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Wages and Regional Labour Markets

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Section INTRODUCTION

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Introduction to the Special Issue

Raul Ramos *, Jordi Suriñach *

ABSTRACT: This introduction summarises the main contributions included in the special issue. These papers were discussed (among others) in the special session on «Wages and Regional Labour Markets» organised within the activities of the 51st Congress of the European Association of Regional Science (ERSA) and the 37th conference of the Spanish Regional Science Association held in Barcelona in August 2011. This special issue contains six of the nine papers discussed in the session, plus three additional papers clearly related to this topic that were discussed in other conference sessions or included at a later stage due to their relevance. Moreover, we also decided to include a brief discussion of each paper in order to incorporate other points of view and some additional thoughts on the topic.

JEL Classification: R23, J31.

Keywords: Wages, regional labour markets.

Salarios y Mercados de Trabajo Regionales: Introducción al monográfico

RESUMEN: Esta introducción trata de resumir las principales contribuciones incluidas en el monográfico. Estos trabajos formaron parte (junto con otros) de la sesión especial sobre salarios y mercados de trabajo regionales celebrada en el contexto del 51.º Congreso de la Asociación Europea de Ciencia Regional y 37.ª Reunión de Estudios Regionales celebrado en Barcelona en agosto de 2011. Este monográfico contiene seis de los nueve artículos presentados en dicha sesión, más tres trabajos adicionales claramente relacionados con este tema que se discutieron en otras sesiones de la conferencia o que se incluyeron en una etapa posterior, debido a su relevancia. Además, el monográfico también incluye una breve discusión de cada artículo con el objetivo de incorporar otros puntos de vista y algunas reflexiones adicionales sobre los temas tratados.

Clasificación JEL: R23, J31.

Palabras clave: Salarios, mercados de trabajos regionales.

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The 51st Congress of the European Association of Regional Science (ERSA), co-organised by the Catalan Association of Regional Science (ACCR), the Spanish Association of Regional Science (AECR) and the Reference Network for Applied Economics (XREAP), was held between August 30th and September 3rd 2011, at the Faculty of Economics and Business of the University of Barcelona. With more than 1000 participants from 50 different countries, 220 parallel sessions, 50 special sessions, a good environment and even a football match, the congress was an important event for European regional scientists. The invited speakers included the European Commission's Commissioner of Regional Policy, Dr. Johannes Hahn, as well as Richard Florida, Diego Puga, Maryann Feldman, David Audretsch and Piet Rietveld.

One of the special sessions was devoted to the analysis of «Wages and Regional Labour Markets». More than 25 abstracts were received in response to the «call for papers» launched in January 2011, and during the special session, we had the opportunity to discuss nine of these papers; eleven others were presented in the regular sessions. This special issue contains six of these papers, plus three additional papers clearly related to this topic that were discussed in other conference sessions or included at a later stage due to their relevance. Moreover, we also decided to include a brief discussion of each paper in order to incorporate other points of view and some additional thoughts.

Various reasons have led us to publish this special issue in the official journal of the Spanish section of the European Regional Science Association. First, during the ERSA conference, the Spanish Regional Science Association celebrated its 37th conference. Second, at the international and Spanish levels, regional labour markets are nowadays even more relevant from an economic policy perspective. Finally, the presented papers were of high quality.

The first contribution to the special issue, by Vicente Royuela, and the related discussion, by Charlie Karlsson, provide an interesting overview of the 51st ERSA Conference. By examining the characteristics of the conference, Royuela's article identifies the main trends in regional science and considers a broad array of information sources: delegates' demographic details, the conference programme itself, a satisfaction survey conducted among delegates, a quality survey addressed to those chairing the sessions and bibliometric information from all participants. One interesting result from Royuela's analysis is that the thematic area that overwhelmingly attracted the most attention was «Regional economic growth and development», followed by «Innovation, knowledge, economy and regional development» and the topics discussed within the «1st European Meeting of the Urban Economics Association». In contrast, a number of other themes included in the programme attracted little attention. Research on regional labour markets was not one of these themes, but it was also not a «trending topic». Three ordinary sessions and three refereed sessions were organised under the topic of «Spatial Issues of the Labour Market» and five special sessions considered «Cultural Diversity, Skills and Productivity: The labour market impacts of immigrants» and «Wages and Regional Labour Markets». In terms of different indicators (number of sessions, papers, presenters, registered authors), these sessions represented no more than 5% of the activity of the conference, although it is fair to

recognise that other papers related to labour market analysis could have been presented in different sessions.

However, regional differences in the functioning of labour markets are an important component of today's economic discussion. Regions have been affected by the crisis in different ways because they have specific characteristics and face different challenges. As shown by Eurostat data [1], the dispersion of regional employment and unemployment rates has substantially increased in recent years, breaking with the pattern of the last expansionary phase. Of course, regional specialisation patterns explain part of this difference, but differences in wage determination schemes have also contributed to this unequal regional labour market resilience.

This is the framework within which the research presented here should be contextualised. In addition to Royuela's article, the issue contains eight additional papers dealing with regional labour markets and wages and their respective discussions. Although three of these contributions analyse Spanish regional labour markets (the recent evolution of our unemployment rate clearly explains the academic and policy interest), most contributions focus on developing countries. According to the ILO Global Employment Trends 2012 report [2], more than 400 million new jobs will be needed over the next decade to avoid a further increase in unemployment and to prevent an increase in poverty levels, particularly for informal workers in developing countries. This clearly shows the relevance of attaining a better understanding of the labour markets of developing countries.

As highlighted in the discussion by Roig, the contribution by García-Mainar and Montuenga-Gómez focuses on a very relevant issue both from the academic and policy perspectives: wage flexibility. In particular, they estimate a dynamic wage curve using microdata from the Spanish sample of the European Community Household Panel (ECHP) and find that, due to its duality, the Spanish labour market is more sensitive to supply shocks than those of other countries where similar analyses have been carried out. The good news is that recent policy reforms are trying to change this particular feature of the Spanish labour market.

Hernández and Serrano introduce an additional issue in the analysis of the Spanish regional labour markets: differences in over-education. In a country where the human capital stock has substantially increased during the past decade, a scenario where highly educated workers do not find suitable jobs is particularly worrying from the policy point of view. Using microdata from the Spanish sample of the Survey of Income and Living Conditions (SILC) for 2004-2009, the authors analyse the wage gap between the adjusted and overqualified employees in the Spanish regions using standard Mincer equations, quantile regression and the Oaxaca-Blinder decomposition. Their results indicate that in Spain, there is a 28% difference between the

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[1] Eurostat Regional Yearbook 2011.
http://epp.eurostat.ec.europa.eu/portal/page/portal/product_details/publication?p_product_code=KS-HA-11-001.

[2] *http://www.ilo.org/wcmsp5/groups/public/@dgreports/@dcomm/@publ/documents/publication/wcms_171571.pdf.*

gross hourly wage paid to overqualified and properly matched employees, of which 25 percentage points correspond to the discrimination effect and only 3 percentage points correspond to the characteristics of the individuals and the firms they work in. According to these results, the authors conclude that the effects of over-education on the regional economies are genuine, substantial and considerably heterogeneous.

Cruz and Naticchioni's article takes us temporarily away from the Spanish labour market. In particular, they use data from the National Household Survey (PNAD) of Brazil to investigate the dynamics of the urban wage premium and the relationship between the urban wage premium and trends in inequality. As highlighted in the discussion by Simón, the article provides novel insights on this topic for developing countries, but it also shows the relevance of agglomeration economies and urbanisation as a way of reducing inequality and reinforces the «place-based approach» that currently dominates the regional development debate.

Tello and Ramos' article provides empirical evidence about the relationship between income (wage) inequality and economic growth in Mexican regions. Usually, policy measures aiming to promote growth do not take the danger of the social exclusion of certain groups of individuals in particular regions into account. The article tries to recognise the link between these two dimensions (growth and inequality) and analyses intra-regional inequality in order to discount the well-known effect of institutional differences at the country level. Contrary to the findings of several studies, the authors find evidence of a positive relationship between changes in inequality and changes in growth (not a common result for developing countries), although they recognise that differences in estimation techniques, variables used in the analysis or data sources are an important source of the different conclusions of these studies. Perhaps the most relevant contribution of the paper is that the negative influences of inequality on growth are mostly associated with inequality in different parts of the income distribution. Many of the positive mechanisms can be linked to inequality at the upper end of the income distribution, while many of the negative mechanisms are associated with in equality at the bottom of the distribution. However, as Di Paolo suggests in his discussion of the article, there are clear directions for future research: the non-linearity of the relationship, additional explanatory factors and the application of recently developed decomposition techniques.

Although they perform a cross-country analysis, the paper by Castells-Quintana and Royuela has clear interest from a regional perspective. They analyse the effects of unemployment and income inequality on economic growth in 48 countries with different levels of economic development from 1990 to 2007. Their results suggest that although high initial unemployment rates do not seem to be statistically significant in explaining long-run growth, they do have a significantly negative effect when interacting with increases in inequality. They also find that increasing inequality seems to harm both growth and unemployment in countries with low levels of urbanisation. As highlighted in Ezcurra's discussion, this finding is particularly relevant in the context of the current economic crisis because there currently are numerous countries across the world with high unemployment rates and important increases in income inequality levels that could harm growth in future decades.

Bande, Fernández and Montuenga provide new evidence on regional differences on wage flexibility in Spain. Using data from different waves of the Structure of Earnings Survey (SES), they estimate regional wage equations, relating the observed wages received by workers to a group of personal and job characteristics as well as the unemployment rate. This analysis allows them to test for the existence of regional differences in the degree of wage flexibility, which may have an important influence on the evolution of regional unemployment, given its impact on the ability of the local labour market to absorb negative shocks. Their results lead them to conclude that regions suffering from higher unemployment rates exhibit lower wage flexibility. From the policy perspective, they recommend that collective bargaining reforms should pursue greater wage flexibility, especially in regions with high rates of unemployment. Although, as highlighted by Sanromá, the paper has some shortcomings, it represents clear progress in the analysis of regional labour markets and opens new directions for future research.

Konyali's paper also addresses wage flexibility, but from the perspective of a Blanchflower and Oswald-like wage curve for the Turkish economy. As noted by Sanz-de-Galdeano, the paper adds to the recently growing literature on low-and-middle-income economies where the informal sector plays an important economic role. Its main contribution is related to the estimation of disaggregated wage curves in this context.

The last article in the issue, by Majchrowska and Żółkiewski, tries to quantify the impact of the minimum wage on employment in Poland, disaggregating it by regions and groups of workers. As Tena explains in the discussion, this is not a new topic, but the paper is original in two aspects: first, previous research has not analysed regional differences, and second, the evidence for new European Union member states is practically inexistent. The authors find that minimum wage has had an adverse impact on employment and that it has been particularly harmful for young workers and workers in the poorest regions, a result that reinforces the policy conclusions from Bande, Fernández and Montuenga's paper.

Editorial work is not always easy, but in this case, it has been. We would like to thank all of the contributors (authors and discussants) for their excellent work and discipline in following very strict deadlines. We also have to recognise that, as authors, referees' comments are not always well received, but as editors, we would like to express our gratitude to the referees whose comments have clearly improved the overall quality of this special issue. Finally, we would like to express our gratitude to Juan Ramon Cuadrado, the editor-in-chief of the journal, who has offered his support during this year and encouraged us to produce this special issue from the beginning. We hope you enjoy reading it.

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Section ARTICLES

Investigaciones Regionales

Regional Science trends through the analysis of the main facts of the 51st ERSA Conference

Vicente Royuela *

ABSTRACT: The 51st ERSA Conference held in Barcelona in 2011 was one of the largest ever. By examining the characteristics of the conference, this paper identifies the main trends in Regional Science and draws on a broad array of sources of information: the delegates' demographic details, the conference program itself, a satisfaction survey conducted among delegates, a quality survey addressed to those chairing the sessions and, finally, a bibliometric database including each author signing a paper presented at the conference. We finally run a regression analysis from which we show that for ERSA delegates what matters most is quality, and this must be the direction that future conferences should move toward. Ultimately, ERSA conferences are comprehensive, all-embracing occasions, representing an ideal opportunity for regional scientists to present their work to each other and to network.

JEL Classification: N00, R00, R11.

Keywords: Regional science, bibliometrics, ERSA.

Tendencias en ciencia regional a través del análisis de las principales cifras de la 51.ª Conferencia de la Asociación Europea de Ciencia Regional

RESUMEN: El 51.º congreso de la ERSA en 2011 en Barcelona fue uno de los más grandes que se recuerdan. Mediante el análisis de las principales característi-

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I thank Jordi Suriñach for facilitating my participation at the ERSA conference and the PhD students who supported me during the event and who collected the information presented here. I also acknowledge the support provided by members of the Local Organizing Committee, in particular Conxita Rodríguez, José Luis Roig, Raül Ramos, Pilar Riera, and Vicent Soler (President of the Spanish Association of Regional Science), Charlie Karlsson (President of the European Association of Regional Science) and ERSA staff members, Richard Kelly and Maristella Angotzi. I acknowledge financial support from CICYT ECO2010-16006. Finally, according to my personal experience, dare to say that at least once in his/her life, every regional scientist should organize a Regional Science conference (the larger the better) so that he/she might realise the magnitude of such a multi-disciplinary undertaking, but above all just how exciting it can be. An extended version of this article can be found at *http://ideas.repec.org/p/xrp/wpaper/xreap2012-12.html*.

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cas del congreso, en este trabajo obtenemos las principales tendencias en Ciencia Regional, basándose en un amplio abanico de fuentes de información: el programa del congreso, el detalle de las características de los delegados, la encuesta de satisfacción, una encuesta a los ponentes que presidían las sesiones y una base de datos bibliométrica con información de los autores de los trabajos presentados en el congreso. Finalmente, mediante un análisis de regresión concluimos que los delegados están interesados en la calidad y la excelencia científica, hacia donde debe dirigirse el futuro de las conferencias de la asociación. Las conferencias de la ERSA son ocasiones únicas para presentar trabajos académicos en un entorno amable e inclusivo donde el *networking* es un aspecto a destacar.

Clasificación JEL: N00, R00, R11.

Palabras clave: Ciencia regional, bibliometría, ERSA.

1. Introduction

The year 2010 marked the 50th anniversary of the European Regional Science Association (ERSA) and saw the passing away of the founder of the discipline of Regional Science, Walter Isard. In the twelve months that followed, a series of papers was devoted to analysing 50 years of the Western Regional Science Association (WRSA) (Franklin *et al.,* 2011; Gibson *et al.,* 2011, Kohlhase, 2011; Plane, 2011) and what it is that makes WRSA meetings so exceptional. It is perhaps, therefore, an opportune moment to take stock and to reflect on what Regional Science is about today and what constitute the main concerns of regional scientists. This interest is not new, and has been addressed several times before. Years ago, Torsten Hägerstrand posed (1970) and reposed (1989) the question: «What about people in regional science?» in examining the differences between the regional science meetings held in Europe and North America, and in seeking to determine whether there might be a difference in «emphasis or tone» between what scientists were doing on either side of the Atlantic. What's more he wondered if Regional Science was concerned at all about people. Several years later, various authors, when examining the state of Regional Science, presented pessimistic points of view (Jensen, 1991; Isserman, 1993 and 1995; Bailly and Coffey, 1994) that were subsequently called into question by Quigley (2001) who described something of a «renaissance» in the discipline. As Plane (2012) has recently argued, «the field emerged from its mid-life crisis of the 1990s renewed and strengthened» (p. 3).

Several papers have inspected the state of the art, or what is «hot», in Regional Science at various moments in time (Stratham, 1992; Taylor and Jones, 1992; O'Kelly, 1999; Rey and Anselin, 2000; Suriñach *et al.,* 2003) while others have examined «who» has taken the leading roles in the field (Allen and Kau, 1991, Rey and Anselin, 2000, Isserman, 2003). Typically, such analyses have been undertaken by examining publication patterns across regional science and urban journals, although others have looked specifically at the publication patterns of just one journal (Dear and Thrift, 1992; Duranton, 2010; Florax and Plane, 2004; Puga and Wrigley, 2006; Pike *et al.,*

2007; Van Dijk, 2010; Wrigley and Overman, 2010; Rogríguez-Pose *et al.,* 2011), region or country (Suriñach *et al.,* 2002, 2004, Ramos *et al.,* 2005, Royuela *et al.,* 2005, 2006 and 2008).

However, regional science is not just an academic discipline, it also involves practitioners and policy makers as is apparent at the annual meetings of the science's associations. Indeed, conferences represent an essential element in the work of researchers and policy makers alike. As Borghans *et al.* (2010) point out, conferences «provide the possibility to acquire feedback on a paper, to get informed about the work of others, and to talk to colleagues to exchange ideas. A relaxed atmosphere and being away from the office can promote creativity» (p 868).

It is these arguments that have led me to present the following report in which I summarise the main characteristics of the 51st ERSA conference held in Barcelona in 2011. It is my belief that by examining the activities undertaken at the conference we can obtain an accurate picture of the current state of Regional Science, in general, and of European Regional Science, in particular. Together with the 50th ERSA conference (Jönköping, 2010), the Barcelona conference was the largest ever organised in Regional Science, with more than 1,000 participants. While I make no claims to the effect that bigger is necessarily better, the Barcelona conference captures a good cross-section of academic and non-academic regional science public.

This paper is divided into six sections. Following on from this introduction, I describe the main features of Barcelona's ERSA conference. Next, in section 3, I present the main demographic characteristics of delegates and provide an initial insight into the distribution of bibliometric indices for Regional Science authors. Section 4 is devoted to an analysis of the main thematic trends in Regional Science based on the characteristics of the authors signing and presenting each paper, which should provide an up-to-date picture of the agenda of regional scientists today. In section 5, I run a simple model in order to obtain additional insights into what attracts people to sessions; again on the understanding that it might serve as a proxy of the concerns of regional scientists today. I finish by summarising the main findings of the analysis and drawing a number of conclusions.

2. The 51st ERSA conference in Barcelona

As Borghans *et al.* (2010) show, Barcelona is a popular location for a conference and this was perhaps an instrumental factor in attracting over 1,000 participants from 44 different countries. The conference, chaired by Jordi Suriñach, was held over four days, and there were eight time slots time devoted to 200 parallel sessions plus five plenary sessions at which the following keynote speakers addressed the conference: David Audretsch, Maryanne Feldman, Richard Florida, Diego Puga and Piet Rietveld (the latter being the recipient of the 2011 EIB-ERSA prize). A plenary lecture was also given by the European Commissioner of Regional Policy, Dr Johannes Hahn, who was accompanied by Joaquim Oliveira-Martins (OECD) and Luis Espadas

(Spanish Ministry of Economy and Finance). The conference was attended by the Major of Barcelona the Catalonia's Regional Minister of Economy and Knowledge, the Vice-President of Spain, and the President of the European Investment Bank. In the conference program he highlighted a number of «*very* Special Sessions», with a panel of leading academics. The conference was also host to the first European Meeting of the Urban Economics Association.

3. Conference description

In conducting the empirical analysis, I draw on information from a range of sources.

- The conference program: the full list of papers delivered, the thematic area to which they belong, the session type and the time of presentation, and the number of authors that signed and/or presented the papers.
- Authors' registration details: age, sex, country of origin, the type of institution they represent and their position. Not all authors supplied this information, but a significant number (93%) did.
- ERSA satisfaction survey: comprising 396 completed responses (representing 40% of total participants).
- Bibliometric indices for each author signing a paper presented at the conference from the *Publish or Perish* software (Harzing, 2010). This information was compiled before the conference (June 2011) and completed following last minute changes to papers in September 2011.
- A survey conducted among those chairing the conference's parallel sessions that includes attendance numbers at each session, the quality of the papers presented, and the homogeneity of topics presented at the sessions. Complete information was collected for 62% of the sessions.

Using this information, I now proceed to characterize various aspects of the conference and, as such, of Regional Science in Europe.

3.1. Overall figures

The conference was attended by 952 registered delegates, 891 of whom presented papers. As each author could present up to two papers, and as each paper could be presented by two different authors, the number of authors did not coincide with the number of papers presented (914 papers). These were delivered in a total of 224 sessions: 5 Plenary Lectures, 80 Ordinary Sessions, 36 Refereed Sessions, 7 Young Scientists Sessions and 96 Special Sessions. The sessions were organised around 25 themes and 44 different special sessions [1]. A total of eight time slots were dedicated

[1] Initially 51 special sessions were planned, but seven did not receive a sufficient number of papers and so were included within the conference's general themes.

to parallel sessions and, consequently, at some points during the conference 32 simultaneous parallel sessions were taking place.

3.2. Authors and delegates demographic characteristics

The modal delegate was a Spanish male academic, aged between 31 and 40 (see table 1). It should be noted that the proportion of women at Barcelona's ERSA conference (35%) was significantly higher than figures reported by Faggian (2009) at previous ERSA conferences (30% at the 2008 Liverpool conference) and at other Regional Science conferences (19% at NASRSC, New York 2008; 23% at WRSA, Napa 2009; 30% at RSAIBIS, Limerick 2009; and, 23% at PRSCO, Gold Coast 2009).

As for age, Franklin *et al.* (2011) reported a modal cohort at 60-69 at WRSA conferences [2], which tell us that ERSA conferences are, by comparison, meetings of relatively young people. Women participants are on average 3.5 years younger than men, and account for 42% of people aged 30 and below.

The Spanish represented by far the largest nationality group (15%) at the conference. However, this figure was much lower than the one recorded at the 2000 ERSA conference in Barcelona when Spanish delegates accounted for just over a third (34%). As van Dijk and Maier (2006) report, it is usual that a substantial number of participants are from the country hosting the conference. In common with previous ERSA conferences, there were sizeable representations of the following nationalities: Italians, Germans, Dutch, British and French, but in Barcelona there was a significant number of Portuguese and Turkish representatives too. Americans and Asians were also highly represented (7.3% and 6.8% respectively).

The bulk of registered delegates listed themselves as Academics (91%). Significantly, 25% of them reported themselves as being Full Professors, but these figures differed markedly between men (30%) and women (14%). The opposite, however, was true for PhD Students, Junior Researchers and Post-Doc Researchers, where there were relatively more women.

Most delegates reported (ERSA satisfaction survey) that they had first learned about the conference via the ERSA website (33%) or other RSAI channels of communication, including the RSAI (7%), ERSA (16%) or local (13%) newsletters, although 48% of them actually reported themselves as being non ERSA/RSAI members.

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[2] Franklin *et al.* (2011) in fact report data collected from a survey among WRSA members rather than a specific group of registered delegates. Thus, should their survey, as they discuss, not be fully representative, any comparisons here would be misleading.

