The table suggests that most respondents expected losses on stocks also in the year ahead, but expected such losses to be much smaller than those of the previous year. Expectations, however, fell short of realizations. In fact, by the end of 2009, the stock market index was up 16.52% with respect to the beginning of the year. Finally, according to SHIW-based estimates, the average return on housing was 1.6% per year in the 2007-2008 period and 1.03% in the 2009-2010 period. In contrast, the median expected

return on housing in 2011 was much higher, at 4.31%.

The comparison between expectations and realizations shows that individual expectations were significantly close to realized returns for assets whose returns were relatively easier to predict, such as deposits or government bonds. For stocks and housing, however, the expectations were not matched by realizations. What matters, of course, is not that people formed imperfect expectations when choosing their consumption and portfolio composition, but that they acted upon such expectations (however imperfect they were).

4.2 Expectations model

Table 3 reports summary statistics of predicted individual expectations based on the estimation of the expectations model in (8). Table A1 in the Appendix reports two-step estimates of the model, where we try to correct for any sample selection due to non-random non-response to the subjective expectations questions. To control for selection, we use three variables based on information provided by the interviewers regarding the general level of understanding of the survey questions, the reliability of the answers on household income, and the general atmosphere in which the interview took place. Besides these three variables, we add a dummy for answering other subjective expectations questions in the survey. These four variables are jointly strongly significant in the probit for the probability of answering the expected returns questions (p-value $<$ 1 percent). The Mills ratio based on this probit regression has a positive and significant coefficient in the expectation model for stocks, bank deposits, and government bonds, which suggests that self-selection is likely to be indeed an issue and lack of control may bias the estimates. Also, the positive coefficient implies that respondents tend to expect higher returns than the average household in the survey. The Mills ratio is not significant in the regression for housing.

Panel A of Table 3 reports predictions for expected returns as of end of 2008 based on equation (9). Panel B displays the ex-post returns realizations for 2009. Finally, Panel C reports expectation errors computed as the difference between return realizations in 2009 and

predicted expectations for 2009. The error is largest for stocks, around 30 percentage points. It is large also for housing, around 10 percentage points. This confirms the descriptive results presented above.

4.3 Wealth effect estimates

Our wealth effect estimates are based on a sample which is selected as follows. First, since we need to observe changes in consumption, we restrict the sample to the panel households, about 60 percent of the 2008 sample. Then, we drop households headed by individuals aged less than 18 or more than 80 (7 percent of sample). To reduce the influence of outliers, we drop households whose consumption halved or doubled between 2008 and 2010 (1 percent), those whose annual saving amounted to more than 10 times their total wealth (2 percent), and those with zero assets (including housing) (2 percent)[8]. Finally, we drop observations with anomalous reports on the subjective expected returns questions (1 percent of our sample). In our regressions, consumption consists of household expenditure on non-durable goods. Total assets are the sum of financial assets, which include end-of-year holdings of bank deposits, government and corporate bonds, and stocks, and real assets, which include end-of-year holdings of real estate (land and buildings) and shares of private businesses.

Tables 4 report the results of the estimation of the wealth effect regression (10), using the approximation in (6) for expectations of returns two years ahead. Estimates of the AR(1) process for the annual returns for such approximation are in Table A2 of the Appendix. The estimated AR(1) coefficient, ρ, ranges from 0.46 for stocks to 0.74 and 0.75 for bank deposits and bonds. For housing, information on past prices is limited and fitting the AR(1) model is not feasible. Since house prices exhibit a high degree of persistency, we set $\rho = 1$. All

[8] While in principle one would need to correct estimates for the self-selection arising from using only asset holders, in our sample this is unlikely to be an issue as only 2 percent of households have non-positive total assets.

regressions include a set of socio-demographic variables, listed in the note to the table, which allows us to control for differences in factors that may vary across the wealth distribution and contaminate the true relationship between changes in wealth and changes in spending.