Table 1. Conference Demographics

Country	*Total*		*Men*	*Women*
Austria	23	2.4%	87%	13%
Belgium	11	1.2%	82%	18%
Croatia	3	0.3%	33%	67%
Czech Republic	7	0.7%	71%	29%
Denmark	4	0.4%	50%	50%
Finland	13	1.4%	85%	15%
France	45	4.7%	62%	38%
Georgia	1	0.1%	100%	0%
Germany	72	7.6%	74%	26%
Greece	28	2.9%	43%	57%
Hungary	6	0.6%	50%	50%
Israel	11	1.2%	73%	27%
Italy	88	9.2%	53%	47%
Latvia	1	0.1%	0%	100%
Norway	10	1.1%	70%	30%
Poland	32	3.4%	56%	44%
Portugal	47	4.9%	47%	53%
Romania	17	1.8%	24%	76%
Russia	7	0.7%	71%	29%
Slovakia	5	0.5%	80%	20%
Spain	141	14.8%	66%	34%
Sweden	30	3.2%	63%	37%
Switzerland	17	1.8%	88%	12%
The Netherlands	64	6.7%	67%	33%
Turkey	44	4.6%	41%	59%
Ukraine	1	0.1%	0%	100%
United Kingdom	46	4.8%	72%	28%
Total Europe	**774**	**81.3%**	**62%**	**38%**

Country	*Total*		*Men*	*Women*
Angola	2	0.2%	50%	50%
South Africa	3	0.3%	100%	0%
Total Africa	**5**	**0.5%**	**80%**	**20%**
Brazil	16	1.7%	63%	38%
Canada	6	0.6%	83%	17%
Chile	1	0.1%	100%	0%
Colombia	1	0.1%	100%	0%
Mexico	1	0.1%	0%	100%
United States	27	2.8%	89%	11%
Uruguay	2	0.2%	50%	50%
Total America	**54**	**5.7%**	**78%**	**22%**
China	1	0.1%	0%	100%
Japan	41	4.3%	83%	17%
Korea, Republic of	1	0.1%	100%	0%
Singapore	2	0.2%	100%	0%
South Korea	1	0.1%	100%	0%
Taiwan	1	0.1%	100%	0%
Total Asia	**47**	**4.9%**	**83%**	**17%**
Australia	6	0.6%	100%	0%
New Zealand	2	0.2%	100%	0%
Total Oceania	**8**	**0.8%**	**100%**	**0%**
Total	**952**	**100%**	**65%**	**35%**

Age	*Total*		*Men*	*Women*
24-30	149	24%	58%	42%
31-40	215	35%	62%	38%
41-50	135	22%	59%	41%
51-60	76	12%	75%	25%
over 60	34	6%	91%	9%
Not available	279		67%	33%
Total	**888**		**574**	**314**
			65%	**35%**

Position	*Total*		*Men*	*Women*
Academic: PhD Student	148	22%	58%	42%
Academic: Junior Researcher	32	5%	44%	56%
Academic: Assistant Professor	111	16%	61%	39%
Academic: Post-Doc Researcher	51	7%	51%	49%
Academic: Associate Professor	118	17%	66%	34%
Academic: Senior Researcher	40	6%	55%	45%
Academic; Full Professor	168	25%	79%	21%
Academic: Other	16	2%	50%	50%
Total Academic	**684**	**91%**	**63%**	**37%**
Professional: Assistant Researcher	4	6%	50%	50%
Professional: Researcher	49	77%	67%	33%
Professional: Manager/Director	5	8%	60%	40%
Professional: Other	6	9%	83%	17%
Total Professional	**64**	**9%**	**67%**	**33%**

Source: Conference registration details.
Note: Israel is included in Europe as it belongs to the European Regional Science Association.

3.3. Authors' bibliometric information

As reported above, bibliometric information for the conference authors was collected. As my aim is to characterise the topics in Regional Science, the unit of analysis adopted here is the author, not the delegate, since 61 registered delegates (6.4% of the total) did not in fact present a paper at the conference. Thus, 891 delegates presented either one or two of the 914 papers delivered at the conference, which were signed by a total of 1,533 authors. Peter Nijkamp (14) Piet Rietveld (10) signed the highest number of papers. A total of 75 authors signed three or more papers, 200 authors signed two papers and 1,258 authors signed one paper [3].

An examination of the co-authorship details of the papers showed that 34% had just the sole author, while 33% had three or more (see table 2). This statistic contrasts with findings in Suriñach *et al.* (2002): in the decade 1991 to 2000, 52% of articles published in nine leading regional science and urban economics journals were single-authored. From this it might be deduced that either co-authorship is increasing (as Duque *et al.,* 2011, have reported for Spanish articles in the fields of Economics and Business) or that academic papers that are eventually published are more frequently singled authored than those presented at conference.

Table 2. Co-authorship pattern

Authors per paper	*Papers*		*Total authors*	
1	312	34%	312	16%
2	303	33%	606	31%
3	211	23%	633	33%
4	66	7%	264	14%
5	16	2%	80	4%
6	6	1%	36	2%
	914	100%	1.931	100%

The bibliometric indices of the authors signing papers at the conference, h, g and hc [4], are highly skewed to the right, since several authors present particularly high values. Table 3 and figure 1 show the main distribution patterns [5]. 25% of authors have publications with no citations. This is perhaps unsurprising if we note that there was a significant proportion of PhD students (22%) and Junior Researchers (5%) among delegates. By contrast, to be included in the fourth quartile authors need an

[3] Of course, not all authors signing a paper atended the conference.

[4] The h-index is defined as follows: A scientist has index h if h of his/her Np papers have at least h citations each, and the other (Np-h) papers have no more than h citations each. It aims to measure the cumulative impact of a researcher's output by looking at the amount of citation his/her work has received. The g and hc indices give more weight to highly cited and more recent articles respectively.

[5] For reasons of clarity, figure 1 only displays the indices up to a value of 25.

h-index of 6 or over. Finally, as the lowest correlation between the indices is 0.95, in all further analyses I use just the h-index.

Table 3. Statistical characteristics of the bibliometric indices

	h	*g*	*hc*
Average	4.48	8.31	3.39
Standard Deviation	7.07	14.56	4.88
Asymmetry index	2.25	2.23	1.84
Kurtosis	21.21	32.42	21.52
Min	0	0	0
Q1	0	0	0
Q2	2	3	2
Q3	6	10	5
Max	74	168	60

Figure 1. Distribution of the bibliometric indices

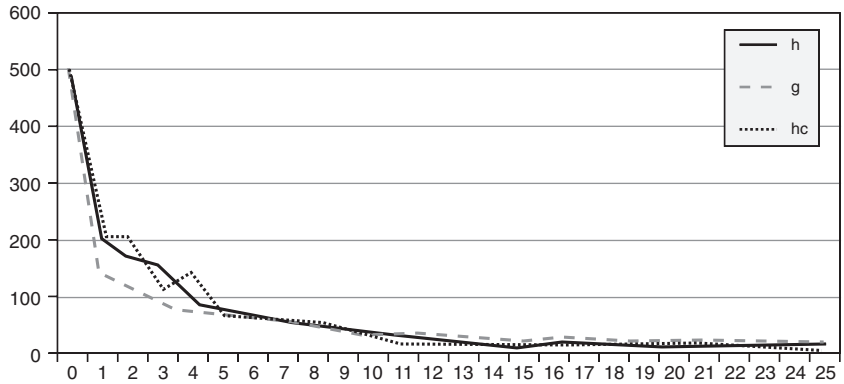

Table 4. Bibliometric information by conference session type: average h-index

	Presenting Authors	*Non- Presenting Authors*	*All Authors*
Ordinary Session	3.17	4.47	3.78
Refereed Session	4.21	6.49	5.43
Special Sessions	6.65	7.18	6.93
Young Scientist Sessions	1.08	1.25	1.12
All Sessions	**5.18**	**5.90**	**5.54**

Note: these figures are based on papers signatures, and consequently every author can appear more than once. As a result, these averages differ from the ones in table 6.

The h-index allows us to compare the different session types held during the conference. Table 4 shows the average h-index for authors presenting and signing papers at four different session types. From here it can be seen that authors delivering papers at Special and Refereed Sessions present higher bibliometric indices than those presenting at Ordinary and, as expected, Young Scientist sessions. Interestingly, for all session types, non-presenting authors displayed slightly higher indices than presenting authors. This might in part reflect the two-paper per author maximum imposed at the ERSA conference, which restricts authors with many papers and probably with higher h- indices from presenting. As such, these results are neither good nor bad per se. Alternatively, these results might be indicative of the fact that younger or less experienced academics consider ERSA a good occasion on which to present their work.

3.4. Attendance

The conference organised a wide range of activities, which can be assumed as being a positive feature since diversity can help accommodate the variety of perspectives adopted in a multidisciplinary field such as that of Regional Science. In order to identify which activities attracted the interest of the delegates, we can draw on two information sources: the conference satisfaction survey, which asked the delegates how many sessions they had attended and enquired about how satisfied they were with different aspects of the conference; and a survey addressed to the person chairing each session, which provides details about attendance at each session, the average quality of the papers presented, the homogeneity of quality and topics presented at the sessions, and the adequacy of the facilities and services provided (full details were collected for 62% of the sessions).

The average delegate attended seven sessions, while the average (non-plenary) session attracted a mean of 18 delegates; although, there was considerable variance as two of the Special Sessions had audiences of 100 and 180, while several ordinary sessions were attended by just two or three delegates [6]. Attendances were higher at Special Sessions, which also tended to be of a higher average quality and homogeneity than Ordinary and Refereed sessions. Based on the delegates' responses, the majority attended between five and nine sessions (19% attending more than ten), while 25% of delegates attended four sessions or less. This translates as an average attendance of between 550 and 600 delegates for each time slot, well below the overall registration figure of 952 delegates. This would seem to confirm that in addition to obtaining international feedback on their research, delegates have other motives for attending conferences: networking, fun, etc. (Borghans *et al.,* 2010). However, the ERSA satisfaction survey reports that the main reason given by delegates for attending the conference was to share

[6] As below we will use attendance as the endogenous variable in a regression analysis, next we describe its main descriptive statistics: Min = 2; Q1 = 10; Q2 = 15; Q3 = 20; Max = 180; Average = 18.2; Std. Dev. = 17.8; Skewness = 6.3; Kurtosis = 53.9.

their academic results with peers (83% of respondents), while a large number also attached importance to networking opportunities (67%). Special Sessions reported a higher attendance than Ordinary, Refereed and Young Scientists Sessions.

Delegates and chairpersons alike reported highly positive opinions about the quality of the conference and individual sessions. Among the former, 64% reported being extremely or very satisfied compared to 9% that were slightly or not at all satisfied with the overall level of the congress sessions. Among the chairpersons, 71% reported that the quality of papers was high or very high compared to just 1% who claimed they had been low or very low. In both surveys, higher marks were awarded to Refereed and Special Sessions than to Young Scientist Sessions. Interestingly, a small yet significant number of sessions were reported by the chairs as presenting low or very low levels of homogeneity, both in terms of the quality of the papers and of their topic. The chairs were more concerned about the homogeneity of their sessions than about the average quality of papers presented. Finally, the satisfaction survey asked delegates to evaluate the return on the money and time they had invested in order to participate at the conference: 56% of respondents reported a high return, 39% a medium return, and 6% a low return.

4. Themes in Regional Science. What is on the agenda of regional scientists?

The 51st ERSA conference included 25 thematic areas and 44 special sessions. Below, drawing on information from the conference program, the delegates and the authors' characteristics, I describe the main features of each topic area. Remember that a registered delegate could present up to two different papers, yet sign many more, while each paper had to be assigned to a different thematic area. Consequently, as we turn now to look at these themes, it should be borne in mind that the analysis is based on the authors that signed the papers, not just the delegates.

4.1. Demographics by topic

Tables 5 and 6 describe the quantitative significance plus the bibliometric indices of the authors presenting in each thematic area. The thematic area that attracted most attention was *A. Regional economic growth and development*: 14 sessions [9 Ordinary (O), 4 Refereed (R) and 1 for Young Scientists], 67 papers and 71 presenting authors. It was followed by *O. Innovation, knowledge, economy and regional development*: 10 sessions, and by *S. Infrastructure, transports and communication.*

The theme attracting most attention in the Special Sessions was *ZZV. 1st European Meeting of the Urban Economics Association*, which had 11 sessions (10 Special sessions and 1 for Young Scientists) and included 44 papers and registered

authors. It was followed by *ZE. SS-Territorial governance, rural areas and local agro food systems*, and by *ZZB. SS-Industrial districts and clusters facing globalization*.

Several differences were noted between thematic areas in terms of the number of authors signing each paper. For instance, *T. Land use real estate and housing markets* had an average of 2.6 authors per paper, while *C. Social capital and regional development* had just 1.7 authors per paper.

Several Special Sessions display very high average and median h-indices (*ZZY. SS- Global Grand Challenges to Regional Science; ZA. SS-The determinants of regional migration; ZB. SS-Do we need place-based policies*). Several topics display central values higher than the rest (*C. Social capital and regional development* and *I. Regional population change, migration, diasporas and development*), while others have lower values (*M. Climate change and its implications for urban and regional development*). These differences can be explained in terms of authors' age, academic and professional position, and the different publication culture in each line of research. An analysis of the main drivers of bibliometric indices lies beyond the scope of this paper, but it is a subject that requires further attention.

For registered authors, it was possible to identify the main demographic characteristics per thematic area. Thus, the themes attracting the largest proportion of women were *J. Social segregation poverty and social policy* and *C. Social capital and regional development*. The topics attracting the youngest authors were *Y. Barcelona as a case study, R. New frontiers in regional science: theory and methodology* and *F. Public finance and regional development*.

Many thematic areas attracted solely academic authors, while the largest proportion of non-academics was observed in *M. Climate change and its implications for urban and regional development*, which also attracted the largest proportion of non-European authors.

At the Special Sessions, *ZF. SS- Tourism externalities* and *ZZQ. SS-The impact of the Global Financial Crisis on the Banking Sector at local-national-international levels* attracted high proportions of women; *ZZN. SS-Processes of urbanisation along European coastal areas* attracted the youngest authors; 100% of papers delivered at *ZG. SS- JSRSAI 50th Anniversary Session* were by Asian authors; *ZZX. SS-The territorial impact of the electric car* attracted many professionals; while all the authors in thematic areas *ZB. SS- Do we need place-based policies?* and *ZZY. SS-Global Grand Challenges to Regional Science* were full professors.

Table 5. Sessions by thematic area. Bibliometric and demographic information

Topic	Sessions			Papers		Presenting authors (all signing authors)						Demograhic Information							
	Ordinary	*Refereed*	*Young*	*Papers*	*Average Papers per session*	*Total*	*Authors per paper*	*Average h-index*	*Min h-index*	*Median h-index*	*Max h-index*	*Registered*	*Average Age*	*% Women*	*% European*	*% American*	*% Asian*	*% Professional*	*% Full Professors & Manager-Director*
A. Regional economic growth and development	9	4	1	67	4.8	71 (134)	1.1 (2)	4.1 (4.6)	0 (0)	2 (3)	20 (25)	83	39.3	39	87	7.2	6.0	14	29
B. Rural and local development	4	3	0	29	4.1	29 (60)	1 (2.1)	4.3 (4.5)	0 (0)	2 (2)	28 (28)	37	41.6	41	81	10.8	8.1	13	31
C. Social capital and regional development	2	0	0	11	5.5	13 (18)	1.2 (1.6)	2.9 (6)	0 (0)	2 (2.5)	13 (30)	13	38	62	77	23.1	0.0	0	27
D. Agglomeration, clusters and policy	4	3	0	30	4.3	31 (50)	1 (1.7)	3.1 (4.5)	0 (0)	2 (3)	13 (42)	35	40.7	29	91	2.9	5.7	4	18
E. Regional policy in Europe	3	1	0	17	4.3	18 (34)	1.1 (2)	3.8 (5.9)	0 (0)	1.5 (3)	25 (28)	23	42.4	22	100	0.0	0.0	5	10
F. Public finance and regional development	2	0	0	10	5	10 (17)	1 (1.7)	1.6 (2.3)	0 (0)	1 (1)	6 (8)	10	34.6	20	80	10.0	10.0	20	10
G. Globalisation and regional competitiveness	3	2	1	22	3.7	23 (46)	1 (2.1)	4.2 (4.3)	0 (0)	1 (2)	25 (25)	26	35	42	88	7.7	3.8	0	13
H. Cross-border cooperation and development	1	0	0	5	5	5 (10)	1 (2)	3 (3.3)	2 (2)	3 (3)	5 (7)	6	34.8	17	100	0.0	0.0	0	0
I. Regional population change, migration, diasporas and development	4	1	0	24	4.8	25 (48)	1 (2)	4.1 (6)	0 (0)	3 (3)	20 (52)	29	38.6	45	93	3.4	0.0	12	36
J. Social segregation poverty and social policy	2	0	0	8	4	8 (17)	1 (2.1)	3.6 (4.5)	0 (0)	2 (3)	10 (11)	11	41.7	91	100	0.0	0.0	0	0
K. Spatial issues of the labour market	3	3	0	27	4.5	27 (58)	1 (2.1)	3.6 (4.1)	0 (0)	1 (1)	29 (29)	33	39.4	24	97	3.0	0.0	7	32

L. Sustainability issues	5	1	0	30	5	33 (68)	1.1 (2.3)	2.5 (2.6)	0 (0)	1 (1)	25 (25)	40	37.5	45	83	7.5	7.5	18	15
M. Climate change and its implications for urban and reg dev	1	1	0	5	2.5	5 (12)	1 (2.4)	1.8 (1.8)	0 (0)	0 (1.5)	5 (5)	6	47	33	33	0.0	66.7	33	33
N. Entrepreneurship, networks and innovation	4	2	1	27	3.9	28 (55)	1 (2)	3.8 (3.6)	0 (0)	2 (2)	18 (26)	37	38.8	35	95	5.4	0.0	10	19
O. Innovation, knowledge, economy and regional development	6	4	0	52	5.2	64 (113)	1.2 (2.2)	3.3 (3.8)	0 (0)	1 (1)	25 (25)	78	37.2	41	97	1.3	1.3	10	19
P. Geographical information systems and spatial analysis	3	1	0	19	4.8	20 (41)	1.1 (2.2)	1.9 (2.7)	0 (0)	1 (2)	7 (13)	23	37.9	43	91	4.3	4.3	10	15
Q. Spatial econometrics	2	1	1	15	3.8	15 (29)	1 (1.9)	3.3 (4)	0 (0)	3 (3)	16 (19)	17	37.8	35	100	0.0	0.0	13	7
R. New frontiers in regional science: theory and methodology	2	0	0	12	6	14 (33)	1.2 (2.8)	3.7 (4.9)	0 (0)	3 (2)	12 (52)	18	32.7	33	74	0.0	26.3	0	14
S. Infrastructure, transports and communications	5	3	0	39	4.9	39 (81)	1 (2.1)	3.9 (5.3)	0 (0)	2 (2)	42 (52)	51	40.1	27	84	0.0	15.7	20	20
T. Land use real estate and housing markets	4	3	0	29	4.1	33 (76)	1.1 (2.6)	3.4 (4.7)	0 (0)	1 (2)	25 (42)	45	42.2	31	98	2.2	0.0	15	21
U. Location studies	2	1	0	14	4.7	17 (27)	1.2 (1.9)	3 (4.9)	0 (0)	1 (1)	18 (25)	21	39.9	24	95	0.0	4.8	13	19
V. Tourism, cultural industries and regional development	4	1	1	24	4	25 (46)	1 (1.9)	1.6 (2)	0 (0)	1 (1)	12 (22)	28	40	46	89	7.1	3.6	4	17
W. Urban governance and cities regeneration	3	1	1	22	4.4	24 (43)	1.1 (2)	1.3 (2.1)	0 (0)	0 (1)	6 (24)	29	37.9	52	93	3.4	0.0	4	28
Y. Barcelona as a case study	1	0	0	3	3	4 (8)	1.3 (2.7)	2.5 (1.8)	0 (0)	2.5 (0.5)	5 (5)	5	30	60	100	0.0	0.0	0	50
Z. Territorial Marketing	1	0	0	2	2	2 (2)	1 (1)	1 (1)	0 (0)	1 (1)	2 (2)	2	44	0	100	0.0	0.0	0	0
TOTAL	**80**	**36**	**6**	**543**	**4.5**							**706**	**39**	**38**	**90**	**4.2**	**5.1**	**11**	**21**

Table 6. Special Sessions by thematic area. Bibliometric and demographic information. (1/2)

Topic	Sessions		Papers		Presenting authors (all signing authors)						Demograhic Information							
	Special Session	Young	Papers	Average Papers per session	Total	Authors per paper	Average h-index	Min h-index	Median h-index	Max h-index	Registered	Average Age	% Women	% European	% American	% Asian	% Professional	% Full Professors & Manager-Director
ZA. SS- The determinants of regional migration	1	5	5	5 (10)	1 (2)	12.4 (11.2)	1 (0)	9 (5.5)	25 (25)	7	35.2	29	100	0.00	0.00	14	57	29
ZB. SS- Do we need place-based policies?	1	4	4	4 (4)	1 (1)	24.5 (24.5)	23 (23)	25 (25)	25 (25)	4	39.3	0	100	0.00	0.00	0	100	
ZC. SS- Innovation and regional growth in Europe	2	7	3.5	7 (16)	1 (2.3)	11.86 (15.2)	2 (1)	10 (9.5)	21 (52)	13	38.9	38	100	0.00	0.00	0	42	
ZD. SS- Retail and local and regional development	2	8	4	9 (16)	1.1 (2)	14.22 (13.9)	0 (0)	17 (12)	38 (38)	13	47.9	31	100	0.00	0.00	0	33	
ZE. SS- Territorial governance, rural areas and local agro food systems	8	23	2.9	28 (58)	1.2 (2.5)	2.43 (2.5)	0 (0)	1 (2)	19 (19)	34	42.7	41	94	0.00	5.90	4	21	
ZF. SS- Tourism externalities	2	6	3	6 (11)	1 (1.8)	2.33 (2.4)	0 (0)	2 (1)	5 (8)	7	37.6	71	100	0.00	0.00	0	0	
ZG. SS- JSRSAI 50th Anniversary Session	2	8	4	7 (26)	0.9 (3.3)	3.43 (2.2)	0 (0)	2 (2)	14 (14)	14	42.9	14	0	0.00	100.00	0	44	
ZI. SS- Productivity & financing reg transport infrastructure	2	8	4	8 (12)	1 (1.5)	8.63 (11.2)	0 (0)	4 (9)	30 (30)	11	41.3	0	73	0.00	18.20	0	56	
ZK. SS- History and institutions in regional development	1	4	4	4 (8)	1 (2)	3 (3.6)	0 (0)	1 (2.5)	10 (10)	5	35.5	40	100	0.00	0.00	40	0	
ZL. SS- Air transport and local development	2	9	4.5	9 (28)	1 (3.1)	1.56 (3.1)	0 (0)	2 (2)	3 (18)	16	34.6	63	100	0.00	0.00	0	6	
ZM. SS- Cross border regions and transport accessibility	1	4	4	4 (9)	1 (2.3)	1.5 (2.2)	0 (0)	2 (2)	2 (9)	6	31.3	67	100	0.00	0.00	20	20	

ZN. SS- Rethinking the Economic Region. New Challenges for the Regional Analysis with Data at Small Scale	2	11	5.5	14 (24)	1.3 (2.2)	5.79 (5.5)	0 (0)	3.5 (3)	28 (28)	17	34.1	18	94	5.90	0.00	0	33	
ZO. SS- Estimating regional impacts of global climate changes	1	3	3	3 (6)	1 (2)	21.67 (20.3)	1 (1)	12 (11.5)	52 (52)	6	44	33	67	33.30	0.00	0	60	
ZP. SS- Modelling 'spatio-temporal data'	1	4	4	4 (9)	1 (2.3)	6 (9.7)	0 (0)	4 (6)	16 (28)	6	36.3	0	83	16.70	0.00	0	60	
ZQ. SS- Public finance and regional economy	1	5	5	7 (12)	1.4 (2.4)	9.29 (8.4)	3 (3)	8 (8.5)	17 (17)	8	39.4	13	100	0.00	0.00	0	29	
ZR. SS- Wages and regional labour markets	2	9	4.5	11 (18)	1.2 (2)	5 (4.6)	0 (0)	6 (4)	10 (13)	12	38.1	25	92	8.30	0.00	9	18	
ZS. SS- Main patterns and economic implications of migratory flows: a regional perspective	1	3	3	3 (9)	1 (3)	15.67 (6.6)	7 (0)	12 (2)	28 (28)	4	52.3	0	100	0.00	0.00	0	75	
ZT. SS- Computable General Equilibrium in Reg Sc & Urban Ec	2	7	3.5	7 (15)	1 (2.1)	6.71 (5.9)	0 (0)	6 (4)	16 (24)	8	41.4	0	75	0.00	0.00	14	57	
ZU. SS- The web of housing supply: markets, finance, development and infrastructures	3	10	3.3	10 (17)	1 (1.7)	10.4 (10)	0 (0)	8.5 (8)	27 (27)	10	31	10	50	0.00	0.00	0	88	
ZV. SS- Creativity and regional development	2	7	3.5	7 (18)	1 (2.6)	2.57 (2.9)	0 (0)	2 (1)	8 (19)	9	37.3	44	100	0.00	0.00	13	25	
ZW. SS- Turkish cases in contemporary issues/dimensions for regional development	2	8	4	10 (16)	1.3 (2)	1.1 (0.8)	0 (0)	0 (0)	5 (5)	12	46.1	50	100	0.00	0.00	18	45	
ZX. SS- Regional science and development in Africa	1	4	4	4 (5)	1 (1.3)	0.5 (2)	0 (0)	0 (0)	2 (8)	4	41.7	25	25	0.00	0.00	25	0	
ZY. SS- Science and Policy Integration for Sustainable Regional Development	1	4	4	4 (12)	1 (3)	1.5 (5.3)	0 (0)	1.5 (0)	3 (52)	7	36	57	100	0.00	0.00	0	0	

Table 6. Special Sessions by thematic area. Bibliometric and demographic information. (2/2)

Topic	Sessions		Papers		Presenting authors (all signing authors)						Demograhic Information							
	Special Session	Young	Papers	Average Papers per session	Total	Authors per paper	Average h-index	Min h-index	Median h-index	Max h-index	Registered	Average Age	% Women	% European	% American	% Asian	% Professional	% Full Professors & Manager-Director
ZZ. SS- Interregional migration	3		10	3.3	11 (23)	1.1 (2.3)	4.64 (8)	0 (0)	3 (6)	15 (48)	17	34.8	47	88	5.90	5.90	0	10
ZZA. SS- Territorial cohesion in the context of new EU member states - policy impact assessment	3		14	4.7	18 (22)	1.3 (1.6)	0.72 (0.7)	0 (0)	0 (0)	3 (3)	20	47.4	30	100	0.00	0.00	0	21
ZZB. SS- Industrial districts and clusters facing globalisation	5		19	3.8	21 (46)	1.1 (2.4)	2.76 (3.6)	0 (0)	2 (3)	11 (11)	27	42.2	26	100	0.00	0.00	14	38
ZZC. SS- Modelling the knowledge-based regional economy	1		4	4	4 (6)	1 (1.5)	6.25 (4.2)	1 (0)	5.5 (2.5)	13 (13)	4	40.7	25	100	0.00	0.00	33	33
ZZD. SS- Reg development, structural changes and services	3		14	4.7	14 (35)	1 (2.5)	6.29 (4.8)	0 (0)	3.5 (2)	20 (20)	22	42.6	36	100	0.00	0.00	5	40
ZZE. SS- Cultural Diversity, Skills and Productivity: The labour market impacts of immigrants	3		11	3.7	11 (24)	1 (2.2)	3.27 (11.2)	0 (0)	1 (3.5)	19 (52)	21	37.1	24	90	0.00	0.00	11	33
ZZF. SS- Understanding factors and processes underlying spatial dependence	1		4	4	5 (8)	1.3 (2)	14.2 (14.9)	1 (1)	9 (10)	33 (33)	4	42.3	25	100	0.00	0.00	0	25
ZZG. SS- Relocation of plants and firms: new insights	2		7	3.5	7 (17)	1 (2.4)	5.29 (4.8)	0 (0)	3 (3)	16 (16)	12	35.8	42	100	0.00	0.00	0	20
ZZH. SS- Transport investment and reg econ development	1		4	4	5 (10)	1.3 (2.5)	5.8 (6.2)	1 (1)	2 (4)	19 (19)	8	46.9	38	88	0.00	12.50	0	43
ZZM. SS- Spin-offs and the diffusion of innovation and routines: a micro perspective	1		4	4	4 (11)	1 (2.8)	6 (4.7)	3 (0)	5.5 (3)	10 (17)	6	42.6	33	100	0.00	0.00	0	0

ZZN. SS- Processes of urbanisation along Eur. coastal areas	2		9	4.5	9 (30)	1 (3.3)	1.22 (1.8)	0 (0)	0 (1)	5 (8)	14	28	29	100	0.00	0.00	0	0
ZZO. SS- Sustain City Conference on land-use and transport	3		9	3	11 (26)	1.2 (2.9)	7.73 (8.7)	0 (0)	8 (5.5)	21 (28)	16	37.4	19	100	0.00	0.00	0	27
ZZP. SS- Knowledge, Innovation and Economic Geography	3		9	3	10 (17)	1.1 (1.9)	19.9 (14.5)	4 (3)	17 (10)	55 (55)	11	37.7	36	91	9.10	0.00	0	33
ZZQ. SS- The impact of the Global Financial Crisis on the Banking Sector at local – national – international levels	1		2	2	2 (4)	1 (2)	0 (0)	0 (0)	0 (0)	0 (0)	3	41	100	100	0.00	0.00	67	0
ZZR. SS- Putting social science into W	1		3	3	3 (9)	1 (3)	6 (9.1)	1 (0)	5 (4)	12 (52)	4	35.5	0	50	50.00	0.00	0	33
ZZT. SS- Transportation in cities: Historical perspectives	1		4	4	4 (5)	1 (1.3)	1.75 (2.8)	0 (0)	1.5 (3)	4 (7)	5	29.5	0	100	0.00	0.00	0	0
ZZU. SS- Knowledge Commercialization and Valorization in Regional Econ Dev: New Approaches and Concepts	3		10	3.3	11 (19)	1.1 (1.9)	9.64 (11.6)	1 (1)	6 (6)	47 (52)	16	46.1	25	100	0.00	0.00	0	58
ZZV. SS- 1st European Meeting of the UEA	10	1	44	4	44 (100)	1 (2.3)	8.86 (10.9)	0 (0)	7 (7)	56 (74)	63	38.6	14	95	0.00	4.80	9	22
ZZW. SS- The New Urban World	4		20	5	23 (23)	1.2 (1.2)	20.96 (21)	2 (2)	23 (23)	52 (52)	20	54.6	10	85	0.00	5.00	0	94
ZZY. SS- Global Grand Challenges to Regional Science	1		4	4	4 (4)	1 (1)	27.25 (27.3)	15 (15)	21 (21)	52 (52)	4	56	25	100	0.00	0.00	0	100
ZZX. SS- The territorial impact of the electric car	1		2	2	3 (4)	1.5 (2)	3 (2.3)	0 (0)	0 (0)	9 (9)	3	35	0	100	0.00	0.00	100	33
TOTAL	**96**	**1**	**368**		**399 (802)**	**1.1 (2.2)**	**7.4 (7.3)**	**0 (0)**	**3 (3)**	**56 (74)**	**533**	**40**	**28**	**91**	**1.70**	**4.50**	**6**	**33**

5. Modelling conference attendance

5.1. The empirical model

Having described the main characteristics of the conference, in this section I seek to determine what influences a delegate's attendance at a particular session. Thus, rather than identifying the most popular themes (given that we have already seen which topics attracted most contributions), what we are interested in examining is the extent to which quality (as we would expect) matters in attracting delegates to sessions, or whether, by contrast, other *circumstances* matter more. To do so, I regress attendance against a list of variables that capture the following aspects (see table 7):

— Conference program: the day on which the paper was delivered, time slot, type of session, and the size of thematic area (the larger the theme, the larger

Table 7. Variables included in the regression analysis

Variable	*Description*
Att	Attendance at the session (total, including presenters)
Day	Day on which the session took place: 1st (base) to 3rd
Time	Time slot in which the session took place: 1st (base) to 4th
Session_type	Ordinary (base), Refereed, Special or Young Scientist
Papers_per_session	Number of papers presented in particular parallel session
Auth_session_1	Number of authors presenting in that session
Auth_session_2	Number of authors signing the papers in that session
Sessions_theme	Number of sessions programmed in the conference on session theme
Papers_theme	Number of papers programmed in the conference on session theme
Age	Average age of delegates attending session's thematic area (over total registered)
Women	Proportion of women attending session's thematic area (over total registered)
Europe	Proportion of Europeans attending session's thematic area (over total registered)
Profesional	Proportion of Professionals attending session's thematic area (over total registered)
Full_professors	Proportion of Full Professors attending session's thematic area (over total registered)
h_av_presen	Average h-index of the presenting authors
h_max_presen	Maximum h-index of the presenting authors
h_av_sign	Average h-index of the signing authors
h_max_sign	Maximum h-index of the signing authors
h_chair	h-index of session's chairperson

the potential audience, but at the same time the greater the competition between parallel sessions).

— Demographic characteristics of each session's thematic area: we control for age, gender, geographical origin, professional activity and the proportion of full professors and or directors or managers. We identify which characteristics of a thematic area matter most, for instance, if themes that attract high proportions of women or professionals are popular topics across the board.

— Bibliometric information: we control for quality using the bibliometric h-index, whereby an author with a high h-index can be expected to be producing good new material for presentation at the conference. We use the average h-index of the session (either of the authors presenting or signing the paper), its square, and the maximum. We also use the h-index of the person chairing the session to see if this serves as a signal to the potential audience.

Finally, our empirical model is as follows:

Attendance = f (Day, Time, Sess. Type, Topic Size, Demog. Charac, Bibliometric Indices).

5.2. Estimation results

The regressions were run considering two data sets: one including the full sample and the other a restricted sample in which two outliers with extremely high attendance figures (100 and 180 delegates) were excluded. Table 8 display the results for both data sets. In order to show the power of each aspect under consideration, we introduce the variables sequentially, and list the results in columns. Below, the main findings are described.

Conference program: the day on which the session was held is never significant; however, the third time slot (just after lunch) is positive and significant in several models. The session type obviously mattered at the conference with Special Sessions attracting a higher attendance than Ordinary Sessions (base category). Offering more papers in a session did not guarantee a higher attendance, but if the session was dedicated to a popular theme (one for which more sessions were organised), it attracted a larger audience, although *diminishing returns* existed.

Demographic characteristics: themes presented by authors with a low average age attracted fewer delegates. This might be evidence of three features: one, young scientist sessions in general attract smaller audiences than the other sessions (albeit that the descriptive statistics show this not to be the case); two, younger authors are not likely to be so well known to the delegates and so it is not so easy for them to attract large audiences; and three, young people tend to be interested in topics that do not attract such large audiences. Gender and the proportion of professionals were found not to matter at all, which tells us that those thematic areas in which women and professionals are over or under represented attract the same relative audiences as the rest. The geographical origin of the delegates attending each thematic area only

Table 8. Regression results.

	All parallel sessions (N=136)					*Restricted sample of parallel sessions (N=134)*				
	Model 1	*Model 2*	*Model 3*	*Model 4*	*Model 5*	*Model 1*	*Model 2*	*Model 3*	*Model 4*	*Model 5*
2nd Day	3.162 *4.41*	1.05 *3.78*	2.83 *3.44*	3.593 *3.02*	2.169 *2.95*	0.296 *1.95*	–0.224 *1.91*	0.626 *1.85*	1.037 *1.83*	0.545 *1.84*
3rd Day	–4.873 *5.61*	–7.371 *4.85*	–3.2 *4.53*	–3.655 *3.97*	–4.454 *3.85*	–0.997 *2.48*	–2.74 *2.47*	–0.921 *2.44*	–0.803 *2.41*	–0.593 *2.42*
Time slot #2	–0.287 *5.37*	–0.495 *4.6*	1.81 *4.22*	0.192 *3.75*	1.324 *3.58*	2.44 *2.4*	1.771 *2.34*	2.186 *2.26*	1.28 *2.26*	2.758 *2.26*
Time slot #3	–1.28 *7.62*	–1.668 *6.49*	2.01 *5.96*	1.079 *5.27*	2.145 *5.06*	5.575 *3.39*	4.14 *3.29*	5.462* *3.19*	4.327 *3.18*	6.103* *3.18*
Time slot #4	–6.72 *6.97*	–6.968 *6.01*	–5.12 *5.46*	–6.435 *4.83*	–4.577 *4.65*	1.867 *3.11*	0.085 *3.06*	–0.023 *2.94*	–1.184 *2.93*	0.664 *2.94*
Refereed Sessions	1.738 *5.69*	–2.542 *4.91*	–3.95 *4.45*	–5.823 *3.93*	–2.479 *3.8*	–1.199 *2.52*	–1.971 *2.48*	–2.269 *2.38*	–2.018 *2.38*	–2.5 *2.37*
Special Sessions	13.526*** *4.15*	2.914 *3.85*	–0.01 *3.52*	–1.478 *3.1*	2.046 *3.02*	7.237*** *1.86*	5.194*** *1.95*	4.009** *1.9*	4.073** *1.91*	4.139** *1.89*
Young Sessions	7.765 *10.73*	–1.681 *9.26*	2.74 *8.52*	4.907 *7.49*	–2.094 *7.28*	1.765 *4.74*	–0.182 *4.67*	0.628 *4.56*	1.655 *4.51*	1.88 *4.55*
Papers_per session	6.238* *3.67*	3.088 *3.25*	2.67 *2.95*	0.105 *2.61*	1.845 *2.51*	1.118 *1.64*	0.718 *1.65*	1 *1.58*	0.654 *1.58*	0.804 *1.57*
Auth_session_1	–1.612** *0.66*	–0.839 *0.6*	–0.7 *0.54*	0.204 *0.52*	–0.161 *0.47*	0.102 *0.3*	0.009 *0.31*	–0.003 *0.29*	–0.086 *0.31*	–0.098 *0.29*
Auth_session_2	–0.222 *2.33*	–0.576 *2.06*	0.85 *1.89*	2.515 *1.72*	0.57 *1.6*	0.339 *1.03*	0.487 *1.04*	0.92 *1.01*	1.68 *1.04*	1.087 *1*
Sessions_theme	0.61 *2.17*	1.781 *1.95*	2.73 *1.93*	3.167* *1.69*	3.529** *1.66*	1.866* *0.96*	2.378** *0.98*	2.869*** *1.03*	2.905*** *1.02*	2.519** *1.04*
Papers_theme	–0.183 *0.49*	–0.378 *0.44*	–0.64 *0.43*	–0.735* *0.38*	–0.748** *0.37*	–0.372* *0.22*	–0.470** *0.22*	–0.594** *0.23*	–0.61*** *0.23*	–0.52** *0.23*

Age		–0.93** *0.39*	–0.725** *0.35*	–0.431 *0.31*	–1.025*** *0.3*		–0.611*** *0.21*	–0.505** *0.2*	–0.55*** *0.2*	–0.49** *0.2*
Women		1.962 *8.7*	8.1 *8*	2.237 *7.07*	0.722 *7.02*		–2.181 *4.4*	0.741 4.33	–0.593 4.3	0.964 4.39
Europe		32.00*** *12.19*	25.293** *11.09*	15.225 *9.84*	18.786** *9.47*		9.622 *6.27*	8.447 6.02	7.492 5.95	7.627 5.97
Professionals		–16.125 *11.56*	–3.48 *10.68*	3.972 *9.42*	–6.751 *9.08*		–2.834 5.87	1.145 5.72	1.678 5.67	2.778 5.71
Full_professors		66.11*** *9.86*	44.024*** *9.79*	31.612*** *8.8*	32.939*** *8.47*		15.095*** *5.7*	10.331* *5.61*	9.736* *5.52*	8.472 *5.61*
h_av_presenting			0.44 *0.51*	1.673** *0.69*	1.525* *0.81*			0.449 *0.28*	1.211*** *0.42*	–0.144 *0.55*
h_av_signing			1.345** *0.54*	3.258*** *0.76*	–3.149*** *0.88*			0.296 *0.3*	–0.073 *0.52*	1.793** *0.77*
h_chair			–0.07 *0.23*	0.027 *0.2*	–0.196 *0.2*			–0.094 *0.12*	–0.024 *0.12*	–0.006 *0.13*
h_max_presenting				–1.101*** *0.26*					–0.388** *0.17*	
h_max_signing				–0.399** *0.15*					0.122 *0.1*	
h_av_presenting^2					–0.069** *0.03*					0.032 *0.02*
h_av_signing^2					0.255*** *0.04*					–0.10** *0.05*
Constant	4.926 *12.89*	9.526 *22.44*	–6.22 *20.44*	–5.396 *17.88*	24.828 *17.94*	2.399 *5.69*	19.073 *11.74*	9.469 *11.55*	11.777 *11.41*	7.724 *11.46*
Observations	136	136	136	136	136	134	134	134	134	134
R-squared	0.178	0.442	0.558	0.668	0.687	0.301	0.381	0.449	0.477	0.471
Adj. R-squared	0.09	0.356	0.477	0.6	0.623	0.225	0.284	0.346	0.368	0.361

Note: *** p<0.01, ** p<0.05, * p<0.1. Standard errors in italics

mattered in the case of the model that included the two *outliers*, which reflects the fact that these two sessions offered a marked European point of view. Geographical origin was not significant in the other 134 sessions.

The proportion of full professors participating in the thematic area is significantly important in most, which is clearly related to the potential quality of the session. In the regressions conducted here, this is controlled with the use of the bibliometric h-index, which is included in the model as the average, squared and maximum values for both presenters and signers of the papers. The main results are as follows:

- The average h-index of both the presenters and signers of the paper matter.
- The h-index of the person chairing the session has no influence on audience size.
- When either the maximum h-index or the squared value of the average h-index of the presenters or signing authors are included, the parameters are significant and the adjustments higher. Non-linear relationships arise, but the picture varies with the model. Thus, in the regression run with the full sample, the squared value of the average h-index of the signing authors is positive, suggesting that having three or four leading researchers in the same room will attract a large audience. By contrast, when we eliminate the two outliers (restricted sample), the parameter for the squared variable is negative, *i. e.,* having leading researchers in a session increases attendance but at a diminishing rate.

Interestingly, these simple models are able to reproduce up to 69% of the variance for the full sample (136 sessions) and 47% of the variance for the restricted sample (134 sessions).

The most important variables by far are those related to the quality of the presenters. This is, of course, to be expected: at a conference: the supply of sessions is considerable and time is limited. Consequently, delegates choose to attend the sessions that potentially offer the highest return in terms of scientific quality. There are two indications of such quality at the ERSA conferences. First, papers presented at Refereed Sessions have passed a review process by the Scientific Committee, while those presented at Special Sessions have been reviewed by the specially nominated Convenors. And second, an author's reputation in his or her line of research counts for a great deal. Our findings show that reputation is at least as important (if not more) than the formal indications of quality.

6. Conclusions

This paper has presented the state of the art of Regional Science by analysing contributions made at the 51st ERSA Conference held in Barcelona in 2011. The main findings can be summarised as follows:

1. The thematic areas attracting greatest attention are, by some distance, *Regional economic growth and development* followed by *Innovation,*

knowledge, economy and regional development and the topics discussed within the *1st European Meeting of the Urban Economics Association.* By contrast, a number of other themes included in the program attract little attention.

2. The attendance of female and young delegates at the conference is high and on the increase.
3. The European conference is attended principally by European delegates; however, a sizeable number (20% of the 952 registered delegates) come from outside Europe.
4. The attendance of professionals in the field of Regional Science is significant, but remains relatively low (9%).
5. Co-authorship is gaining in importance.
6. Authors presenting papers at the Special and Refereed Sessions have higher bibliometric indices, their papers display a higher quality and a higher degree of homogeneity than is the case of papers presented at Ordinary Sessions. However, only the Special Sessions attract significantly higher attendance.
7. Non-presenting authors have higher h-indices than those of the presenting authors. This might reflect the two-paper per author maximum imposed at the ERSA conference or, alternatively, it might be indicative of the fact that younger or less experienced academics consider ERSA a good occasion on which to present their work.
8. Both the delegates and those chairing the sessions reported high levels of satisfaction with the sessions and the conference in general. The homogeneity of the sessions is an important concern for delegates while the Special Sessions help ensure a high degree of homogeneity.
9. The conference schedule seems to be influential in determining which sessions delegates attend: the time slot immediately following lunch being the most popular.
10. Quality matters but an author's reputation is more important than any formal recognition granted (refereed versus ordinary sessions).

In short, the ERSA conference is a massive meeting in Regional Science, at which young academics and professionals enjoy the opportunity to present their research and discuss it with leaders in the field. Moreover, the conference organises an excellent range of sessions delivered by top academics, making it the ideal setting for networking.

How then might ERSA improve the quality of its conference? According to the ERSA satisfaction survey, most respondents called for fewer parallel sessions (53%) and for more time to be dedicated to each paper (45%). Arguably, these suggestions run contrary to the event's current strengths. ERSA conferences seek to be comprehensive, all-embracing occasions, promoting regional science among young academics and professionals, from developing countries, and covering a wide range of themes and points of view. In short, the ERSA conference is an event at which everyone in the field has an opportunity to meet and talk together. The quality of sessions

in this multidisciplinary science are apparent in the rejection rate (around 5%) and the session types: thus, Ordinary Sessions allow researchers to get feed-back on their work in progress; Refereed Sessions are for finished studies that have been reviewed by the Scientific Committee and which dispose of more time for in-depth discussion and comments from colleagues; and, Special Sessions are for papers reviewed by the session convenors and which function as a specialist workshop within the framework of the broader conference and ensure that the presenter finds the right audience among what is a large multidisciplinary gathering.