Estimates in the first six column of the table are based on the "Respondent" sample. Estimates in the last three columns are based on a larger sample that includes non-respondents to the subjective expectations questions. In the first three columns, anticipated and unanticipated gains on financial assets are based on individual expectations as computed directly from the answers to the expectations questions, i.e. diregarding any time discrepancy between date of interview and date to which wealth stocks refer to. Gains on housing are always predicted as of end of 2008 using the expectation model estimated on data from the 2010 survey. We estimate that the overall wealth effect is significant and around 3 cents per unexpected euro increase in total assets. The response of consumption to anticipated changes in wealth is also significant and around 3.5 cents per euro variation. As shown in column (2) and (3), both effects are driven by real assets. In fact, when we distinguish between financial assets (as an aggregate or disaggregated into deposits and bonds, and stocks) and real assets, the effects on consumption of expected and unexpected gains on the former are both statistically insignificant, whereas the effects of gains on the latter are significant and of the same order of magnitude of the effects of gains on total assets. Consumption does not appear to respond to expected gains nor to unexpected gains on stocks even if we restrict the sample to stockholders (regressions available upon request).

Our 3% real wealth effect estimate is in line with the findings of Engelhardt (1996) for the US, regarding consumption response to gains on housing, and the estimates obtained by Disney, Henley and Jevons (2003) for the UK. However, unlike our framework, both papers look at realized gains without distinguishing between anticipated and unanticipated ones. Furthermore, our finding that consumption responses are smaller, if not negligible, for financial assets than for non-financial assets is in line with the evidence from other studies, including Case et al. (2005) and Guiso et al. (2006).

In the rest of the table, anticipated and unanticipated wealth gains are determined using predicted expectations as of end of 2008 for all assets involved, using the strategy discussed in section 3.1.3. Estimates on the "Respondents" sample are very similar to those based on actual expectations. Our results are robust to changes in the specification of the expectation model for housing returns intended to increase the degree of heterogeneity in predicted expectations.

When we extend the analysis to the "Whole sample", we obtain smaller effects: the consumption response to either anticipated or unticipated wealth changes is about 1.3 cents per euro, but the effects are still entirely driven by real assets. The smaller response could reflect measurement error in the expectation variables. If respondents and non-respondents differ in their expectation formation mechanis and our expectation model does not fully capture such heterogeneity, expectations imputed using respondents data may not be a good description of non-respondent beliefs, leading to some attenuation bias.

5 Conclusions

In this paper, we decompose the wealth effects on consumption into its various component using subjective expectation data. Individual expectations are important determinant of choice and most economic models assign a central role to expectations regarding asset prices, future income and individual mortality. Nevertheless, the collection of expectation data is rare. Given the lack of data, researchers have typically adopted *ad hoc* assumptions and measured individual expectations using past realizations.

In our work, we combine subjective expectations data of asset returns with ex-post return realizations to distinguish between anticipated and unanticipated changes in wealth and investigate the separate consumption response to expected and unexpected changes in asset prices. Moreover, we stress that another important distinction (which is often neglected in the empirical literature on the wealth effect) is that changes in wealth are partly exogenous,

i.e. related to variations in asset prices, and partly endogenous, i.e. related to portfolio shifts. The availability of expectation data on returns allows us also to focus on exogenous changes in wealth.

We find that the consumption response to unexpected exogenous changes in wealth, i.e. the "pure" wealth effect, amounts to around 3 percent. Also, consumption responds to expected changes in asset prices, which we argue reflects intertemporal substitution. Both effects are driven by a positive consumption response to changes in house prices. Why is consumption unaffected by exogenous shocks to stock market returns? A possibility is that the extreme uncertainty surrounding the Italian stock market during our sample period may have induced households to "wait and see" before monetizing gains (or losses), a form of precautionary behavior response. The housing market was also volatile, but local factors induced much more heterogeneity. Moreover, the continuing credit market liberalization process may have resulted in better opportunities to borrow against the (modest) housing wealth gains experienced during our sample period.