Thus, the delegates are in favour of maintaining the comprehensive nature of the ERSA conference but would like to see an improvement in the means of signalling the formal recognition afforded higher quality papers. This might be achieved by better publicity for session types and, more importantly, by introducing a formal policy regarding the work of the Scientific Committee at the conference. All such steps would improve the quality of the papers delivered in the Refereed Sessions and, consequently, boost attendance.

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Comment on «Regional Science trends through the analysis of the main facts of the 51st ERSA Conference», by Vicente Royuela

Charlie Karlsson *

The European congress of the Regional Science Association International —the ERSA congress— has in recent years established itself as by far the largest meeting for regional scientists, and policy makers in the world with more than 800 participants in Liverpool UK in 2009, in Jönköping Sweden 2010, and Barcelona Spain 2011, and in 2012 in Bratislava Slovakia. When we had the meeting in Cambridge in 1989, there were only 200 participants. The very substantial growth in attendance at the European congresses mirrors the increased interest among researchers in spatial issues but also the increased importance on spatial development and spatial policies among policy makers all the way from the local level to the EU level. A very positive aspect of the growth of attendance is that we have an increasing share of young scientists and not least young female scientists among the participants. There was a time when one could think that a European congress was a business for middle-aged and elderly men only. We welcome the changes in attendance that we have been able to observe during the last 10-15 years and we see these changes as a proof that regional science today is a very healthy research field offering many interesting and important research questions both from the viewpoint of science and from the viewpoint of policymaking.

An ERSA congress in the 2010s looks very different from the early ERSA congresses in the 1960s and 1970s. In the first ERSA congress in The Hague 1961, there were only 122 participants of which only three were women. This can be compared with about 1000 participants at the Barcelona congress of which around a third were women. At the first congress 29 countries were represented, which can be compared with 44 countries at the Barcelona congress. This is a substantial increase but we can observe that a substantial number of European countries were not represented at the congress. They include Albania, Belarus, Bosnia-Herzegovina, Bulgaria, the Czech Republic, Estonia, Iceland, Ireland, Lithuania, Malta, Montenegro, Moldavia, Luxembourg, Serbia, Slovenia, and Ukraine. This illustrates that there is still a substantial job to do for the RSAI and ERSA communities to attract researchers and policy-makers from these countries to the ERSA congresses and to help them organize their own sections.

What has exploded at the ERSA congresses is the scientific program. At the first ERSA congress there were just 15 papers presented. In Barcelona there were more than 900 papers presented. At the first congress, all sessions were plenary sessions. At the Barcelona congress, there were keynote sessions, round tables, refereed ses-

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sions, ordinary sessions, special sessions, young scientists sessions, etc. With an increasing number of participants and papers, we also have an increased diversity in terms of types of sessions. At the first ERSA congress, there was no social program. Walter Isard who organized the congress thought that the time was too valuable to be used for such things. All the time should be used for intellectual discussions. At the Barcelona congress, there was a rich social program with a reception, an informal dinner and an excellent gala dinner. Interestingly, it was the Barcelona congress in 1981 that set the new standards for the social program at ERSA congresses. I actually miss a section in the paper by Vicente Royuela presenting and analysing the social program at the 2011 ERSA congress. Such an analysis would have been valuable for future organizers of ERSA congresses. There is no information about the technical excursions, either. Neither is there any deeper discussion of all the problems met when organizing the congress as well as during the congress, and how they were dealt with. I am certain that the author has enough material and experience for another paper focusing these topics.

It is not easy to describe the field of regional science with a few words. Wikipedia offers the following description: «*Regional science* is a field of the social sciences concerned with analytical approaches to problems that are specifically urban, rural, or regional. Topics in regional science include, but are not limited to location theory or spatial economics, location modeling, transportation, migration analysis, land use and urban development, inter-industry analysis, environmental and ecological analysis, resource management, urban and regional policy analysis, geographical information systems, and spatial data analysis.» I cite this description here not because it necessarily is the best but because it shows the breadth of the field of regional science. The paper by Vicente Royuela in a very interesting manner illustrates the breadth of themes at the Barcelona congress that goes well beyond the breadth of the above definition. Whatever interest a regional scientist or regional policy-maker have, they can always find interesting and relevant presentations with a strong relevance for their interest.

It is beyond the scope of this short comment to try to disentangle the results in the econometric part of the paper. I must say that I appreciate this part of the paper very much. It contains very valuable information for those that have the responsibility to plan future ERSA congresses. This part tells future organizers which types of sessions that attract a large audience. It is a demanding task for any ERSA congress organiser to organize a good scientific programme but in this part of the paper, they get very valuable information concerning how to make a good program.

As president of ERSA, I sincerely thank Vicente Royuela for all his efforts in getting this paper together. It contains a lot of valuable information for ERSA and future ERSA congress organizers. It is my hope that future organizers will repeat this kind of effort, so that we over time can build up a solid and dynamic information bank on the noble art of «the organizing of ERSA congresses».

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Section ARTICLES

Investigaciones Regionales

Wage dynamics in Spain: evidence from individual data (1994-2001)

Inmaculada García-Mainar, Víctor M. Montuenga-Gómez *

ABSTRACT: In this paper, we test the hypothesis of a wage curve against a Phillips curve for Spain, within a dynamic framework that allows for both of these, and for more general alternatives. To this end, we use data from the European Community Household Panel, providing micro-information for the period 1994-2001. The results indicate that, contrary to the situation in other European countries, the wage adjustment occurs in just one period, with the elasticity of wages to unemployment being close to the «empirical law of economics» of –0.1.

JEL Classification: J30, J60, J64, R23.

Keywords: Phillips curve, Wage Curve, dynamic panel data, GMM.

Dinámica salarial en España: Evidencia a partir de datos individuales (1994-2001)

RESUMEN: En este artículo, contrastamos para España la hipótesis de una curva de salarios frente a la curva de Phillips en un marco dinámico que permite éstas y otras alternativas más generales. Para ello utilizamos datos del Panel de Hogares de la Unión Europea, el cual proporciona información individual para el periodo 1994-2001. Los resultados indican que, al contrario de lo observado en otros países europeos, el ajuste de los salarios tiene lugar en un solo periodo, siendo la elasticidad de largo plazo de los salarios a variaciones en el empleo próxima a la «ley empírica de la economía» de –0,1.

Clasificación JEL: J30, J60, J64, R23.

Palabras clave: Curva de Phillips, curva de salarios, panel de datos dinámico, MGM.

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1. Introduction

The dynamics of wage adjustment is a controversial issue. The negative relationship of the Phillips curve, between the growth rate of wages and the unemployment rate, became the cornerstone of the Keynesian synthesis and macro-econometric modelling, since it seemed to capture well the price and wage adjustment mechanisms. Economic authorities, by following a «fine tuning» policy, were then able to select an appropriate combination of inflation and unemployment rates. The Phillips curve has been widely used to model the supply side of the economy, such that, when confronted with the demand side, their intersection determines equilibrium values of product and price. Under this Phillips curve view, wages and prices tend to adjust to excess demand in such a way that, sooner or later, the economy moves towards the equilibrium locus. Thus, supply and productivity shocks have no long-run effects on real variables.

The Phillips curve, however, has been disputed, from the micro-economic perspective in the US by Blanchflower and Oswald (1994), who claim that «the Phillips curve is probably a mis-specified aggregate wage curve», and consequently, «the idea of a Phillips curve may be inherently wrong». In Europe, and in other OECD countries, the hypothesis of a Phillips curve had already been empirically challenged since the mid-1980s (Grubb, 1986), in favour of a dynamic wage relationship. This evidence has theoretical foundations, since non-competitive theories of the labour market predict a negative relationship at the micro stage between the level of wages and the unemployment rate (see Shapiro and Stiglitz, 1984). This relationship, called «the wage curve», represents an equilibrium locus of wages and unemployment, resulting from the optimising behaviour of the agents involved in the bargaining process (see Blanchflower and Oswald, 1994; Card, 1995). The wage curve is depicted as an upward sloping quasi-labour supply curve (or surrogate labour supply, or wage setting curve, depending on the author) that lies to the left of, and is flatter than, the classical labour supply curve, in such a way that, when it is confronted with the demand labour curve, determines an equilibrium wage above that of the labour market, and an «equilibrium unemployment rate» (Woodford, 1994). The growing acceptance of the wage curve in modelling labour markets has led to its being reinterpreted as a wages/unemployment space, where a downward-sloping wage curve intersects with a horizontal or upward-sloping price curve, to derive a new aggregate supply curve (see Blanchard, 2011). Under the wage curve model, both aggregate supply and productivity shocks will have permanent effects on unemployment and output.

Thus, the discussion about whether unemployment is related to growth or to the level of wages is not meaningless, but has powerful consequences for our understanding of the labour market and of the economy as a whole. First, in determining the dynamic effects, if any, of demand and supply wage variables on the natural rate of unemployment, and second, in providing an empirical guide for policy modelers to appraise the effects of shocks on price inflation and on the inflation-unemploy-

ment trade-off. In recent years, and given the European experience, some evidence seems to support the idea that both hypotheses, the static wage curve and the Phillips curve, are extreme cases, and that an inter-medium view is probably more appropriate (Montuenga-Gómez and Ramos-Parreño, 2005), labelling this alternative view as dynamic wage curve.

It is also of great interest in retrieving evidence about the degree of wage flexibility in a country, especially in those countries belonging to a monetary union. It is well known that both exchange rate and monetary policies are no longer independent in the European Monetary Union (EMU), so that membership of the EMU imposes further requirements on factor market flexibility. The European Commission (2003, p. 155) calls attention to this by stating that «the formation of EMU is often taken to put further demands on the flexibility of wages to compensate for the lack of (national) instruments to deal with economic disturbances. If wages are too rigid, the necessary adjustment will come slowly and with considerable economic and social costs».

The aim of this paper is to shed some light on this debate for Spain by using individual data to make comparisons with other EU countries. This paper is then similar in nature to those of Bell *et al.* (2002), Iara and Traistaru (2004), Blanchflower and Oswald (2005) and Baltagi *et al.* (2009), extending previous evidence to the case of Spain (where no prior studies exist). Results show that, contrary to other countries, the Spanish wage curve seems to be static, with little or no autoregression in pay. Section 2 surveys the literature and describes the main concerns of our research. Section 3 presents the empirical specifications addressed in the applied analysis and describes the data base. Section 4 presents the empirical results, and Section 5 lays out our conclusions.

2. The wage curve and the Phillips curve

The idea of a wage curve in micro-economic terms can be opposed to the existence of a Phillips curve in aggregate terms (Blanchflower and Oswald, 1994). First, the wage curve is a negative relationship between the wage *level* and the unemployment rate, whereas the Phillips curve captures the negative relationship between the *growth* of wages (wage inflation) and the unemployment rate. Second, the wage curve is normally obtained from disaggregated data of longitudinal household or individual surveys, whereas the Phillips curve is usually estimated with macro-time series of unemployment and wage inflation. A further difference lies in the economic meaning of each concept. The Phillips curve is a set of disequilibrium points that represent the adjustment process in a competitive model of the labour market. In contrast, the wage curve represents a *locus* of equilibrium points - the wage/unemployment rate pairs that arise from the optimising behaviour of economic agents in non-competitive models of the labour market. Recently, some effort has been devoted to reconcile both approaches in a unified framework, see for example Blanchard and Katz (1999) or Whelan (2000). Similarly, Campbell (2008), by developing an efficiency wage

model, shows that the wage equation looks like a wage curve when regional economies are modelled, and looks like a Phillips curve at the national level.

Habitually, a static wage curve using individual data is estimated by adding the log of the unemployment rate to a Mincer-type wage equation,

$$ln(w_{irt}) = a + f_r + d_t + b\, X_{irt} + \beta\, ln(u_{rt}) + \varepsilon_{irt} \quad (1)$$

where i represents individuals, r regions and t time periods and where w is the real wage, X a set of individual and labour characteristics (such as gender, education, occupation...), u the unemployment rate, f_r a set of regional fixed effects, d_t a set of time fixed effects, and ε is the remainder error term. Time-period effects control for all those variables that vary over time but that are common to all regions (*i. e.* business cycle variables), whereas variables that are time-invariant but specific to each region, such as endowments, amenities, facilities, etc., are contemplated by including regional fixed effects.

This double logarithmic expression has been justified as providing the best results (see Blanchflower and Oswald, 1994) and has been widely applied. The coefficient β is, therefore, the elasticity of wages with respect to unemployment, with a negative estimated value, thereby demonstrating the existence of a wage curve. The inclusion of regional fixed effects allows us to capture any permanent component of the relationship between wages and unemployment, so that the unemployment coefficient β is only reflecting the temporary component of that relationship. Expressions like (1) have been estimated for many countries, showing, as a general result, that wage elasticity to unemployment lies in the range (–0.20, –0.05) for most cases. This general result has given rise to calls to recognise «an empirical law of economics» [1].

To study the behaviour of wage dynamics, Blanchflower and Oswald (1994) add, as an additional regressor, the lagged dependent variable, and test whether its associated coefficient is close to zero or to one. Therefore, an equation in the form of (2) is estimated.

$$ln(w_{irt}) = a + \rho\, ln(w_{irt-1}) + f_r + r_t + b\, X_{irt} + \beta\, ln(u_{rt}) + \varepsilon_{irt} \quad (2)$$

With the estimate of the parameter ρ, the hypothesis of a Phillips curve can be tested in a straightforward manner. If its value is not significantly different from one, the null hypothesis of a Phillips curve could not be rejected, whereas if its value is close to zero, we would accept the alternative hypothesis of a wage curve.

This implies testing the extreme alternatives of a competitive modelling of the labour market, the Phillips curve, $\rho = 1$, in which supply shocks do not have permanent effects on unemployment and income compared to a non-competitive framework, wage curve $\rho = 0$, by which wages adjust almost instantaneously to changes in un-

[1] Extensive surveys of this literature can be found in Blanchflower and Oswald (2005), Nijkamp and Poot (2005) and Montuenga-Gómez and Ramos-Parreño (2005). Some of the most recent country-specific contributions are Livanos (2010) for Greece, Ammermuller et al. (2010) for Germany and Italy, and Deller (2011) for the US.

employment, so that supply shocks have persistent effects on output and unemployment. However, there is a wide range of possible values, $0 < \rho < 1$, as a reflection of an intermediate situation, indicating that supply shocks have permanent impact on wages, but some time is required to exert such impact; more rapidly when $\rho \to 0$, more slowly when $\rho \to 1$. This is the dynamic wage curve.

In their tables 4.27 and 6.20, Blanchflower and Oswald (1994) show that, with data from the March CPS (Current Population Survey) for the US, and from the GESS for the UK, the estimate of ρ is close to zero. This result suggests that wages adjust rapidly to the unemployment rate, which constitutes the starting point in claiming the death of the Phillips curve. These authors argue that «the apparent autoregression in macro pay levels may be the result of aggregate error or measurement error or specification error, or all three» (p. 284), and their use of micro data is considered to be most appropriate in unveiling the truth. This conclusion presented a significant challenge to the predominant evidence shown by the aggregate studies for the case of the US, always favourable to the Phillips curve, and spurred empirical analysis in order to study the phenomenon of wage persistence in greater depth.

Blanchard and Katz (1997, 1999) disputed those results, arguing that the type of data used and the measurement of the dependent variable were inadequate, since the samples from the March CPS are too small to properly measure the yearly wage variations in each state, and the use of annual earnings may be contaminated by the effect of worked hours. These two factors may bias the estimate of the autoregressive parameter ρ downwards. In order to control for this, the authors employed data from the merged Outgoing Rotation Group (ORG) in the CPS, which presents a larger sample size (almost twice as large as the simple CPS) and reduces the measurement error in the computation of the hourly wages. They then apply a two-step procedure to estimate the parameter ρ, obtaining estimates above 0.90, close to one. Later research for the US, including Bell (1996), Whelan (2000) and Blanchflower and Oswald (2005), conclude that this parameter is estimated to be strictly positive, but significantly lower than 1. That is to say, a dynamic wage curve exists.

Using regional data, a dynamic wage curve has also been found in several non-US countries —for example, Germany (Pannenberg and Schwarze, 2000; Ammermuller *et al.,* 2010) and Norway (Dyrstad and Johansen, 2000)—. With individual data, Bell *et al.* (2002) for the UK, Iara and Traistaru (2004) for Bulgaria and Poland, and Baltagi *et al.* (2009, 2012) for Germany, have also found that the wage curve is dynamic. A different result is obtained in studies of the Nordic countries. For example, Albaek *et al.* (2000) analyse a group of Nordic countries and find that the estimate of the autoregressive parameter is close to one, favourable to the Phillips curve, but β is, however, non-significant, which leads to the rejection of both the wage and the Phillips curve specifications. They argue that centralised-type negotiations, such as are found in these countries, may generate this kind of result [2].

[2] By contrast, Barth *et al.* (2002) for Norway and the UK obtain evidence in favour of a static wage curve, even though they recognise that their sample period may be too short to avoid the dynamic bias of the autorregressive parameter.

Overall, at the microeconomic level, the US has more auto-regression in wages than many other nations, but there is much evidence across nations of a dynamic wage curve [3]. It seems, then, that the relationship between wages and unemployment is more appropriately determined by a dynamic specification, in which unemployment has an influence that lingers over time and wages. We test this hypothesis for the Spanish case on the basis of individual data from the second half of the 1990s. The following section presents the empirical specifications and describes the database.

3. Empirical specification and data

The relationship between wages (or wage inflation) and unemployment, for Spain, has been studied in the aggregate —Dolado and Jimeno (1997), Galí and López-Salido (2001), Bentolila *et al.* (2008)— and on a regional basis —Jimeno and Bentolila (1998), Bande and Karanassou (2009)—. The most significant findings are the elevated hysteresis in the rate of unemployment, the low wage elasticity to unemployment, the permanent, and widening, unemployment differences across regions, and both low inter-regional mobility and flows into and out of the participation status. This evidence is corroborated with individual data by García and Montuenga (2003), who estimate a static wage curve for Spain. It is our interest now to provide some evidence for the dynamic wage adjustment to unemployment shocks by allowing for a more general framework. To do this, we employ the specification derived in Bell *et al.* (2002), based directly on individual data, to make use of the panel properties of our database. Thus, the estimated equation is

$$ln(w_{irt}) = a_i + \rho\, ln(w_{irt-1}) + f_r + r_t + b\, X_{irt} + \beta\, ln(u_{rt}) + \gamma\, t_r + \varepsilon_{irt} \qquad (3)$$

where the inclusion of regional trends, t_r, takes into account regional differences in the evolution of wages, as suggested by Bell *et al.* (2002). Nevertheless, this inclusion is tested empirically in our approach. The estimated value of ρ captures the dynamic behaviour of the relationship between unemployment and wages; β expresses the short-run elasticity and $\beta/(1-\rho)$ the long-run elasticity. Analysis of wage dynamics of this sort is used in Bell *et al.* (2002), Iara and Traistaru (2004), and Baltagi *et al.* (2009, 2012).

Our data comes from the European Community Household Panel (ECHP), which collects information about wages and personal characteristics from a sample of 17,908 surveyed individuals. The study covers the period 1994-2001, with the ECHP being the only panel that offers micro-information on wages and individual characteristics for more than one year in Spain. From an international perspective, this is a short period of analysis (see Bell *et al.,* 2002; Baltagi *et al.,* 2009) making the measurement of the dynamic character of the wage curve more difficult [4]. This is a potential caveat

[3] At the macro level, Madsen (2009), however, finds support for the Phillips curve for 18 OECD countries.

[4] However, it is similar to those in Barth *et al.* (2002) and Iara and Traistaru (2004), for example.

of our study, which cannot be solved with the existing data for Spain [5]. The employment statistics come from the official Spanish Labour Force Survey (*Encuesta de Población Activa*). A detailed description of the data set can be found in the Appendix. Hourly wages are expressed in real terms by deflating the nominal values by the corresponding regional CPI [6].

The regional dimension of the data base is reduced, since it is provided only at the NUTS 1 level, resulting in only 7 regions being considered [7]. This also reduces the total number of degrees of freedom to 56 (7 regions times 8 years) [8]. In order to enlarge this number, and then to obtain more precise estimates of the wage adjustment, regional unemployment rates are also expressed by gender and by age group (see Kennedy and Borland, 2000; García and Montuenga, 2003). This provides up to 448 different unemployment rates (7 regions by 8 years by 4 age groups by 2 genders). The unemployment rate will be considered exogenous, since prior studies (García and Montuenga, 2003) have demonstrated its predetermined nature for Spain [9].

A final comment is worthwhile before describing the estimation procedure. Some recent studies have been concerned with the spatial influence of neighbouring regional unemployment rates on individual wages (see Iara and Traistaru, 2004; Longhi *et al.,* 2006; Deller, 2011; and Baltagi *et al.,* 2012). In Spain, most wage bargaining takes place at the sectoral provincial level (NUTS 3), which is clearly more disaggregated than what is available in our data. Moreover, given the size of the NUTS 1 regions, the possibility of commuting is unlikely. Finally, the way that unemployment rates are defined (region by age by gender) makes it difficult to determine the existence of interdependence of unemployment rates across units. All this has convinced us not to consider the problem of spatial autocorrelation, while retaining confidence in our estimates.

As for the estimator used, the inconsistency of the Least Square Dummy Variable (LSDV) estimator arises from the short-period available data. Since the lagged dependent variable appears as an additional explanatory regressor, it leads to an asymptotic correlation between the dependent variable and the error term, generating a negative bias in the estimated value of the autorregressive coefficient of order 1/T,

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[5] There is no other data set providing information on wages at the individual level for a longer span of years.

[6] It is not possible to distinguish between normal working wages and overtime wages, which may bias the estimation (Black and FitzRoy, 2000). Detailed information for individual wages in Spain is not available in our data set (and in no other dataset in panel data form). Additionally, it must be noted that, as usual, the survey-provided wages tend to be lower than the actual earnings. Both facts are inescapable limitations of our data.

[7] The NUTS 1 regions are obtained from simple grouping of the 17 Spanish Autonomous Communities (see Appendix).

[8] Note that, in the regression equation, the unemployment rate is defined at a higher level, regional, than the dependent variable, individual. Consequently, the regional dimension is the restricting factor in the availability of the degrees of freedom.

[9] This is a generalised finding elsewhere (see Blanchflower and Oswald, 1994; Bell, 1996; Black and FitzRoy, 2000; and Bell *et al.,* 2002), except in Germany (Baltagi *et al.,* 2009).

where T is the number of sample periods (see Nickell, 1981) [10]. In this case, the GMM estimator is the best choice for controlling this bias (Arellano and Bond, 1991) [11]. Although some other estimators have also been suggested (Kiviet, 1995), they perform no better than GMM for T < 10. As a consequence, one first alternative is to apply the Arellano-Bond GMM procedure, also called «difference GMM», which involves first taking differences in Equation (3) in order to remove the fixed effects, and then running the estimate using all lags of the variables in levels, as instruments. Since these are correlated with differenced variables, but uncorrelated with difference error terms (unless the error terms in levels display serial correlation), they provide a set of valid instruments. While first order autocorrelation in the first-differenced residuals complies with the estimator's consistency requirements, it is necessary that the differenced error terms are free of second order autocorrelation. This can be checked by examining the m_1 and m_2 tests for serial correlation in the first-differenced residuals, following Arellano and Bond (1991).

However, efficiency can be dramatically improved, provided that first differences of instrumenting variables are uncorrelated with the fixed effects, so that the number of instruments is augmented (Arellano and Bover, 1995; Blundell and Bond, 1998). Operationally, a system of two equations is built —the original equation as well as the transformed equation— that is known as «system GMM». In the system GMM estimator, the differenced equations, using level instruments, are combined with equations in levels using differences as instruments. Blundell and Bond (1998) show that first differences of the series may be uncorrelated with the industry-specific effects under stationarity. This allows the use of lagged differences as instruments for the levels equation. One further advantage of this estimator is that its efficiency is not affected in the cases in which the dependent variable is close to a random walk. In such cases, difference GMM performs poorly, since past levels convey little information about future changes, so that untransformed lags are weak instruments for transformed variables. Errors in the two-step estimation of system GMM are corrected according to Windmeijer (2005), so that they are superior to robust one-step. Finally, we employ Sargan-Hansen tests of over-identifying restrictions for the GMM estimates.

4. Results of the estimation

In table 1, we report the estimates of the relevant coefficients of equation (3) and their corresponding robust standard errors. Estimates presented here are com-

[10] The value of the bias corresponds to the case in which the lagged endogenous is the only regressor. In any case, if there exist other predetermined regressors, such as the individual characteristics or the fixed effects, the bias will be even greater. However, when the sample size is large, the bias becomes negligible.

[11] Arellano and Bond (1991) show that their test is preferred to the OLS, Within Groups, and Anderson-Hsiao difference and levels estimators using Monte Carlo simulations. The difference GMM exhibits the least bias and variance in estimating the parameter of interest.

puted using the program *xtabond2* in Stata [12]. We begin by showing the results corresponding to the inconsistent estimators OLS and LDSV. As indicated by Roodman (2009), these two estimators produce extreme values, between which the true parameter should lie. In the following two columns, the estimates according to the difference GMM proposed in Arellano and Bond (1991) are presented: the one-step GMM with robust standard errors, and the two-step GMM, exploiting all available lagged values of the dependent variables as instruments. One-step GMM simply takes account of the fact that the first differenced error term of equation (3) is MA (1) with unit root. Two-step GMM uses the estimated residuals of one-step GMM to construct a weighting matrix that yields a two-step GMM estimator, which, in turn, is robust to general cross-section and time-series heteroskedasticity. Both GMM estimators hinge on the assumption that there is no second-order serial correlation for the disturbances of the first differenced equations, which is checked by the respective tests m_1, m_2, presented below the estimates. The next columns present the estimates obtained from the «system GMM» suggested by Arellano and Bover (1995) and Blundell and Bond (1998), which are shown to be more efficient, considering alternative specifications. The preferred specification is chosen according to the Sargan-Hansen test of over-identifying restrictions, which is also helpful in assessing the validity of the instruments.

We have explored diverse specifications using the flexibility provided by the *xtabond2* program. The unemployment rate has been introduced in levels and also one-period lagged, resulting in the latter being non-significant; we have also tested whether it is endogenous, or not, with the values produced by the Sargan-Hansen tests rejecting the null. Similarly, the length of lags of the variables used as instruments has been chosen based on these tests, obtaining that the null of validity of instruments is accepted when only the dependent variable is considered as endogenous, and instruments are restricted to take the second to the fifth lagged values. All specifications appear to capture the relevant dynamics, since no second order residual correlation is evident. Regional, time, and individual fixed effects are found to be jointly significant and are retained in the regressions. By contrast, regional trends are found not to be individually significant, and they are excluded from final estimations. Whereas, in most of the specifications, Sargan-Hansen tests reject the null that the over-identifying restrictions are valid, in the two final columns this hypothesis is not rejected. Hence, we restrict our comments on these estimated values, though point estimates do not vary significantly across different specifications.

The unemployment coefficient is about –0.07, within the range of the typical finding in the literature (see Nijkamp and Poot, 2005), approaching the «empirical law of economics» of –0.1. The coefficient of the lagged dependent variable is found to be statistically non-significant (it is, however, in the «difference system» estimation, but with a very low value, below 0.1). This indicates, for the period

[12] For more on this matter, see Roodman (2009).

1994-2001, almost no autoregression in pay, with wages thereby adjusting very rapidly to changes in unemployment. From an economic point of view, this result can be interpreted as the Spanish labour market being relatively more sensitive to supply shocks than in other countries. In this sense, the labour market in Spain has been characterised by both an enormous rate of temporary contracts, over one third in this period, and an increasing relevance of immigration (Bentolila *et al.,* 2008), providing an important tool in rapid wage adjustment to shocks. This result is not at all normal in other countries. Whereas values, more or less closer to unity, have been obtained for the US, in Europe most countries are between the 0.3 coefficient in Germany and 0.5 in the UK (see Baltagi *et al.,* 2009; Bell *et al.,* 2002; and Montuenga-Gómez and Ramos-Parreño, 2005). Only in Norway (Barth *et al.,* 2002) and Romania (Iara and Traistaru, 2004) have values similar to ours been found [13].

Since these two features, high temporary rates and the increasing participation of immigrants, are peculiar to Spain, we have focused on their potential influence. To check for this, we have run several regressions similar to that in the last two columns, distinguishing, first, between workers with permanent contracts against those with fixed-term contracts, and second, between native and immigrant workers. In the case of permanent workers, the coefficient of the lagged dependent variable is 0.44, within the range of global estimates for other EU countries, and the unemployment coefficient is non-significant, probably reflecting the low responsiveness of permanent worker payments to changes in unemployment during that period. By contrast, in the case of fixed-term employees, the autoregressive parameter is non-significant, with the unemployment coefficient being statistically significant with a value of –0.111, thereby reflecting higher wage flexibility with respect to the case of permanent workers. More noticeably, the unemployment coefficient of immigrants becomes –0.204, being non-significant in the case of native workers [14]. These both results may support the view of a more responsive labour market in Spain. Although wage flexibility is reduced, the elasticity of wages to unemployment is, in absolute values, above –0.1 for both temporary and immigrant workers, providing the Spanish labour market with a rapid adjustment of wages; that is to say, the reaction of wages to unemployment is low, but it is rapid. However, it must be noted that the period of analysis may be too short to capture the dynamic nature of wage adjustments as, for example, in the case of Norway and the UK (Barth *et al.,* 2002). The unavailability of data samples covering a longer period prevents us from achieving undisputed conclusions.

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[13] *A special case is Italy, for which Ammermuller et al. (2010) find a negative autoregressive coefficient for the period 1991-2004. The authors argue this result is probably due to the continuous decline observed in Italian real wages since 1992.*

[14] Overall results are not presented to preserve space, but they are available from the authors.

Table 1. Estimation results of the dynamic wage equation

	OLS	*LDSV*	*Difference GMM*		*System GMM*			
			GMM1	*GMM2*	*GMM1*	*GMM2*	*GMM1*	*GMM2*
Ln(w_{irt-1})	0.322*** (0.004)	–0.064*** (0.063)	0.088*** (0.015)	0.098*** (0.015)	0.068 (0.092)	0.072 (0.095)	0.073 (0.089)	0.081 (0.094)
Ln(u_{rt})	–0.012 (0.016)	–0.087*** (0.023)	–0.069*** (0.033)	–0.072*** (0.033)	–0.078*** (0.025)	–0.081*** (0.026)	–0.065*** (0.023)	–0.067*** (0.024)
Secondary education	0.093*** (0.009)	0.012 (0.015)	–0.002 (0.020)	–0.002 (0.020)	0.117*** (0.018)	0.119*** (0.013)	0.126*** (0.012)	0.120*** (0.013)
Higher education	0.191*** (0.011)	0.030* (0.022)	0.006 (0.026)	0.005 (0.026)	0.267*** (0.031)	0.274*** (0.017)	0.275*** (0.016)	0.273*** (0.017)
Experience	0.125*** (0.001)	0.036*** (0.006)	0.015*** (0.006)	0.011** (0.006)	0.024*** (0.004)	0.023*** (0.002)	0.024*** (0.002)	0.025*** (0.013)
Experience squared	–0.016*** (0.002)	–0.050*** (0.007)	–0.067*** (0.015)	–0.065*** (0.015)	–0.034*** (0.007)	–0.034*** (0.004)	–0.033*** (0.003)	–0.035*** (0.004)
Married	0.052*** (0.008)	0.070*** (0.022)	–0.022 (0.034)	–0.019 (0.034)	0.087*** (0.019)	0.088*** (0.012)	0.094*** (0.012)	0.090*** (0.012)
Long–run elasticity	–0.017	–0.082	–0.092	–0.080	–0.084	–0.087	–0.070	–0.073
Regional fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual fixed effects	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F tests (p-values)	188.75 (0.000)	51.15 (0.000)	30.85 (0.000)	33.58 (0.000)	223.23 (0.000)	225.18 (0.000)	227.51 (0.000)	231.25 (0.000)
m_1 (p-values)			–17.19 (0.000)	–17.14 (0.000)	–17.30 (0.000)	–17.00 (0.000)	–5.65 (0.000)	–17.30 (0.000)
m_2 (p-values)			0.40 (0.689)	0.56 (0.575)	0.57 (0.571)	0.47 (0.641)	0.08 (0.933)	0.15 (0.882)
Sargan test (p-values)			125.16 (0.000)	62.93 (0.000)	120.31 (0.000)	69.73 (0.000)	21.29 (0.265)	21.29 (0.265)
Hansen test (p-values)			61.34 (0.000)	45.62 (0.000)	73.96 (0.000)	42.57 (0.000)	12.03 (0.846)	12.03 (0.846)
Number of instruments			55	55	63	43	58	58

Control variables include: marital status, 3 educational levels; 8 occupational categories; experience and experience squared; 2 industry categories, gender, 5 firm size categories (detailed description of all these variables in the Appendix. Clustered by unemployment rates (see text) standard errors in parentheses. In GMM2, the Windmeijer (2005) correction is included. GMM1 is one-step GMM. GMM2 is two–steps GMM. The number of observations is NT=27,954.
***, **, * indicates significance at 1%, 5%, 10% level, respectively.
m_1 tests for AR (1) in first differences
m_2 tests for AR (2) in first differences
Sargan-Hansen tests. The hypothesis null is that over-identifying restrictions are valid.

5. Conclusions

The aim of this article has been to study the relationship between individual wages and local unemployment rates in Spain, considering a dynamic specification. The existing literature for Europe has shown that labour markets are better modelled by a wage curve representation in which wages are linked to the level of unemployment. Usually, the effect of unemployment on wages is persistent, so that some time is required to exert an inverse influence on wages; i.e. a dynamic wage curve is present.

We have estimated this dynamic wage curve for Spain, using individual data, coming from the eight waves of the ECHP for the period 1994 to 2001, using a specification that is common in empirical studies. We take into account both the reduced time dimension available and the subsequent bias arising from the estimation of a dynamic panel data model with fixed effects. Thus, we have used GMM estimators to test the degree of sluggishness in the response of wages to changes in unemployment rates.

Estimated results seem to reveal that, contrary to most earlier empirical research for other countries, a static wage curve models well the case of Spain, since the autoregressive parameter is non-significantly different from 0, and with the elasticity wages to unemployment of –0.07, close to the –0.1 «empirical law of economics» posited by Blanchflower and Oswald (1994, 2005). This can be interpreted as wages being low-degree sensitive to changes in unemployment, but wages adjusting very rapidly to such changes, at least during the period under consideration. Accordingly, supply shocks will impact wage bargaining and price/wage inflation, so that they will have permanent effects on the unemployment rate. This may be due to the high flexibility provided by temporary and immigrant workers to the Spanish labour market during the period. However, this result must be treated with caution, given that the period analysed, first, may be too short to capture the dynamic behaviour of wages and, second, coincides with an expansive phase of the Spanish economy, during which unemployment fell sharply, employment increased strongly, and real wage growth was controlled. The availability of longer data bases with individual information would allow us to obtain more robust conclusions.

Looking back in time, the advent of the Great Recession in 2008 has had a strong impact on the Spanish economy, with an explosion of unemployment rates, whereas real wages have grown only moderately (Bentolila *et al.,* 2012). During these last years, there has been a quantitative adjustment in the labour market, such that non-permanent workers and immigrant groups have borne most of the charge in such adjustment. Thus, the temporary rate has decreased from 35% in 2006 to 25% in 2011, representing almost two million fewer workers with temporary contracts in the period. Similarly, non-Spanish employees have been reduced by 500,000 between 2007 and 2012. When new information becomes available, it would be of great interest to repeat the present study, comparing results obtained under both scenarios: in booms

and in recessions. An exercise as such will be helpful in understanding the adjustment mechanisms in the Spanish labour market.

Appendix

The sample from the European Community Household Panel (ECHP) is made up of 17,908 individuals who were surveyed personally. The final size of the sample is reduced to 5,779 employees, forming an overall sample of 27,954 observations. Some individuals have been discarded: those who are not workers (including the self-employed), workers in agriculture and fishing, civil servants, and members of the military. The survey provides information on earnings, as well as job and personal characteristics. Specifically, the variables we have used are:

— *Log real wage per hour.* Nominal wages are computed as the ratio between annual earnings and the number of hours worked in a week, times the number of weeks worked in a year (50). They are then deflated by the corresponding weighted regional CPI, which is own-elaborated at the NUTS 1 level from the NUTS 2 information provided by the Spanish National Statistic Institute.
— *Log unemployment rate*. The variable measures the unemployment rate by region, by gender, and by age group (the corresponding age groups being between 16 and 19, between 20 and 24, between 25 and 54, and over 55). The data are drawn from the Spanish Labour Force Survey.
— *Age*. This is used to proxy working experience. We also introduce it to the second power (divided by 100) to shape the decreasing returns on experience.
— *Gender*. Male = 1 and female = 0.
— *Marital status*. Married = 1, otherwise = 0.
— *Part-time work*: Working less than 30 hours per week = 1. Working more than 30 hours = 0.
— *Fixed-term contract*: Employed with a temporary contract = 1. Employed with a permanent contract = 0.
— *Immigrant*: Non-Spanish worker = 1. Spanish worker = 0.
— *Education level of the employee*: This includes 3 categories: primary or no formal education, secondary education, and university and technical education.
— *Occupation group*. This variable describes the type of specialisation of the employee, divided into 8 categories: manager, professional technician, supporting professional technician, administrative, simple services, qualified craftsman and technician, assembler, and non-qualified worker.
— *Seniority*. The number of years that a worker has been employed in his/her current position. This includes 3 categories: less than 2 years, between 2 and 10 years, and more than 10 years.
— *Type of activity*. In principle, this classifies into agricultural, industrial, and service activities. However, once we eliminate agricultural workers, it becomes a dummy variable. Industry worker = 1, Services worker = 0.

The ECHP offers regional disaggregation for the seven NUTS I («nomenclature of territorial units for statistics») areas of Spain (see table A).

Table A. Regional (NUTS I and NUTS II) disaggregation

Spain	*NUTS I*	*NUTS II*
Region 1	North West	Galicia, Asturias, Cantabria
Region 2	North East	Basque Country, Navarre, La Rioja, Aragón
Region 3	Community of Madrid	Community of Madrid
Region 4	Center	Castilla-León, Castilla-La Mancha, Extremadura
Region 5	East	Catalonia, Comunidad Valenciana, Balearic Islands
Region 6	South	Andalusia, Murcia, Ceuta and Melilla
Region 7	Canary Islands	Canary Islands

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Comment on «Wage Dynamics in Spain: Evidence From Individual Data (1994-2001)», by Inmaculada García-Mainar and Víctor M. Montuenga-Gómez

José Luis Roig *

The analysis of wage flexibility is a highly relevant issue both from the academic and policy perspectives. It is even more crucial for countries such as Spain that belong to a single currency area. How do wages adjust to unemployment variations in Spain? This is the question that «Wage dynamics in Spain: evidence from individual data (1994-2001)» addresses. To answer the question, a *dynamic wage curve* is estimated with data from the European Community Household Panel for the entire period covered by this panel: 1994-2001.

The idea behind the dynamic wage curve is that the Phillips curve that establishes an aggregated dynamic relation between unemployment levels and changes in wages in a competitive labour market framework and the wage curve that assumes a micro relationship between regional unemployment rates and wage levels in a non-competitive labour market framework only represent extreme cases. In the Phillips curve, full wage persistence is assumed, whereas the wage curve assumes exactly the opposite. In some countries, neither of these approaches may be able to properly model the adjustment of wages to unemployment. Instead, a mixed approach would be more effective. The dynamic wage curve extends the wage curve by introducing a lagged wage term as an explanatory variable. A non-significant coefficient of this variable would mean that the wage curve explains the relationship between unemployment and wages, whereas a coefficient that is close to one would mean that wage adjustment is explained by the Phillips curve. Intermediate coefficient values would support a partial persistence adjustment. Empirical evidence from the United Kingdom, Germany and other countries supports the hypothesis of partial persistence.

The article by García and Montuenga contributes to this literature by analysing the Spanish case. The contribution is interesting because it increases the available evidence on a non-settled topic and because the institutional context of the Spanish labour market is different from that of other European countries due to regulations that, according to many authors, generate rigidities to adjustment in the labour market and favour the creation of a sort of dual market in which some groups of workers bear the burden of differentially worse contractual conditions (temporary contracts) that allow flexibility at the margins of the market.

The econometric modelling is well developed and uses a GMM system to address endogeneity issues in a dynamic panel. The results show that the wage curve rules the wage dynamics in Spain. The authors obtain a coefficient of –0.07 for the

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unemployment rate. This is not far from the coefficient of –0.1 that constitutes the «empirical law of economics» of Blanchflower and Oswald. Most importantly, the lagged wage term is not significant in the preferred estimations and is very low in the other presented estimations. In the words of the authors, «this result can be interpreted as that the Spanish labour market is relatively more sensitive to supply shocks than in other countries». The given explanation for this sensitivity is the presence of groups with lower bargaining power in the labour market. The authors note two of these groups: workers in temporary contract jobs and immigrants. The results of segmented estimations for these groups of workers (temporary *vs.* permanent contract; native *vs.* immigrant) tend to corroborate this hypothesis. The degree of flexibility and non-persistence of temporary and immigrant workers is larger than that of their permanent and native counterparts.

In my view, the main weakness of the paper lies in the short time period available for the estimations. Eight years may not be enough to fully capture the dynamics of the market, and this limitation is rightly acknowledged by the authors. There is also a second question that should be taken into account. The period of analysis runs from 1994 to 2001, whereas immigration in Spain began to reach significant levels only after 2001 or later. Thus, the importance of the immigrant workers in the market during the period of analysis is likely to be very limited [15].

All in all, this is a nice piece of work on a disputed topic and is extremely relevant given the problems that the Spanish labour market is currently facing. The results will need to be corroborated when longer and more recent panel data become available.

[15] Nonetheless, it could be interesting to estimate the model with the panel data from the EU-SILC available for 2004 to 2010. The number of observations is now very similar to that of the ECHP used in this article, but the cyclical characteristics of this period are richer and immigrant workers account for a significant share of the market.

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Section ARTICLES

Investigaciones Regionales

Overeducation and its effects on wages: a closer look at the Spanish regions

Laura Hernández *, Lorenzo Serrano **

ABSTRACT: This paper uses data from the 2004 to 2009 Living Conditions Survey (LCS) to analyze the wage gap between the adjusted and the overqualified employees in the Spanish regions using standard Mincer equations, quantile regression and the Oaxaca-Blinder decomposition. The results indicate that in Spain there is a 28% difference between the gross hourly wage between the overqualified and well-matched employees, of which 25 percentage points correspond to the discrimination effect and only three percentage points correspond to the characteristics of the individuals and the firms they work in. These results show that the effects of overeducation on the regional economies are genuine and substantial and present a considerable heterogeneity.

JEL Classification: J24, J31, R23.

Keywords: Overeducation, education mismatch, returns to education, quantile regression, regional labour markets.

Sobreeducación y sus efectos sobre los salarios: una mirada a las regiones españolas

RESUMEN: Este trabajo utiliza datos de la Encuesta sobre Condiciones de Vida (ECV) desde 2004 hasta 2009 para analizar la brecha salarial entre los trabajadores ajustados y los sobrecualificados en las regiones españolas utilizando ecuaciones de Mincer estándar, regresiones cuantílicas y la descomposición de Oaxaca-Blinder. Los resultados indican que en España hay una diferencia del 28% entre el salario bruto por hora que reciben los trabajadores sobrecualificados y los adecuadamente ajustados, de los cuales 25 puntos porcentuales se deben al efecto discriminación y únicamente tres puntos al efecto de las características de los individuos y de las empresas donde trabajan. Estos resultados muestran que los efectos de la sobree-

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ducación sobre las economías regionales son genuinos y sustanciales y presentan una considerable heterogeneidad.

Clasificación JEL: J24, J31, R23.

Palabras clave: Sobreeducación, desajuste educativo, rendimientos a la educación, mercados de trabajo regionales.

Introduction

Overeducation is becoming one of the main economic issues in Spain. This is a serious problem from an individual point of view but also from an aggregate one as it seems that an important part of the working population has acquired more education than required in their respective jobs. Overeducation is related to inefficiency problems, as individuals may not take advantage of all the knowledge and skills and education is costly not only for the individuals but also to the whole society. The existence of overeducation in the modern economies shows that it is not enough to improve the skills and competences of the labour force, but it is necessary also to achieve a better match between education and jobs. This mismatch may reduce productivity and competitiveness, both fostering underemployment and unemployment. Thus, the main consequences of overeducation are personal dissatisfaction and lower wages for workers and less productivity for firms. All this may lead to a lower volume of production related to the inputs used, so that these differences with respect to other economies or firms can cause losses in competitiveness. This is especially true at a regional level since regions are fully open economies extremely dependent on their competitiveness. Therefore, the way each regional economy deals with this problem is a key factor to understand their final economic performance. However, the analysis must consider not only the frequency of overeducation but also its specific effects on productivity looking at the wage differentials across regions and their determinants.