A Appendix: The subjective expectation questions

The 2008 and 2010 Italian Surveys of Household Income and Wealth have a section designed to elicit individual expectations of future asset returns. Each participant in the survey is asked a set of probabilistic questions tightly worded along the lines set by Manski in several studies (e.g., Manski, 1990 and 2004). Specifically, the 2008 survey includes the following questions:

1) On a scale from 0 to 100, what is the likelihood that in a year's time interest rates will be higher than today?

2) (If you gave a figure for Question [1]) What is the likelihood that they will be more than 1 percentage point higher?

3) On a scale from 0 to 100, what is the likelihood that if you invest in the Italian stock market today you will obtain a profit in a year's time?

4) (If you gave a figure for Question [3]) What is the likelihood that your investment will earn more than 10%?

Respondents can either give a probability or answer "do not know".

Besides these same questions, the 2010 survey includes also the following questions:

5) On a scale from 0 to 100, what is the likelihood that in a year's time house prices will be lower than today?

6) (If you gave a figure for Question [5]) What is the likelihood that they will fall more than 10%?

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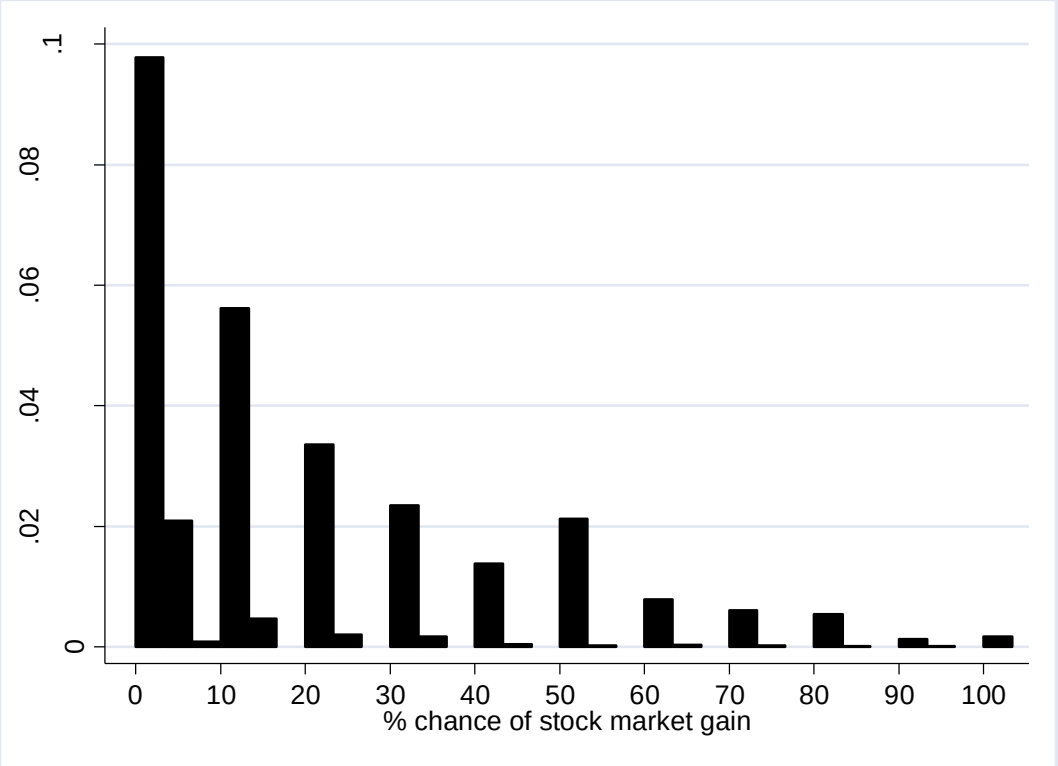
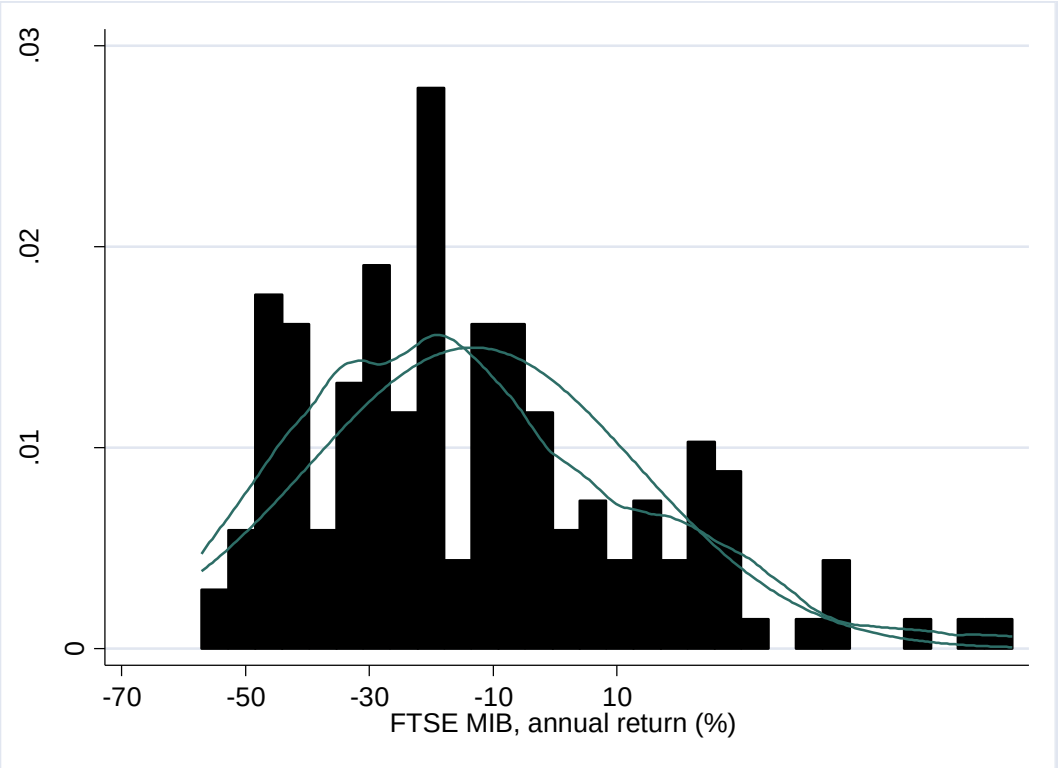
Figure 1
Distribution of Responses to the Survey Question
Eliciting the Probability of a Stock Price Increase (2008 SHIW)