In this paper, we use data from the Spanish Living Conditions Survey (LCS) for the period 2004-2009 to analyze the wage differentials caused by overeducation in the Spanish regions. We use a quantile regression approach to account for the existence of non-uniform effects of overeducation over the wage distribution. Thus, we can measure the changes in salary between the overeducated and the adjusted workers at different deciles of the wage distribution and conclude if there is a larger dispersion among overeducated workers. There is also a part of the overeducation literature that relates unobservable characteristics of the individuals, like innate ability or motivation, to different locations in the wage distribution. In that case, more skilled workers would be located at the upper part or the wage distribution and vice versa. With quantile regression we can estimate the wage differentials between low and high ability overeducated workers and see if, related to the believe that overeducated individuals are less able and productive, their lower wages are a consequence or their lower innate abilities and are not related to the mismatch

between education and skills required in their jobs. According to this idea workers located in the lower part of the wage distribution and thus less able should show a greater wage differential. However, like Budría and Moro-Egido (2007, 2009) for the EU countries, we find that overeducated employees in the upper part of the wage distribution are more penalized than overeducated workers in the lower part of the wage distribution. This in turn, as these authors point out, seems to be the consequence of a lack of efficiency in the allocation of skills to the characteristics of the productive sector.

We also investigate whether the wage gap between the overeducated and the adjusted workers in the Spanish regions is due to differences in the individuals' and firms' characteristics or to differences in the way the Spanish regional labour markets compensate these characteristics. We do it through the Oaxaca-Blinder decomposition.

The paper is organized as follows. In Section 1 we present some overeducation approaches and evidences and the approximation followed in this paper to measure it. In Section 2 we present the dataset and estimate the average regional effect of overeducation on wages. In Section 3 we present the quantile regression model and its results. In section 4 we present the Oaxaca-Blinder decomposition and its results. Section 5 concludes.

1. Overeducation background

Overeducation is related to the possession of an education level higher than the one required by the job. Although education can be measured differently, the evidence is that there is an important part of overeducated workers. The existence of overeducation contradicts the Human Capital Theory (Becker, 1964), as this theory predicts that workers with higher education levels will be paid higher wages and we find workers with the same level of education and significant wage differentials. This evidence could be rationalized within the HCT framework if educational mismatches were found to be a short run singularity (Sicherman, 1991; Alba-Ramírez, 1993), but there seems to be evidence supporting that workers remain overeducated for much longer time spells (Robst, 1995; Rubb, 2003; Dolton and Vignoles, 2000; McGuinness, 2003).

Concerning international evidence, the differential between the overeducated and the matched workers ranges between 12% (Dolton and Vignoles, 2000), 18% (Dolton and Silles, 2003) or 27% (Chevalier, 2003) for the United Kingdom, 13% for the United States (Verdugo and Verdugo, 1989) or 11% (Cohn and Kahn, 1995), 26% for the Netherlands (Groot, 1993) or 8% in Portugal (Kiker *et al.,* 1997). There are also some authors supporting the argument that overeducated workers may incorporate less innate skills or abilities in their wage gaps. Others (Groot, 1996) find that the wage penalty for overeducated workers is related to tenure, which means that as time goes by the employers find out the real productivity of the workers and discriminate those with fewer abilities than the qualifications they possess.

There are also other theories besides Human Capital Theory that explain the existence of overeducated workers. Carrier Mobility Theory (Galor and Sicherman, 1990) considers an initial situation of overeducation for workers, which will gain experience and specific skills to gain higher occupation levels over time to finally match their qualification level to their occupation. Signaling Theory (Spence, 1973) assumes the existence of an excess of education as a signal to employers in order to be hired. Credential Hypothesis (van der Meer and Wielers, 1996) relies on the difficulty of the employers to measure the true individual's productivity, thus using the educational credentials as a strong proxy for the potential worker's productivity. In that case, individuals may acquire an excess of education in order to fight for a job with other candidates. Job Competition Theory (Thurow, 1975) states that unemployed candidates for a given job are ranked in a hypothetical queue, so overeducation could be an optimal response in order to improve or maintain their position in the queue in order to get the job. Matching Theory (Jovanovic, 1979) assumes the existence of job's misallocations by the existence of search costs and imperfect information.

One of the main difficulties arising from the analysis of overeducation is how to measure it. There are mainly three different methods commonly used. Some of them are based on the systematic evaluation of the jobs and their specific requirements (objective measures), others rely on the subjective perception of the workers about their potential mismatch (subjective measures) and the third type of overeducation measurement is based on empiric analysis (statistic measures). As usual, all of them have advantages and disadvantages but the most frequent decision criterion is the availability of data and information. The objective measures rely on a meticulous analysis of the jobs based on their difficulty, main characteristics, education requirements or special abilities. In this case, the comparison of the education level of the workers and the characteristics of the jobs will determine whether a mismatch exists. This kind of analysis requires an exhaustive analysis. Even more, this process requires a continuous update of the list of occupations given the quick absorption of new technologies and its consequences on the jobs' characteristics. Moreover, not all the countries have such detailed and disaggregated information in order to perform this analysis. The OECD proposes an approximation for an objective and comparable measure of overeducation based on the ISCO classification of occupations and the ISCED classification of education and a correspondence between the occupations and the education level required, but this solution has also some limitations as it relies on the homogeneity of the educational profiles and the occupations between countries. If differences between countries in the requirements of the jobs are important, which is something very likely when working with a high level of aggregation in the definition of the different occupations, and the education systems are different, then the use of a common classification could be misleading.

The subjective method relies on the individuals' opinion about their own mismatch and the overeducated present usually higher dissatisfaction levels in the workplace. It is important to notice that there is a type of overeducation commonly

accepted among individuals when they are satisfied with their jobs although they are not well matched with their formation because they usually consider education as a personal consumption good (from a vocational point perspective) or a social status component, but not an investment. There is also a trend towards an upward bias of overeducation, as individuals may exaggerate the requirements of their jobs (Peiró and Montalvo, 2008).

The statistical method is based on the observed adjustment within each occupation through the observation of the most frequent education level. Some authors, like Verdugo and Verdugo (1989), prefer to take the mean of the years of education within each of the occupations, so that individuals above one standard deviation of the average years of education in a given occupation will be classified as overeducated and vice versa. However, these methods are based on the arbitrariness of using the standard deviation as a threshold for detecting overeducation and the assumption that the occupation-education mismatch follows a normal distribution. In that case, if an occupation group had a high incidence of overeducated individuals, then the mean would be affected by this phenomenon thus underestimating its composition (Dolton and Vignoles, 2000). Furthermore, according to Sicherman (1991), the classification of occupations may group jobs for which the educational requirements differ substantially and this effect may be reinforced as we move to a greater occupational aggregation. The statistical method is also very sensitive to the labour market situation (Hartog, 2000), in the sense that if there is a surplus of qualified workers then workers with a higher qualification than the one required for their jobs will be hired, so there would be an underestimation of the overeducation effect and viceversa. The first effect could arise in regions or countries in periods of general education improvements. Alternatively, other authors (Kiker *et al.,* 1997) prefer to use the mode as an alternative to the mean. In that case, individuals with an education level higher than the modal within each occupation group will be overeducated and vice versa. This definition is supposed to be less sensitive to the existence of outliers in the educational distribution.

Unlike in any other Spanish analysis related to overeducation in which subjective or statistical measures are used (Alba, 1993; Beneito *et al.,* 1996; Alba and Blázquez, 2004; Budría and Moro-Egido, 2008; García-Montalvo and Peiró, 2009; Nieto and Ramos, 2010) or the analysis focuses on young workers (Rahona, 2008), in this paper we will use the objective method proposed by the OECD matching the educational and the occupational levels of the workers based on the data provided by the Spanish Living Conditions Survey . In this survey there are no subjective statements related to the education mismatch and regarding the regional analysis we preferred to use a more objective measure of overeducation consistent over time and less dependent on conjunctural circumstances rather than a statistical one like the mean or the mode. Other methods, like the overeducation, required education, and undereducation (ORU) rely on the years of education required to perform a specific occupation, so that overeducation is defined as the surplus of years and undereducation implies the opposite. We use a similar approach

relying on dummy variables for the different possible matching between education levels and occupations instead of years of education and center the attention on the group of employees which might be overeducated, thus not taking into account undereducation.

The ISCO (International Standard Classification of Occupations) produced by the International Labour Organization can be used to distinguish the different qualifications and skills related to the education levels required to perform the jobs grouped by this classification (tables 1 and 2). The 1-digit educational and occupational groups are classified as high-skilled, intermediate or low-skilled depending on the capacities and abilities related to them and, finally, a correspondence table between occupations and education levels results from matching them together (table 3).

Table 1. Conversion of ISCO-88 9 categories to 3 categories

	Low-skilled	*Intermediate*	*High-skilled*
1. Legislators, senior officials and managers			x
2. Professionals			x
3. Technicians and associate professionals			x
4. Clerks		x	
5. Service and sales workers		x	
6. Skilled agricultural, forestry and fishery workers		x	
7. Craft and related trades workers		x	
8. Plant and machine operators, and assemblers		x	
9. Elementary occupations	x		

Source: OECD (2007).

Table 2. Conversion from ISCED 7 categories to 3 categories

	Low-skilled	*Intermediate*	*Skilled or highly skilled*
0. Pre-primary education or preschool	x		
1. Primary education	x		
2. Lower secondary education	x		
3. Upper secondary education		x	
4. Post-secondary non-tertiary education		x	
5. First stage of tertiary education			x
6. Second stage of tertiary education			x

Source: OECD (2007).

Table 3. Correspondence between ISCED education level and ISCO employment level

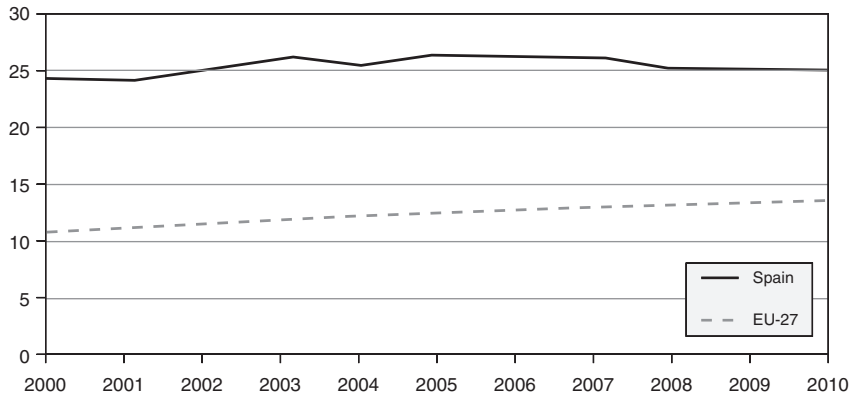
		ISCO employment level		
		Low-skilled	*Intermediate*	*Skilled or highly skilled*
ISCED education level	Low-skilled	Adjusted	Under-qualified	Under-qualified
	Intermediate	Over-qualified	Adjusted	Under-qualified
	Skilled or highly skilled	Over-qualified	Over-qualified	Adjusted

Source: OECD (2007).

From the previous table we can describe three different categories from the adjustment between the occupation groups and the education levels: overqualification, well-matched workers and underqualification. Overqualification arises for high education (ISCED 5-6) and intermediate or low-skilled occupations (ISCO 4-9) or intermediate education levels (ISCED 3-4) and low-skilled occupations (ISCO 9).As the purpose of this paper is to analyze the overeducation phenomenon, we will not take into account the population with low-skilled levels of education (ISCED 0-2) because this group cannot be overqualified. Thus, we will analyze the population with education levels ISCED 3-4 (post-secondary education) and ISCED 5-6 (high education) which will be either adjusted or overqualified.

Following the OECD methodology for the overeducation measurement we can observe that the percentage of overeducated workers with medium and high education is around 25% in Spain, whereas this percentage is much smaller for the EU (around 13%). In that sense, Spain is a special case in the European Union with one of the highest levels of overeducation jointly with Cyprus and followed by Ireland

Figure 1. Overeducation. Spain and EU-27, 2000-2010 (% of medium and high education workers)



Source: Eurostat and own calculations.

and the UK. The Spanish case could be explained in part by the fact that ISCED 5B is rarely found to be matched with ISCO 1-3 occupations. However, if we analyze overeducation in Spain only for employees with a university degree (ISCED 5A-6), this percentage sinks to 20%.

2. Data and methodology

We use data from the 2004-2009 waves of the Spanish Living Conditions Survey (SLCS). The SLCS is a new source of statistical information in the Community environment that strengthens the current European statistical infrastructure in order to respond to the Commission's needs to obtain initial information on the distribution of income and social exclusion in Europe, and acts as a base for the formulation of its social policy in different spheres, and to monitor the effects of these policies in the whole of the European Union (EU). Between 1994 and 2001, the European Union Household Panel (EUHP) survey satisfied these political needs. Nevertheless, given the need to update its content in view of the new demands, and to improve its functioning (especially as regards the speed at which data is produced), the EUHP was replaced with the SLCS. Although persons of all ages are part of the target population, not all persons are eligible to respond to the individual questionnaire. The population under investigation (target population) is persons who are members of private households who live in main family dwellings, as well as said households. Although persons of all ages are part of the target population, not all persons are exhaustively researched since the only persons who can be selected for exhaustive investigation are those aged 16 or over on December 31st of the year prior to the interview. For each region (Autonomous Community) an independent sample that represents it is designed, due to one of the objectives of the survey being to facilitate regional data.

This survey contains personal and labour market characteristics, such as wage, hours worked, age, activity sector, occupation, if the employee supervises other employees, firm size, marital status and nationality, among other variables. Potential labour experience may be estimated as the difference between the age of the employee and the age at which he declared to have finished his studies. Individuals are asked to report the maximum level of education that they have completed according to three categories based on the ISCED-97 classification (OECD, 2003): less than upper secondary (ISCED 0-2), upper secondary (ISCED 3-4) and tertiary education (ISCED 5-6).Our sample consists of employees between 17 and 64 years old not working for the armed forces and reporting a maximum level of education equivalent to ISCED 3-4 or ISCED 5-6 since workers with ISCED 0-2 cannot be overeducated according to our measure of overeducation. The hourly wage is calculated by dividing the gross monthly earnings by the hours usually worked per week multiplied by 4. Since we pool the observations for all the years, a set of dummies controls for a possible time trend and wages are corrected for inflation. Furthermore, we use sample weights provided by the SLCS to make the sample comparable to the population; all the standard errors are robust to heteroskedasticity arising from the sample design. We account for all the Spanish regions except for Ceuta and Melilla.

Table 4. Distribution of the employees of the SLCS survey by educational occupation groups classified by skills. Spain, 2004-2009

		Occupation by skill level			*Total*
		Low-skilled	*Intermediate*	*Skilled or highly skilled*	
ISCED education level	Low-skilled	11.57	26.43	1.68	39.68
	Intermediate	3.16	16.84	3.96	23.95
	Skilled or highly skilled	1.19	13.16	22.02	36.37
	Total	15.91	56.43	27.66	100.00

Source: SLCS and own calculations.

In Table 5 we report some descriptive statistics. Data from the SLCS confirm the existence of significant wage differentials between the Spanish regions, with mean hourly wages ranging from 9.1 euros in Canarias to 13.2 euros in País Vasco, which are almost 50% higher. This regional pattern is coherent with other statistic sources and usual among other economic development indicators. Madrid and the regions located in the north-east occupy the top positions in gross hourly wages, which is also what the SLCS shows relative to the educational levels: the percentage of employees with high education (ISCED 5-6) is higher than 45% in Madrid (45.9%), Navarra (47.3%) and País Vasco (53.4%). On the other hand, Murcia, Canarias and Baleares show percentages of less than 30%. Comunidad Valenciana, Extremadura, Andalucía and Castilla-La Mancha have an amount of high educated employees near 30%. Other variables such as age or labour experience show more homogeneity.

Also the job's characteristics are different between regions, as the percentage of employees in high-skilled occupations (ISCO 1-3) is around 40% in Madrid and 35% in País Vasco, whereas in other regions like Murcia or Canarias this percentage is 22%. Also the percentage of non-skilled jobs (ISCO 9) is very high in Murcia (24%) and doubles the weight of these occupations in other regions. We can also observe that in Madrid, Cataluña and Aragon, jobs which entangle supervision tasks are much frequent than in Murcia, Galicia or Extremadura. Finally, the firm's characteristics constitute a fundamental dimension in which inequalities are apparent between regions. Madrid, País Vasco, Cantabria and Navarra show a higher presence of bigger firms (40%-50%), whilst in Murcia big firms barely arrive to 22%.

For this particular sample of the SLCS for the 2004-2009 period we find that a third of the employees with medium and high education are overeducated. This percentage is almost 37% in Navarra and 21.7% in Baleares. One of the main drawbacks of the education-occupation matching following the methodology proposed in table 3 is the fact that it does not allow to relate specific degrees to specific occupations as it aims to capture this matching in a broader sense in order to enable international comparability. This should not be the case when analyzing a single country, or, as in our case, a regional performance, because of the occupation-education existing homogeneity. In our case, the availability of data did not allow us to go any further, as our database disaggregates occupation in the 9 commonly ISCO main-groups and the

Table 5. Descriptive statistics. Pool 2004-2009

	Gross monthly wage (euros)	*Gross hourly wage (euros)*	*Potential experience (years)*	*Age (years)*	*ISCED 5-6 (%)*	*ISCED 3-4 (%)*	*ISCO 1-3 (%)*	*ISCO 9 (%)*	*1-19 employees (%)*	*50 or more employees (%)*	*Supervision tasks (%)*	*Part-time (%)*	*Overeduc. (%)*	*Obs.*
Andalucía	1,543	10.0	20.1	38.9	33.0	20.9	26.3	20.6	34.5	28.4	19.6	11.5	27.6	6,334
Aragón	1,790	11.5	22.2	41.3	38.2	26.1	27.6	13.4	29.6	37.8	26.0	10.1	32.0	2,830
Asturias	1,754	11.2	21.8	41.2	36.8	28.9	26.5	12.1	34.4	38.4	23.2	8.9	27.0	2,366
Baleares	1,712	11.1	21.3	39.9	29.1	24.2	26.2	14.0	35.4	30.7	24.7	8.9	21.7	2,440
Castilla y León	1,673	10.8	21.5	40.7	40.4	23.8	26.6	15.6	32.5	38.1	20.0	9.0	32.4	3,645
Castilla-La Mancha	1,605	10.5	20.7	39.3	33.0	21.2	25.0	16.3	37.2	27.4	20.8	8.7	29.4	2,877
C. Valenciana	1,536	9.7	21.0	39.1	30.0	24.1	25.1	14.3	35.2	30.3	23.9	10.6	28.1	5,421
Canarias	1,409	9.1	20.7	40.8	27.7	22.8	22.3	21.6	35.2	28.6	20.7	9.0	28.2	3,141
Cantabria	1,728	11.2	21.7	40.2	39.9	26.2	27.8	14.4	27.4	41.7	20.1	11.0	30.4	1,545
Cataluña	1,808	11.6	20.9	39.0	36.2	27.3	30.6	14.9	29.8	37.7	27.5	11.0	26.1	7,510
Extremadura	1,400	9.2	20.6	39.2	31.5	19.9	25.0	23.6	39.8	22.1	18.5	11.0	27.7	2,168
Galicia	1,480	9.4	21.6	40.2	33.9	22.7	23.8	14.6	35.1	31.7	18.3	8.9	30.3	3,975
La Rioja	1,544	10.1	21.7	40.2	35.7	23.5	22.5	15.2	33.8	30.8	18.8	9.4	34.4	2,072
Madrid	1,964	12.3	20.5	41.0	45.9	26.0	39.7	13.3	23.8	50.3	30.6	8.7	24.5	5,056
Murcia	1,501	9.5	20.7	38.8	26.6	25.0	21.6	24.3	33.9	30.2	18.0	9.4	30.1	2,777
Navarra	1,914	12.6	20.1	39.5	47.3	22.8	27.2	10.3	28.7	41.9	24.1	13.4	36.8	2,537
P.Vasco	1,993	13.2	21.6	41.6	53.4	20.5	34.8	12.1	25.0	44.3	24.7	10.9	34.2	3,430
Total	**1,675**	**10.8**	**21.0**	**40.0**	**36.4**	**23.9**	**27.7**	**15.9**	**32.1**	**35.0**	**23.0**	**10.1**	**29.0**	**60,124**
Dispersion range	**593**	**4.1**	**2.1**	**2.8**	**26.7**	**8.9**	**18.1**	**13.9**	**16.0**	**28.2**	**12.5**	**4.8**	**15.0**	
Standard Deviation	**186**	**1.2**	**0.6**	**0.9**	**7.3**	**2.5**	**4.5**	**4.1**	**4.4**	**7.3**	**3.6**	**1.3**	**3.8**	

Source: SLCS and own calculations.

education levels are also grouped in three main categories according to the 0-2, 3-4 and 5-6 ISCED levels. Table 4 shows the distribution of the three educational levels of the SLCS for the years 2004 to 2009 by skilled groups.

As a preliminary exercise we estimate the effect of the worker's and the workplace's characteristics on the gross hourly wage, adding also a dummy variable for the effect of being overeducated, using OLS techniques through a Mincerian (Mincer, 1974) semi-logarithmic wage equation:

$$y = \alpha + X'\beta + over\ \gamma + \varepsilon \tag{1}$$

where α is the intercept term, X is a vector of independent variables measuring a range of individual and job characteristics such as marital status, level of education (equal to one for high education and equal to zero for post-secondary education), gender, potential labour market experience calculated as the difference between the year of the survey and the year that the individuals finished their formal studies, a second degree polynomial in labour market experience, supervising other employees, part-time work, etc, ε is the residual term and there is also dummy variable (*over*) that takes the value of one if the worker is overeducated and zero if the worker is well-matched. Since we pool the observations for all the years, we use a set of dummies controls for a possible time trend. The dependent variable is the logarithm of the average hourly wage of each employee. We also apply the Gardeazabal and Ugidos (2004) identification restriction in order to obtain the estimation effects for the omitted reference for all the categorical variables. The results for the subset of employees with upper secondary or tertiary education, including also occupational categories in column 1, are shown in table 6. Ceteris paribus, gross hourly wages increase with the educational level, the employee's potential experience and the firm's size and is also positively associated with performing supervision tasks and working in skilled occupations (ISCO 1-3). On the contrary it is significantly smaller for women, foreign workers and part-time workers. Finally, the economic activity and the region have a significant influence on wages (with higher wages in the financial sector, education or health, and regions such as País Vasco and Navarra).