Note: We drop observations where individual responses imply a declining c.d.f..

Figure 2
Distribution of Annual Returns to the Italian Stock Market (2008-2010)



Note: Distribution of annual returns to the Italian FTSE MIB, 2008-2010 (end-of-week values). Weekly returns have been averaged over the previous 52 weeks and then annualized. The mean annual return is -13 percent, with a standard deviation of 27 percent. The curves represent a fitted normal distribution (with the same mean and standard deviation), and a kernel density estimate of the empirical density.

Table 1
Subjective Expectation Responses: Descriptive Statistics

Panel A: Interest rate on safe assets (*2008 SHIW*)

Response interval	$r_{t+1} > r_t$ N	$r_{t+1} > r_t$ Sample Proportion	$r_{t+1} > r_t+0.01$ N	$r_{t+1} > r_t+0.01$ Sample Proportion
0%	633	9%	199	12%
1-25%	751	11%	711	42%
25-50%	549	8%	253	15%
50-75%	184	3%	50	3%
75-100%	200	3%	12	1%
Do not know	4,480	66%	459	27%
All	6,797	100%	1,684	100%

Panel B: Stock prices (*2008 SHIW*)

Response interval	$p_{t+1} > p_t$ N	$p_{t+1} > p_t$ Sample Proportion	$p_{t+1} > 1.1p_t$ N	$p_{t+1} > 1.1p_t$ Sample Proportion
0%	797	11%	587	29%
1-25%	1,237	17%	977	48%
25-50%	571	8%	143	7%
50-75%	138	2%	22	1%
75-100%	81	1%	5	0%
Do not know	4,642	62%	293	14%
All	7,466	100%	2,027	100%

Panel C: House prices (*2010 SHIW*)

Response interval	$p_{t+1} < p_t$ N	$p_{t+1} < p_t$ Sample Proportion	$p_{t+1} < 0.9p_t$ N	$p_{t+1} < 0.9p_t$ Sample Proportion
0%	847	23%	354	31%
1-25%	674	18%	510	44%
25-50%	324	9%	97	8%
50-75%	91	2%	12	1%
75-100%	71	2%	7	1%
Do not know	1,653	45%	189	16%
All	3,660	100%	1,160	100%

Note: From the initial sample we drop those observations where individual responses imply a declining c.d.f.. In the 2010 SHIW, subjective expectations questions are asked only to a randomly selected half of the sample.

Table 2
Subjective expectations of returns: descriptive statistics

Percentile	*Bank deposits*[(i)] Mean (%)	*Bank deposits*[(i)] Standard dev. (%)	*Long-term bonds* Mean (%)	*Long-term bonds* Standard dev. (%)	*Stocks (FTSE MIB)* Mean (%)	*Stocks (FTSE MIB)* Standard dev. (%)	*Housing* Mean (%)	*Housing* Standard dev. (%)
5th	-1.80	0.21	0.87	0.22	-35.27	2.19	-9.54	1.77
25th	-0.18	0.78	2.49	0.78	-16.53	2.66	1.15	2.66
Median	1.30	1.70	3.97	1.70	-4.86	9.73	4.31	9.73
75th	1.73	2.75	4.40	2.75	-1.82	22.73	16.60	22.73
95th	2.78	4.08	5.40	4.08	6.16	36.68	40.23	36.89
Mean	0.93 (1.55)		3.60 (1.56)		-9.59 (13.46)		9.59 (15.47)	
N	1,204	1,204	1,204	1,204	1,703	1,703	965	965
Average realized return:								
in 2008:	2.17%		4.46%		-48.84%			
in 2009:	1.00%		3.54%		16.52%			
in 2007-2008:							1.59%	
in 2009-2010:							1.03%	

Note: Realized returns on housing wealth are based on household self-reported house prices taken from the 2006, 2008 and 2010 SHIW surveys. Returns are based on changes in average prices by province and are per year.

Table 3
Expected and realized returns on assets

	(1) Bank deposits	(2) Bonds	(3) Stocks	(4) Housing
(A)Average expectations 2008-09				
Estimation Sample	0.76%	3.39%	-12.80%	10.69%
	(0.48%)	(0.48%)	(4.64%)	(6.06%)
Whole sample	0.73%	3.36%	-15.40%	10.31%
	(0.43%)	(0.43%)	(4.76%)	(6.34%)
(B) Ex-post realizations 2008-09	1.00%	3.54%	16.52%	1.03%
(C) Expectation error [(B)-(A)]				
Estimation Sample	0.24%	0.15%	29.32%	-9.66%
Whole sample	0.27%	0.18%	31.92%	-9.28%