Column 2 presents the results for the estimation including the dummy variable for overeducation, defined following the correspondence between the education level and the occupation group (table 3), thus excluding the ISCO dummies for the occupation groups. The coefficients are very similar for all variables to the ones estimated in column 1, although it is important to remark the positive increase of education, reflecting the fact that the occupation level depends positively on the education of the individuals, which is also an important component of the returns to education. The effect of being overeducated is significant and negative, reflecting ceteris paribus a decrease of –25% on the gross hourly wage, a very high cost associated with this problem. If mismatched employees had jobs suited to their qualifications there would be a substantial increase in their productivity and given the high levels of overqualification in Spain, this would also increase the national and regional labour productivity. The time dummies included in the regression and all the econometric

Table 6. OLS regression for the log hourly wage

	Total (1)		*Total (2)*	
ISCED 5-6	0.101	***	0.318	***
Experience	0.015	***	0.015	***
Experiencie2	0.000	***	0.000	***
Female	–0.111	***	–0.102	***
Foreign	–0.117	***	–0.128	***
Married	0.090	***	0.095	***
Supervision	0.123	***	0.154	***
Part–time work	–0.048	**	–0.052	**
1-10 employees	–0.082		–0.089	
11-19 employees	–0.035	***	–0.028	**
19-49 employees	0.031	***	0.027	**
50 or more employees	0.086	***	0.089	***
Agriculture, cattle & fishing	–0.121		–0.130	
Extr. ind., manuf, prod. & distrib.	–0.026	*	–0.046	***
Construction	–0.055	***	–0.073	***
Trade & repair	–0.071	***	–0.103	***
Hotels & restaurants	–0.076	***	–0.110	***
Transportation, storage & repair	–0.043	**	–0.046	**
Financial intermediation	0.183	***	0.191	***
Real estate, renting & business act.	–0.074	***	–0.072	***
Public adm. & defence; comp. ss.	0.160	***	0.166	***
Education	0.149	***	0.229	***
Health & vet. act, social service	0.068	***	0.083	***
Other social activities, etc	–0.096	***	–0.090	***
ISCO 1: Managers	0.351			
ISCO 2: Professionals	0.286	***		
ISCO 3: Technicians & ass. professionals	0.066	***		
ISCO 4: Clerical support workers	–0.046	***		
ISCO 5: Service and sales workers	–0.115	***		
ISCO 6: Skilled agric., forestry and fishery workers	–0.133	**		
ISCO 7: Craft and related trades workers	–0.125	***		
ISCO 8: Plant and machine operators, & assemblers	–0.092	***		
ISCO 9: Elementary occupations	–0.192	***		
Andalucía	–0.069		–0.066	
Aragón	0.032		0.026	
Asturias	–0.002		–0.007	
Baleares	0.104	***	0.117	***
Castilla y León	–0.012		–0.027	
Castilla-La Mancha	0.020		0.024	
C. Valenciana	–0.043	**	–0.033	*
Canarias	–0.079	***	–0.077	***
Cantabria	–0.006		–0.020	
Cataluña	0.045	***	0.049	***
Extremadura	–0.080	***	–0.076	**
Galicia	–0.091	***	–0.097	***
La Rioja	–0.001		–0.003	
Madrid	0.009		0.016	
Murcia	–0.040	**	–0.040	*
Navarra	0.120	***	0.128	***
País Vasco	0.094	***	0.086	***

Table 6. *(cont.)*

	Total (1)		*Total (2)*	
2004	–0.115		–0.115	
2005	–0.068	***	–0.067	***
2006	0.027	***	0.028	***
2007	0.034	***	0.033	***
2008	0.046	***	0.044	***
2009	0.076	***	0.078	***
Overeducated			–0.250	***
Constant	2.041	***	1.997	***
Obs.	34,169		34,169	
R^2	0.541		0.511	
Adjusted R2	0.540		0.511	

*** p<0.01, ** p<0.05, * p<0.1.

analysis performed in the next sections should capture any inflation or trend effects or any break due to the economic crisis after 2007. As it can be seen, as time goes by their values are more positive.

These results are broadly consistent with the empirical literature on this topic for the Spanish case. The wage penalty estimated for self-assessed overeducated workers was –9% according to Budría and Moro-Egido (2007), –17% according to Alba (1993) or, using a strict definition of subjective overeducation, –4% according to Aguilar and García-Crespo (2008).Evidence about a wage penalty for overeducated workers with respect to workers having a job matching their qualifications was also found in Nieto and Ramos (2010). Rahona *et al.* (2010) find that overeducated workers have a relative impact with respect to adjusted workers of –3.2 percentage points on the rate of return of years of schooling for the years of overeducation. In order to compare these results, we must take into account that they are related to different overeducation definitions (self-assessment, mean, mode...), different surveys (PHOGUE, ECBC, EES) or different analytical tools (ORU, panel, quantile...) to the ones used in our paper.

In Spain there are no formal barriers to labour mobility, but it is useful to analyze each regional labour market performance separately. The results for estimating a separate regression for each region as in table 6-column 2 are shown in table 7. Some of them are qualitatively similar: positive effect of education, firm's size and supervision tasks; negative effect on being a woman, a foreigner, etc. However, there are also differences in the magnitude and relevance of the effects between regions. Regional labour markets seem to pay some employee's characteristics such as education, gender, nationality or experience differently. Something similar happens with the job's and firm's characteristics.

In particular, being overeducated has a significant and negative effect over the gross hourly wage in all regions, but this effect is heterogeneous across the Spanish territory. The overeducation penalty is -17.5% in Cataluña, whereas in Castilla-La

Table 7. OLS regressions for the log hourly wage, by region

	Andalucía		*Aragón*		*Asturias*		*Baleares*		*Castilla y León*		*Castilla-La Mancha*		*C. Valenciana*		*Canarias*		*Cantabria*	
ISCED 5–6	0.317	***	0.329	***	0.407	***	0.206	***	0.345	***	0.361	***	0.374	***	0.321	***	0.310	***
Experience	0.014	**	0.019	**	0.022	*	0.012		0.028	***	0.015	*	0.016	***	0.004		0.024	**
Experiencie^2	0.000		0.000		0.000		0.000		0.000	***	0.000		0.000		0.000		0.000	
Female	–0.059	*	–0.177	***	–0.073		–0.041		–0.189	***	–0.092	*	–0.121	***	0.032		0.042	
Foreign	–0.168	*	–0.208	***	–0.355	*	–0.160	*	–0.063		–0.251	***	–0.053		–0.055		0.019	
Married	0.062		0.019		0.124	*	–0.034		0.043		0.049		0.028		0.097	*	0.108	
Supervision	0.133	***	0.079	*	0.190	***	0.239	***	0.183	***	0.129	***	0.076	*	0.208	**	0.299	***
Part-time work	–0.077		–0.065		0.058		0.091		–0.050		0.016		0.038		–0.141	*	–0.125	
1-10 employees	–0.097		–0.071		–0.130		–0.104		–0.082		–0.087		–0.092		–0.173		–0.060	
11-19 employees	–0.034		–0.003		0.001		–0.013		–0.030		–0.075		–0.044		–0.051		0.020	
19-49 employees	0.042		–0.040		0.058		0.085	*	0.023		0.039		–0.009		0.105	**	–0.070	
50 or more employees	0.090	***	0.115	***	0.071	*	0.032		0.089	***	0.123	***	0.145	***	0.118	***	0.109	**
Agriculture, cattle & fishing	–0.154		0.167		–0.112		–0.016		0.050		0.012		–0.425		–0.015		–0.381	
Extr. ind., manuf, prod. & distrib.	–0.096	*	–0.072		0.082		0.096		0.002		–0.092		–0.088	*	0.005		–0.058	
Construction	–0.075		–0.057		–0.014		–0.231	**	0.004		–0.058		–0.041		–0.155	**	–0.074	
Trade & repair	–0.135	***	–0.101	**	–0.115	*	–0.162	*	–0.054		–0.023		–0.081		–0.179	***	0.006	
Hotels & restaurants	–0.136	*	–0.175	***	–0.297	***	–0.214	***	–0.267	***	–0.146	*	0.094		–0.076		–0.250	***
Transportation, storage & repair	–0.104		–0.050		–0.125	*	0.057		–0.163	***	–0.163	**	0.007		–0.278	***	–0.171	**
Financial intermediation	0.363	***	0.054		0.139		0.114		0.325	***	0.134		0.329	***	0.354	***	0.571	**
Real estate, renting & business act.	0.010		0.026		–0.165	**	0.036		–0.164	***	–0.091		–0.094	**	–0.067		–0.129	
Public adm. & defence; comp. ss.	0.174	***	0.140	*	0.178	**	0.102		0.188	***	0.234	***	0.202	***	0.121	**	0.232	***
Education	0.229	***	0.147	**	0.183	**	0.209	***	0.318	***	0.314	***	0.230	***	0.283	***	0.385	***
Health & vet. act, social service	0.028		0.084		0.071		0.225	***	0.084		0.193	***	0.097		0.201	***	–0.016	
Other social activities, etc.	–0.106	*	–0.164	**	0.177		–0.215	**	–0.324	**	–0.315	**	–0.230	***	–0.195	*	–0.115	
2004	–0.114		–0.112		–0.088		–0.089		–0.155		–0.102		–0.119		–0.139		–0.181	
2005	–0.064	***	–0.027		–0.060	*	–0.103	***	–0.059	***	–0.042		–0.078	***	–0.054	**	–0.089	**
2006	0.026		0.015		0.028		0.015		0.009		0.023		–0.001		0.034		0.154	***
2007	0.032	**	0.002		0.005		0.040		0.055	**	0.005		0.039	**	0.025		0.037	
2008	0.051	***	0.033		0.013		0.032		0.052	***	0.006		0.060	***	0.052	**	0.023	
2009	0.070	***	0.090	***	0.101	***	0.105	***	0.098	***	0.111	***	0.099	***	0.083	***	0.057	*
Overeducated	–0.236	***	–0.286	***	–0.325	***	–0.182	**	–0.249	***	–0.343	***	–0.269	***	–0.267	***	–0.244	***
Constant	1.948	***	2.115	***	1.838	***	2.181	***	1.899	***	1.947	***	1.961	***	1.950	***	1.782	***
N	3,197		1,745		1,471		1,238		2,200		1,501		2,783		1,528		987	
R^2	0.568		0.550		0.567		0.568		0.636		0.679		0.552		0.680		0.588	
Adjusted R^2	0.564		0.542		0.559		0.558		0.631		0.673		0.547		0.674		0.576	

*** p<0.01, ** p<0.05, * p<0.1.

Table 7. *(cont.)*

	Cataluña		*Extremadura*		*Galicia*		*La Rioja*		*Madrid*		*Murcia*		*Navarra*		*País Vasco*	
ISCED 5–6	0.237	***	0.405	***	0.340	***	0.293	***	0.369	***	0.285	***	0.261	***	0.272	***
Experience	0.011	**	0.015		0.020	***	0.002		0.014	**	0.021	**	0.025	***	0.015	**
Experiencie^2	0.000		0.000		0.000		0.000		0.000		0.000		0.000	*	0.000	
Female	–0.092	***	–0.142	**	–0.157	***	–0.193	***	–0.088	***	–0.164	***	–0.075	*	–0.169	***
Foreign	–0.185	***	–0.279		0.166	*	–0.077		–0.146	**	–0.334	***	–0.086		0.125	
Married	0.110	***	0.150	**	0.113	**	0.033		0.133	***	0.228	***	0.005		0.117	***
Supervision	0.175	***	0.141		0.224	***	0.067		0.188	***	0.094	**	0.052		0.106	**
Part-time work	–0.140	***	–0.052		0.023		–0.047		0.038		–0.064		–0.061		–0.005	
1-10 employees	–0.078		–0.124		–0.034		–0.056		–0.119		–0.046		–0.078		–0.107	
11-19 employees	–0.007		0.025		–0.051		–0.075		–0.049		–0.037		–0.170	***	0.014	
19-49 employees	0.025		0.038		–0.029		0.010		0.086	**	0.019		0.091	**	0.034	
50 or more employes	0.060	***	0.061		0.015	***	0.121	***	0.081	***	0.064	**	0.156	***	0.059	**
Agriculture, cattle & fishing	–0.300		0.394		–0.188		–0.193		–0.117		0.084		–0.163		–0.230	
Extr. ind., manuf, prod. & distrib.	–0.029		–0.149	**	–0.072		–0.180	***	0.020		–0.090	*	–0.045		–0.031	
Construction	–0.061		–0.243	**	–0.051		–0.018		–0.109	**	–0.175	***	0.032		–0.038	
Trade & repair	–0.078	*	–0.004		–0.023		–0.196	***	–0.091		–0.170	**	–0.109	**	–0.091	
Hotels & restaurants	–0.090		–0.013		–0.242	***	–0.026		–0.102		–0.027		–0.154	*	–0.028	
Transportation, storage & repair	–0.014		–0.094		–0.011		–0.086		0.015		–0.143	**	0.167	**	–0.119	*
Financial intermediation	0.212	***	0.512	***	0.107		0.322	***	0.102	**	0.317	***	0.102		0.210	***
Real estate, renting & business act.	–0.042		–0.654	***	–0.054		0.112		–0.089	**	–0.105	**	–0.159	*	–0.066	
Public adm. & defence; comp. ss.	0.187	***	0.172	**	0.295	***	0.106	**	0.123	***	0.126	**	0.252	***	0.125	**
Education	0.216	***	0.234	**	0.329	***	0.293	***	0.133	***	0.232	***	0.191	*	0.250	***
Health & vet. act, social service	0.039		0.252	***	0.051		0.051		0.109	**	–0.029		–0.002		0.209	***
Other social activities, etc.	–0.041		–0.408	***	–0.140	*	–0.186	*	0.007		–0.021		–0.111		–0.191	**
2004	–0.078		–0.106		–0.165		–0.122		–0.134		–0.151		–0.113		–0.078	
2005	–0.064	***	–0.078	**	–0.096	***	–0.076	***	–0.069	***	–0.094	***	–0.065	***	–0.042	**
2006	0.010		0.018		0.051	**	0.012		0.062	***	0.055	**	–0.028		0.026	
2006	0.028	**	0.050	*	0.058	**	0.039		0.036	**	0.020		0.086	***	0.001	
2007	0.044	***	0.012		0.059	***	0.047	*	0.044	***	0.063	**	0.030		0.031	*
2008	0.060	***	0.105	***	0.093	***	0.099	***	0.061	***	0.107	***	0.091	***	0.062	***
2009	–0.078		–0.106		–0.165		–0.122		–0.134		–0.151		–0.113		–0.078	
Overeducated	–0.175	***	–0.287	***	–0.303	***	–0.195	***	–0.253	***	–0.297	***	–0.217	***	–0.263	***
Constant	2.112	***	1.872	***	1.790	***	2.107	***	1.950	***	1.963	***	2.117	***	2.145	***
N	4,477		1,090		2,106		1,134		3,218		1,381		1,708		2,405	
R^2	0.433		0.632		0.548		0.670		0.464		0.704		0.521		0.467	
Adjusted R^2	0.429		0.622		0.541		0.661		0.460		0.698		0.513		0.460	

*** p<0.01, ** p<0.05, * p<0.1.

Mancha this wage gap is -34.3%. In some cases, the effect of being overeducated almost compensates (País Vasco, Galicia, Castilla-La Mancha, Baleares, Aragón) or even exceeds (Murcia) the effect of attaining higher levels of education over upper secondary education. These results show that in order to assess the regional overeducation differences in Spain, it is not enough to consider the amount of mismatched workers or their weight on the total employment. Its ultimate impact in terms of productivity and economic performance may be influenced by the characteristics of the workers and the regional productive structure. The same percentage of overeducation may be more or less important depending on these factors. The following sections will analyze these issues.

3. Quantile regression approach

The quantile regression method allows to estimate the impact of overeducation not only on the mean of the wage distribution as in the standard OLS technique, but to estimate the possible different impacts of overeducation over different points of the wage distribution, thus helping us to understand the existence of differences in returns among employees with different levels of unobserved ability, as all of them hold an equivalent observable ability (education level). For the technique to be useful we require there to be sufficient variation in the levels of the exogenous variables across the quantiles in order to obtain statistically significant estimations. The empirical results suggest that the data used here is sufficient to meet that condition.

The QR model can be formally written as follows (see Buchinsky, 1994):

$$\ln w_i = X_i\beta_q + \varepsilon_{qi} \;\; with \;\; Quant_q(\ln w_i \big| X_i) = X_i\beta_q \tag{2}$$

Where X_i is the vector of exogenous variables and β_q is the vector of parameters. $Quant_q(\ln w_i \big| X_i)$ denotes the *qth* conditional quantile of *ln* given *X*. The *qth* regression quantile, $0 < q < 1$, is defined as a solution to the problem:

$$\min_{\beta \in R^k} \left\{ \Sigma \rho_q (\ln w_i - X_i\beta_q) \right\} \tag{3}$$

where the check function $\rho_q(z) = q_z$ if $z \geq 0$ or $\rho_q(z) = (q-1)z$ if $z < 0$. This problem is solved using linear programming methods, where standard errors for the vector of coefficients are obtained using the bootstrap method described in Buchinsky (1998). It must be noted that if the underlying model were a location model, that is, changes in the explanatory variables producing changes only in the location, not in the shape, of the conditional wage distribution, then all the slope coefficients would be the same for all *p*.

This analysis will allow us to determine if it is unobservable characteristics such as innate ability of personal motivation which are affecting earnings and producti-

vity or it is more due to situations of apparent educational mismatch. If unobservable characteristics were important, the negative effect of being overeducated should be bigger in the lower part of the wage distribution where other kind of abilities could not compensate this mismatch. If we observe the opposite phenomenon, then we could conclude that unobservable characteristics are not as relevant as the pure education-occupation mismatch.

Tables 8 and 9 show the gross hourly wages for the well-matched and the overeducated employees across the wage distribution in Spain and the Spanish regions for the workers with at least upper secondary education (ISCED 3-6) and the workers with high education (ISCED 5-6). For both groups the wage gap grows as we move to higher percentiles. As it can be seen, the range of variation of wages between regions is higher as we move to the upper part of the wage distribution. These differences are slightly smaller for workers with tertiary education for higher deciles but, anyway, they are also higher in the lower part of the wage distribution.

Table 8. Wage differences across the wage distribution. Spain. Pool 2004-2009 (euros 2009)

Deciles	*Overqualif. (ISCED 3-6)*	*Adjusted (ISCED 3-6)*	*Overqualif. / Adjusted (%)*	*Overqualif. (ISCED 5-6)*	*Adjusted (ISCED 5-6)*	*Overqualif. / Adjusted (%)*
10	5.33	6.14	86.78	5.54	8.08	68.49
20	6.22	7.49	83.09	6.51	10.11	64.43
30	7.01	8.84	79.38	7.36	11.96	61.55
40	7.79	10.19	76.48	8.22	13.80	59.54
50	8.66	11.73	73.86	9.13	15.56	58.72
60	9.65	13.62	70.85	10.18	17.45	58.33
70	10.89	15.83	68.78	11.50	19.45	59.14
80	12.58	18.70	67.29	13.28	21.97	60.42
90	15.67	22.83	68.63	16.41	26.01	63.08
Diff. 90-10	10.33	16.68	61.94	10.87	17.93	60.64

As a next step we analyze whether the matched-mismatched wage differential remains stable across the wage distribution controlling for the individual's and firm's characteristics. Table 10 presents the coefficients for the overeducation dummy from the 10^{th} to the 90^{th} percentiles of hourly income. The results for Spain (last row of table 10) confirm the negative effect across the wage distribution, which is more intensive in the highest percentiles (this effects is –19.2% in the 10^{th} percentile and –30.1% in the 90^{th} percentile, a difference of 11 percentage points). This pattern is similar in the Spanish regions except for Cantabria, and the 90^{th}-10^{th} difference is higher than 18 percentage points in Galicia, La Rioja and País Vasco.

Table 11 shows the overeducation coefficients obtained for the employees with tertiary education.The results are similar than the ones shown in table 10 but the

Table 9. Gross hourly wage for the overeducated and matched employees across the wage distribution

A) ISCED 3-6											B) ISCED 5-6										
	10	20	30	40	50	60	70	80	90	90-10		10	20	30	40	50	60	70	80	90	90-10
Overeducated											**Overeducated**										
Andalucía	5.0	5.8	6.5	7.1	7.9	8.7	9.9	11.6	14.3	9.3	Andalucía	5.3	6.1	6.9	7.6	8.4	9.3	10.5	12.5	15.5	10.2
Aragón	6.0	7.0	7.8	8.4	9.3	10.2	11.7	13.2	16.8	10.8	Aragón	6.4	7.3	8.1	8.9	9.8	10.8	12.0	13.9	17.5	11.1
Asturias	4.9	6.2	6.8	7.6	8.9	10.0	11.4	13.2	16.8	11.9	Asturias	5.3	6.4	7.0	8.0	9.3	10.3	12.0	14.0	17.9	12.6
Baleares	5.7	6.7	7.3	7.9	8.8	9.6	11.4	12.6	15.0	9.3	Baleares	6.0	6.9	7.6	8.3	9.3	10.4	11.9	13.2	16.3	10.4
C. y León	5.3	6.1	7.0	7.8	8.6	9.8	11.1	13.0	15.7	10.4	C. y León	5.5	6.3	7.3	8.2	9.0	10.4	11.7	13.6	16.0	10.5
C.-La Mancha	5.2	6.2	7.1	7.8	8.7	9.5	10.9	12.5	15.0	9.8	C.-La Mancha	5.5	6.5	7.3	8.2	9.0	10.0	11.3	13.1	15.3	9.8
C. Valenciana	5.2	6.0	6.6	7.2	7.8	8.6	9.5	10.9	13.1	7.9	C. Valenciana	5.4	6.2	7.0	7.5	8.3	9.1	10.1	11.6	13.9	8.4
Canarias	4.7	5.5	6.1	6.7	7.2	8.0	8.7	9.8	12.1	7.5	Canarias	4.9	5.6	6.2	6.8	7.5	8.3	9.2	10.3	12.7	7.8
Cantabria	5.0	6.1	7.0	7.6	8.5	9.6	10.9	13.0	17.5	12.4	Cantabria	5.5	6.3	7.3	8.1	8.9	10.0	11.7	14.3	18.0	12.5
Cataluña	5.6	6.8	7.4	8.4	9.5	10.7	11.9	13.7	17.1	11.5	Cataluña	5.9	6.9	7.9	9.0	10.2	11.4	12.6	14.6	18.2	12.3
Extremadura	4.7	5.3	6.1	6.7	7.4	8.0	9.1	10.4	14.1	9.4	Extremadura	4.8	5.6	6.3	6.9	7.4	8.1	9.5	11.2	15.0	10.2
Galicia	4.6	5.4	6.2	6.8	7.4	8.2	9.1	10.5	12.7	8.1	Galicia	4.7	5.6	6.3	6.9	7.6	8.5	9.5	10.9	13.1	8.4
La Rioja	5.4	6.2	7.0	7.6	8.2	9.1	9.7	11.0	13.2	7.8	La Rioja	5.6	6.5	7.2	7.9	8.6	9.4	10.2	11.4	14.1	8.5
Madrid	5.5	6.4	7.2	8.2	9.0	10.0	11.5	13.4	16.9	11.4	Madrid	5.8	6.9	7.9	8.8	9.7	10.9	12.3	14.4	18.0	12.2
Murcia	5.2	6.0	6.6	7.1	7.9	8.7	9.6	10.7	13.5	8.3	Murcia	5.4	6.2	6.8	7.5	8.7	9.4	10.2	11.3	14.3	8.9
Navarra	6.3	7.5	8.4	9.3	10.4	11.3	12.8	14.7	16.8	10.4	Navarra	6.5	7.8	8.7	9.7	10.6	11.7	13.1	15.1	17.0	10.5
País Vasco	6.4	7.8	8.6	9.5	10.4	11.4	12.8	14.5	17.8	11.5	País Vasco	6.8	8.0	8.8	9.7	10.6	11.8	13.1	14.9	18.2	11.3
Range. Var.	1.7	2.5	2.5	2.8	3.2	3.4	4.1	4.9	5.7	5.0	Range. Var.	2.1	2.4	2.6	3.0	3.2	3.7	4.0	4.8	5.5	4.8