Table 4
Wealth Effect Regressions

	Respondents sample						*Whole Sample*		
	Baseline			*Imputed expectations*					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Unexpected gain on:									
Total assets	0.030			0.031			0.013		
	(0.012)*			(0.012)*			(0.004)**		
Deposit and Bonds		-0.282			0.864			0.597	
		(0.182)			(0.306)			(0.046)	
Stock		-0.295			-19.461			4.021	
		(0.827)			(0.164)			(0.957)	
Financial assets			-0.065			-0.054			0.081
			(0.543)			(0.601)			(0.356)
Real assets		0.031	0.030		0.031	0.031		0.013	0.013
		(0.016)*	(0.020)*		(0.018)*	(0.016)*		(0.006)**	(0.004)**
Expected gain on:									
Total assets	0.034			0.034			0.012		
	(0.006)**			(0.006)**			(0.014)*		
Deposit and Bonds		-0.046			-0.060			-0.067	
		(0.681)			(0.649)			(0.328)	
Stocks		-0.273			-19.184			3.932	
		(0.831)			(0.164)			(0.959)	
Financial assets			-0.026			0.004			0.032
			(0.735)			(0.853)			(0.378)
Real assets		0.035	0.034		0.033	0.034		0.011	0.012
		(0.008)**	(0.010)**		(0.010)**	(0.010)**		(0.020)*	(0.016)*
Observations	410	410	410	410	410	410	3180	3180	3180
R^2	0.11	0.11	0.11	0.11	0.11	0.11	0.01	0.01	0.01

Note: In column (1)-(6) the sample is restricted to the household who answer the subjective expectations questions in the 2008 SHIW, while in columns (7)-(9) we use the whole sample. In columns (4) through (9) expectations are imputed using a Heckman selection model which allows for non-random non-response to the subjective expectations questions. All regressions in this table include the following additional controls: a constant term, age, a second-order polynomial in years of education, dummies for gender, married, in employment, in public employments and for self-employed, a second-order polynomial in the number of income recipient, a dummy for having some debt, dummies for living in a municipality with 20,000 inhabitants or less, and dummies for living in the North-West, Center, South or Islands of the country. Bootstrapped p-values in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table A1
Heckman selection model: two-step estimates of subjective expectations of individual mean returns

	(1) Bank deposits	(2) Bonds	(3) Stocks	(4) Housing
Age/100	-0.012***	-0.012***	-0.002	0.084**
Education (years)	-0.001	0.000	0.190**	0.002
Male	0.001	0.001	0.019***	-0.024**
White collar	-0.003***	-0.003***	-0.015*	0.019
More than one earner	0.002*	0.002*	0.007	-0.017*
Literacy index	0.001	0.001	0.074***	0.027
Risk attitude	-0.004	-0.004	0.101***	-0.006
Risk attitude squared	0.001	0.001	-0.020***	-0.002
Own risky assets	0.005***	0.005***	0.021***	-0.022*
House prices in 2006 (avg. in prov.)	-0.002	-0.002	-0.046***	0.029
House prices squared	0.000	0.000	0.006***	-0.003
Bank branches in 2004 (avg. in prov.)	-0.009**	-0.010**	-0.096***	0.086*
Ineff. judiciary system (> median)	0.001	0.001	-0.008	0.031*
Prov. GDP growth (>75th pctile)	0.006***	0.006***	0.025	-0.046*
Prov. GDP growth	-0.001	-0.001	-0.008**	1.888
GDP growth squared	0.005	0.006	0.085**	-7.002
North East	0.007***	0.007***	0.061***	-0.081
Center	0.001	0.001	0.030**	-0.120
South	0.002	0.001	0.005	-0.250**
Islands	0.001	0.001	-0.008	0.071
20-40.000 inhab.	-0.001	-0.002	-0.010	0.059
40-500.000 inhab.	0.001	0.000	-0.014*	-0.002
>500.000 inhab.	0.003	0.003	0.022*	-0.218**
Home purchase price (if owner)				0.045***
Home purchase price squared				-6.022***
Recently renovated (if owner)				-0.027**
Year of acquisition (if owner)				-0.151
Year of acquisition squared				0.038
Not owner				-150.234*
Bathrooms>1				-0.025**
Price per m^2 (avg. in the prov.)				-0.061
Price per m^2 squared				0.011
Lagged returns	YES	YES	YES	-
Price per m^2 x city size dummies				YES
Price per m^2 x area dummies				YES
Mills ratio	0.003***	0.002**	0.030***	-0.020
Constant	0.013	0.022	-0.404***	150.255*
<u>Selection equation</u>				
Understanding of questions	-0.004	0.006	0.153***	-0.092
Reliability of income information	-0.016	-0.021	-0.055***	0.002
Good atmosphere during interview	0.046**	0.054**	0.079***	0.025
Answer other subj. expect. questions	1.412***	1.410***	1.157***	-1.017***
Age/100	-0.021	0.011	-0.312**	-0.460**
Education (years)	3.519***	3.464***	2.042***	0.003
Male	0.059	0.065	0.108***	0.020
White collar	-0.086	-0.082	0.003	0.066
More than one earner	1.713***	1.735***	0.117***	0.052
Literacy index	0.114**	0.101**	1.715***	0.480***

Risk attitude	0.164	0.122	0.451**	0.317
Risk attitude squared	-0.039	-0.032	-0.090**	-0.069
Own risky assets	0.029	0.024	0.366***	0.093
House prices in 2006 (avg. in prov.)	-0.304***	-0.296***	-0.293***	0.440***
House prices squared	0.034**	0.034**	0.036***	-0.055***
Bank branches in 2004 (avg. in prov.)	-0.160	-0.094	-0.528***	-0.178
Ineff. judiciary system (> median)	-0.060	-0.048	-0.006	-0.209**
Prov. GDP growth (>75th pctile)	0.244**	0.250**	-0.165*	-0.010
Prov. GDP growth	-0.028	-0.025	-0.023	22.512
GDP growth squared	0.328	0.300	0.294	-243.735
North East	-0.522***	-0.537***	-0.389***	-0.380
Center	-0.405***	-0.421***	-0.254***	-1.164***
South	-0.285**	-0.288**	-0.715***	0.147
Islands	-0.401***	-0.394***	-0.907***	0.214
20-40.000 inhab.	0.021	0.018	0.139**	-0.321
40-500.000 inhab.	-0.023	-0.032	0.054	-0.249
>500.000 inhab.	-0.157	-0.154	0.072	-0.191
Home purchase price (if owner)				-0.006
Home purchase price squared				-0.497
Recently renovated (if owner)				0.204***
Year of acquisition (if owner)				0.952**
Year of acquisition squared				-0.239**
Not owner				946.072**
Bathrooms>1				0.035
Price per m^2 (avg. in the prov.)				-0.575
Price per m^2 squared				0.063
Lagged returns	YES	YES	YES	-
Price per m^2 x city size dummies				YES
Price per m^2 x area dummies				YES
Constant	-5.348***	-0.825	-2.833***	-946.775**
Observations	6797	6797	7466	3660
Censored	5593	5593	5763	2695
Uncensored	1204	1204	1703	965
Test signif. excluded var. (p-value)	0.0000	0.0000	0.0000	0.0000
Fitted expectations				
Respondents sample	0.69%	3.38%	-12.31%	11.45%
	(0.49%)	(0.50%)	(4.82%)	(6.09%)
Whole sample	0.65%	3.35%	-14.91%	11.52%
	(0.45%)	(0,45%)	(4.89%)	(6.24%)

Note: We drop households whose mean expected return fall above the top or below the bottom 1% of the cross-sectional distribution. The exclusion restrictions (variables included only in the selection equation) are: a dummy for whether the interviewer's impression is that the respondent has a good understanding of the questions; a dummy for whether the interviewer's impression is that the income information provided by the respondent is truthful; an index ranging between 1 and 10 reflecting the interviewer's rating of the atmosphere of the interview; and a dummy for answering the other subjective expectation questions. Standard errors are not reported for brevity: * significant at 10%; * significant at 5%; ** significant at 1%.

Table A2
AR(1) estimates for annual returns

	(1) Stocks	(2) Bank deposits	(3) Bonds
Lagged return	0.4558	0.7393	0.7531
	(0.2200)	(0.0834)	(0.1010)
Constant	0.0139	0.2799	0.9904
	(0.0523)	(0.2276)	(0.5928)
No. observations	19	19	19
R-squared	0.2015	0.8289	0.7764

Note: Annual returns, years 1994 to 2012.