A) ISCED 3-6											B) ISCED 5-6										
	10	20	30	40	50	60	70	80	90	90-10		10	20	30	40	50	60	70	80	90	90-10
Matched											**Matched**										
Andalucía	5.9	7.1	8.5	9.9	11.5	13.3	15.6	18.6	22.4	16.5	Andalucía	7.8	9.7	11.6	13.6	15.3	17.4	19.3	21.6	24.8	17.0
Aragón	6.7	8.0	9.3	10.7	12.3	14.3	16.3	18.6	22.7	16.0	Aragón	8.9	10.9	12.6	14.6	16.2	17.7	19.3	21.8	25.4	16.5
Asturias	5.8	7.0	8.4	9.8	11.4	13.4	15.9	19.0	23.5	17.7	Asturias	7.7	10.3	12.3	14.4	16.0	17.9	20.2	22.7	27.3	19.6
Baleares	6.7	8.0	9.3	10.8	12.4	14.7	16.9	19.5	23.2	16.5	Baleares	9.8	11.9	13.6	15.7	17.1	18.8	20.8	23.0	27.6	17.8
C. y León	6.2	7.5	8.7	10.3	11.7	13.5	15.8	18.7	22.5	16.3	C. y León	7.7	9.8	11.7	13.5	15.6	17.7	19.9	21.9	25.4	17.7
C.-La Mancha	6.1	7.5	8.8	10.0	11.6	13.7	16.0	19.3	23.8	17.6	C.-La Mancha	7.7	9.7	11.4	13.7	15.7	17.6	19.8	22.9	27.1	19.3
C. Valenciana	5.8	6.9	8.1	9.3	10.5	12.3	14.5	17.1	20.3	14.5	C. Valenciana	7.5	9.5	11.1	12.8	14.5	16.2	18.0	19.8	22.6	15.1
Canarias	5.3	6.3	7.3	8.6	10.0	12.0	14.8	17.6	22.0	16.7	Canarias	7.3	9.5	11.1	13.5	15.5	17.3	19.4	21.8	24.9	17.6
Cantabria	6.1	7.4	8.7	10.6	12.4	14.4	16.2	19.0	23.9	17.8	Cantabria	7.0	9.8	12.4	14.3	15.9	17.7	19.5	21.9	26.9	19.8
Cataluña	6.8	8.3	9.3	10.6	12.1	13.9	16.0	18.9	23.0	16.2	Cataluña	8.6	10.4	11.9	13.8	15.3	17.4	19.4	22.0	26.2	17.6
Extremadura	5.3	6.8	8.2	9.6	11.3	13.3	15.6	19.0	22.9	17.6	Extremadura	7.7	9.8	11.8	13.8	15.4	17.6	19.8	22.1	25.8	18.1
Galicia	5.3	6.4	7.5	8.8	10.2	12.0	14.2	17.0	21.8	16.5	Galicia	6.9	8.9	10.7	12.9	14.7	16.3	18.3	21.2	25.4	18.6
La Rioja	6.2	7.0	8.2	9.4	10.4	11.9	13.9	16.6	21.5	15.3	La Rioja	7.8	9.8	11.0	12.7	14.4	15.8	18.1	21.1	24.0	16.2
Madrid	6.5	8.1	9.7	11.2	12.9	14.6	16.7	19.7	24.3	17.9	Madrid	8.5	10.5	12.2	13.8	15.6	17.4	19.5	22.5	27.8	19.3
Murcia	5.6	7.0	8.2	9.2	10.6	12.4	14.5	17.3	21.1	15.4	Murcia	8.1	10.0	12.0	13.7	15.4	16.9	18.6	21.0	23.7	15.6
Navarra	7.2	8.6	10.0	11.3	12.9	15.0	17.4	20.2	24.1	16.9	Navarra	9.0	11.1	12.7	14.9	17.3	19.1	20.9	23.6	27.6	18.6
País Vasco	7.7	9.2	10.6	12.1	13.9	15.7	17.8	20.9	25.9	18.2	País Vasco	8.9	10.8	12.8	14.4	16.0	18.0	20.6	23.9	27.8	18.9
Range. Var.	2.4	2.9	3.3	3.6	3.9	3.7	3.9	4.2	5.7	3.8	Range. Var.	2.9	3.0	2.8	3.0	2.9	3.4	2.9	4.1	5.3	4.8

Table 9. *(cont.)*

A) ISCED 3-6											B) ISCED 5-6										
	10	20	30	40	50	60	70	80	90	90-10		10	20	30	40	50	60	70	80	90	90-10
Difference between overeducated and matched employees											Difference between overeducated and matched employees										
Andalucía	–0.9	–1.4	–2.0	–2.7	–3.6	–4.5	–5.7	–7.0	–8.1	–7.2	Andalucía	–2.5	–3.6	–4.8	–6.0	–6.9	–8.0	–8.8	–9.1	–9.3	–6.9
Aragón	–0.7	–1.0	–1.6	–2.2	–3.1	–4.0	–4.6	–5.3	–5.8	–5.2	Aragón	–2.4	–3.6	–4.5	–5.6	–6.3	–6.9	–7.3	–7.9	–7.8	–5.4
Asturias	–0.9	–0.9	–1.6	–2.2	–2.5	–3.4	–4.5	–5.8	–6.6	–5.8	Asturias	–2.4	–3.9	–5.4	–6.4	–6.7	–7.6	–8.2	–8.7	–9.3	–7.0
Baleares	–0.9	–1.3	–2.1	–2.8	–3.7	–5.0	–5.5	–6.9	–8.2	–7.2	Baleares	–3.8	–5.0	–5.9	–7.4	–7.8	–8.5	–8.9	–9.8	–11.3	–7.5
C. y León	–0.9	–1.3	–1.7	–2.5	–3.2	–3.6	–4.7	–5.7	–6.8	–5.9	C. y León	–2.2	–3.5	–4.4	–5.3	–6.5	–7.3	–8.3	–8.3	–9.4	–7.2
C.-La Mancha	–0.9	–1.2	–1.7	–2.2	–2.9	–4.2	–5.1	–6.8	–8.8	–7.9	C.-La Mancha	–2.2	–3.2	–4.1	–5.6	–6.7	–7.6	–8.5	–9.8	–11.7	–9.5
C. Valenciana	–0.6	–1.0	–1.5	–2.1	–2.7	–3.8	–5.0	–6.2	–7.1	–6.5	C. Valenciana	–2.1	–3.3	–4.1	–5.2	–6.2	–7.2	–7.9	–8.3	–8.7	–6.6
Canarias	–0.6	–0.7	–1.2	–1.9	–2.8	–4.0	–6.0	–7.8	–9.9	–9.2	Canarias	–2.4	–3.9	–4.9	–6.7	–8.0	–9.0	–10.2	–11.5	–12.2	–9.7
Cantabria	–1.0	–1.3	–1.8	–3.1	–4.0	–4.7	–5.3	–6.0	–6.4	–5.4	Cantabria	–1.5	–3.5	–5.1	–6.3	–6.9	–7.7	–7.8	–7.6	–8.9	–7.3
Cataluña	–1.2	–1.5	–1.9	–2.2	–2.6	–3.2	–4.1	–5.2	–5.9	–4.7	Cataluña	–2.7	–3.4	–4.0	–4.8	–5.1	–6.0	–6.8	–7.5	–8.0	–5.3
Extremadura	–0.6	–1.5	–2.1	–2.9	–3.9	–5.2	–6.6	–8.6	–8.8	–8.2	Extremadura	–2.9	–4.2	–5.5	–6.9	–7.9	–9.5	–10.3	–10.9	–10.8	–7.9
Galicia	–0.7	–0.9	–1.3	–2.0	–2.8	–3.8	–5.1	–6.5	–9.1	–8.4	Galicia	–2.1	–3.3	–4.4	–5.9	–7.1	–7.8	–8.8	–10.3	–12.3	–10.2
La Rioja	–0.7	–0.8	–1.2	–1.8	–2.2	–2.8	–4.2	–5.6	–8.3	–7.6	La Rioja	–2.2	–3.3	–3.8	–4.8	–5.8	–6.4	–7.9	–9.7	–9.9	–7.7
Madrid	–1.0	–1.7	–2.5	–3.0	–3.8	–4.5	–5.2	–6.3	–7.4	–6.5	Madrid	–2.7	–3.6	–4.3	–5.0	–5.8	–6.5	–7.2	–8.1	–9.8	–7.1
Murcia	–0.4	–1.0	–1.6	–2.1	–2.7	–3.6	–4.9	–6.6	–7.5	–7.1	Murcia	–2.7	–3.8	–5.1	–6.2	–6.7	–7.5	–8.4	–9.7	–9.4	–6.6
Navarra	–0.9	–1.0	–1.6	–2.0	–2.5	–3.6	–4.6	–5.5	–7.3	–6.4	Navarra	–2.5	–3.3	–4.0	–5.1	–6.7	–7.5	–7.8	–8.5	–10.6	–8.1
País Vasco	–1.3	–1.3	–2.0	–2.6	–3.4	–4.3	–4.9	–6.4	–8.1	–6.7	País Vasco	–2.1	–2.8	–4.0	–4.8	–5.4	–6.2	–7.5	–9.0	–9.6	–7.6
Range. Var.	0.9	1.0	1.3	1.2	1.7	2.4	2.5	3.4	4.0	4.6	Range. Var.	2.3	2.2	2.1	2.7	2.9	3.5	3.5	4.0	4.5	4.9

magnitude of the effect is much higher now. For Spain, the effect of being overeducated over the gross hourly wage is –20.9% in the 10th percentile and –36.4% in the 90th percentile, which amounts to a difference of 15.5 percentage points. In this case Cantabria is also a special case and does not follow the general pattern of intensification of the wage penalty across the wage distribution. Differences between the 90th and the 10th percentile are higher than 20 percentage points in Galicia, Andalucía and País Vasco. Moreover, the overeducation effect for the 90th percentile is higher than 40% in five regions and no smaller than 26% for all of them.

These results suggest that the importance of the unobservable characteristics is not the main issue concerning the wage differentials related to overeducation: the overeducation indicator is reflecting a genuine mismatch with significant effects on the regional productivity.

4. Oaxaca-Blinder decomposition

The Oaxaca-Blinder decomposition (Blinder 1973; Oaxaca, 1973) divides the wage differential between two groups of workers (by sex, race, etc.) in a counterfactual framework. This decomposition allows disentangling the part of the differential due to differences in the characteristics of the individuals (which is usually captured by simple OLS regression) and the part due to differences in the way the labour mar-

Table 10. Quantile regression coefficients for the dummy «overeducated». Employees with ISCED 3-4 or ISCED 5-6 education

	q10	*q20*	*q30*	*q40*	*q50*	*q60*	*q70*	*q80*	*q90*	*q90-q10*
Andalucía	–0.202	–0.228	–0.242	–0.247	–0.260	–0.280	–0.301	–0.314	–0.341	–0.139
Aragón	–0.222	–0.241	–0.223	–0.225	–0.232	–0.232	–0.235	–0.247	–0.229	–0.007
Asturias	–0.248	–0.229	–0.257	–0.270	–0.278	–0.269	–0.320	–0.360	–0.397	–0.149
Baleares	–0.185	–0.263	–0.249	–0.260	–0.308	–0.303	–0.297	–0.324	–0.306	–0.121
Castilla y León	–0.202	–0.226	–0.218	–0.261	–0.270	–0.281	–0.285	–0.288	–0.302	–0.100
Castilla-La Mancha	–0.222	–0.192	–0.241	–0.293	–0.299	–0.315	–0.354	–0.336	–0.295	–0.073
C. Valenciana	–0.200	–0.205	–0.216	–0.207	–0.233	–0.229	–0.229	–0.238	–0.216	–0.016
Canarias	–0.129	–0.199	–0.228	–0.242	–0.265	–0.261	–0.293	–0.278	–0.303	–0.173
Cantabria	–0.253	–0.247	–0.309	–0.312	–0.334	–0.299	–0.303	–0.256	–0.248	0.005
Cataluña	–0.207	–0.204	–0.224	–0.223	–0.214	–0.233	–0.241	–0.236	–0.228	–0.020
Extremadura	–0.270	–0.298	–0.304	–0.349	–0.359	–0.350	–0.340	–0.376	–0.374	–0.104
Galicia	–0.205	–0.236	–0.270	–0.275	–0.314	–0.320	–0.338	–0.336	–0.395	–0.190
La Rioja	–0.127	–0.192	–0.216	–0.208	–0.226	–0.225	–0.218	–0.246	–0.309	–0.182
Madrid	–0.191	–0.214	–0.226	–0.268	–0.277	–0.284	–0.293	–0.298	–0.331	–0.141
Murcia	–0.132	–0.193	–0.191	–0.227	–0.232	–0.241	–0.236	–0.247	–0.275	–0.143
Navarra	–0.239	–0.227	–0.230	–0.239	–0.232	–0.228	–0.255	–0.278	–0.272	–0.033
País Vasco	–0.098	–0.169	–0.200	–0.212	–0.238	–0.234	–0.252	–0.275	–0.282	–0.183
Spain	–0.192	–0.214	–0.230	–0.245	–0.260	–0.268	–0.280	–0.293	–0.301	–0.110

Note: All coefficients are significant at the 0.01 level.

Table 11. Quantile regression coefficients for the dummy «overeducated». Employees with ISCED 5-6 education

	q10	*q20*	*q30*	*q40*	*q50*	*q60*	*q70*	*q80*	*q90*	*q90-q10*
Andalucía	–0.217	–0.215	–0.270	–0.282	–0.299	–0.319	–0.354	–0.390	–0.440	–0.223
Aragón	–0.255	–0.251	–0.263	–0.242	–0.259	–0.265	–0.267	–0.279	–0.263	–0.008
Asturias	–0.243	–0.186	–0.285	–0.299	–0.309	–0.301	–0.316	–0.363	–0.415	–0.172
Baleares	–0.244	–0.333	–0.322	–0.334	–0.325	–0.322	–0.349	–0.394	–0.350	–0.105
Castilla y León	–0.241	–0.247	–0.246	–0.280	–0.292	–0.320	–0.346	–0.367	–0.364	–0.123
Castilla-La Mancha	–0.279	–0.219	–0.281	–0.336	–0.332	–0.391	–0.426	–0.439	–0.451	–0.172
C. Valenciana	–0.226	–0.261	–0.258	–0.225	–0.252	–0.284	–0.303	–0.311	–0.308	–0.082
Canarias	–0.182	–0.203	–0.260	–0.243	–0.261	–0.264	–0.306	–0.338	–0.374	–0.192
Cantabria	–0.266	–0.344	–0.358	–0.340	–0.337	–0.314	–0.333	–0.283	–0.218*	0.048
Cataluña	–0.186	–0.219	–0.238	–0.240	–0.240	–0.255	–0.289	–0.289	–0.283	–0.097
Extremadura	–0.334	–0.363	–0.389	–0.438	–0.477	–0.466	–0.498	–0.471	–0.445	–0.110
Galicia	–0.257	–0.292	–0.295	–0.318	–0.357	–0.380	–0.417	–0.426	–0.488	–0.232
La Rioja	–0.160	–0.254	–0.223	–0.235	–0.245	–0.256	–0.259	–0.264	–0.356	–0.197
Madrid	–0.208	–0.209	–0.226	–0.284	–0.283	–0.291	–0.299	–0.310	–0.265	–0.057
Murcia	–0.212	–0.274	–0.327	–0.321	–0.336	–0.321	–0.320	–0.298	–0.305	–0.092
Navarra	–0.255	–0.241	–0.218	–0.250	–0.240	–0.242	–0.280	–0.285	–0.307	–0.051
País Vasco	–0.112	–0.156	–0.201	–0.212	–0.234	–0.243	–0.258	–0.266	–0.319	–0.206
Spain	–0.209	–0.236	–0.252	–0.271	–0.290	–0.304	–0.320	–0.339	–0.364	–0.155

Note: Coefficients are significant at the 0.01 level unless specified otherwise. ** p<0.05, * p<0.1

ket values these characteristics. This last part could be accounted as a measure for discrimination or differences due to unobserved predictors.

This decomposition needs two groups (we will use «O» for overeducated and «M» for well-matched employees), an outcome variable Y (the log hourly wage), and a set of predictors relating individual and firm characteristics (with the same specification as for the initial OLS analysis from the previous section: education, sex, immigrant condition, activity sector, etc.). This decomposition tries to answer the question on how much of the mean outcome difference $R = E(Y_M) - E(Y_O)$, where $E(Y)$ denotes the expected value of the log hourly wage, is accounted for by group differences in the predictors based on the linear model:

$$Y_\mu = X_\mu'\beta_\mu + \varepsilon_\mu,\ E(\varepsilon_\mu) = 0,\ \mu \in \{A,\ B\} \tag{4}$$

where X is a vector containing the predictors and a constant, β contains the slope parameters and the intercept, and ε is the error:

$$R = E(Y_M) - E(Y_O) = E(X_M)'\beta_M - E(X_O)'\beta_O \tag{5}$$

since $E(\beta_\mu)$ and $E(\varepsilon_\mu) = 0$, which can be rearranged as follows (see Jann, 2008):

$$R = [E(X_M) - E(X_O)]'\beta_O + E(X_O)'(\beta_M - \beta_O) + [E(X_M) - E(X_O)]'(\beta_M - \beta_O) \tag{6}$$

This is a «three-fold» decomposition, as the differential can be divided in three components: $R = E + C + I$.

The first component amounts to the part due to group differences in the predictors (the «endowments effect»). The second component measures the contribution of differences in the coefficients (including differences in the intercept). The third component is an interaction term which takes into account the existence of simultaneous differences in both endowments and coefficients.

The previous decomposition is formulated from the viewpoint of the overeducated group (O). We can see that the group differences in the predictors are weighted by the coefficients of the overeducated to determine the endowments effect (E). In other words, the E component measures the expected change in the overqualified's mean outcome, if overeducated had the same characteristics of the well-matched (M) employees. Moreover, for the second component (C) the differences in coefficients are weighted by the overeducated mean characteristics. That is, the second component measures the expected change in the overeducated's mean outcome, if they had the well-matched coefficients (betas). Thus, the differential can also be expressed from the viewpoint of the well-matched (reverse three-fold decomposition):

$$R = [E(X_M) - E(X_O)]'\beta_M + E(X_M)'(\beta_M - \beta_O) - [E(X_M) - E(X_O)]'(\beta_M - \beta_O) \tag{7}$$

In order to account for both possibilities we take the average and the interaction effect disappears:

$$R = \tfrac{1}{2}R + \tfrac{1}{2}R = \tfrac{1}{2}\Big[[E(X_M) - E(X_O)]'\ \beta_O + E(X_O)'(\beta_M - \beta_O) + [E(X_M) - E(X_O)]'\ (\beta_M - \beta_O)\Big] + \tfrac{1}{2}\Big[[E(X_M) - E(X_O)]'\ \beta_M + [E(X_M)'\ (\beta_M - \beta_O) - [E(X_M) - E(X_O)]'\ (\beta_M - \beta_O)\Big] \quad (8)$$

In the previous sections we have found that the situations of apparent mismatch between the education levels of the employees and the requirements of their occupations are very common in the Spanish regions. We have also found that there is a substantial impact of overeducation in the labour productivity of the Spanish regions and this overeducation seems to be a situation of genuine mismatch and not the result of unobservable characteristics of the employees.

The Oaxaca-Blinder decomposition allows us to further analyze the factors determining the negative effect of overeducation in the Spanish regions. Results from OLS regressions (tables 5 and 6) showed the importance of several personal characteristics, as well as characteristics of the types of job and the firms, and the different influence of these variables across the Spanish regions. With this technique we can separate out the wage differential between the overeducated and the well-matched employees into differences in the average individual's and job's characteristics between these two groups of workers and differences in the returns to these characteristics for each region.

Table 12 shows the results of the decomposition for workers with at least upper secondary education. As it can be seen, differences between the overeducated and the well-matched workers are mainly due to differences of the effect of these characteristics in the wage determination for these two types of workers (as much as 90% is due to the coefficients effect), usually through the effect of how experience is valued by the labour market. In Spain, of the 28% difference between overqualified and well-matched employees, 25 percentage points correspond to the coefficients effect, whereas only 3 percentage points correspond to the endowments effect. Only in Baleares, Andalucía, Canarias, Cantabria and La Rioja the endowments effect has some relevance, contributing between a 20% and a 54% to the negative wage effect of being overeducated.

If we analyze only the workers with tertiary education (table 13), the results are similar but not as accentuated. First we can observe that the wage gap is much bigger (44% for Spain instead of 28%). Moreover, the coefficients effect is also more relevant (accounting for a 73% in Spain) than the characteristics effect (27%). We can observe this pattern in all the Spanish regions except for Baleares. However, if we compare these results with the ones in table 12 we can see that the endowments effect is generally bigger and significant and represents more than a quarter of the total wage differential. This is something that can be explained by the fact that matched workers with tertiary education have an ad-

Table 12. Oaxaca decomposition (mean of the Oaxaca and the reverse Oaxaca decomposition). Population with ISCED 3-4 or ISCED 5-6 education. Pool 2004-2009 [1]

	Adjusted (lnw)	*Overqualif. (lnw)*	*Difference*	*Endowments effect*	*Coefficients effect*	*% Endow.*	*% Coeff.*
Andalucía	2.50	2.17	0.33	0.10 **	0.23 ***	30.58	69.42
Aragón	2.55	2.31	0.24	–0.03	0.26 ***	–11.12	111.12
Asturias	2.54	2.32	0.22	–0.07	0.29 ***	–31.58	131.58
Baleares	2.61	2.38	0.23	0.12	0.11 **	54.01	45.99
Castilla y León	2.50	2.28	0.23	–0.01	0.23 ***	–3.43	103.43
Castilla-La Mancha	2.67	2.25	0.42	0.01	0.41 ***	3.02	96.98
C. Valenciana	2.51	2.20	0.31	0.02	0.29 ***	5.35	94.65
Canarias	2.49	2.12	0.37	0.09	0.27 ***	24.90	75.09
Cantabria	2.53	2.23	0.30	0.09	0.20 ***	31.00	69.00
Cataluña	2.56	2.35	0.21	0.03	0.18 ***	16.01	84.00
Extremadura	2.44	2.26	0.17	–0.12	0.30 ***	–70.30	170.29
Galicia	2.39	2.15	0.24	–0.05	0.30 ***	–21.23	121.23
La Rioja	2.49	2.21	0.28	0.06	0.22 ***	22.94	77.06
Madrid	2.61	2.33	0.29	0.03	0.26 ***	10.46	89.54
Murcia	2.51	2.23	0.28	–0.05	0.33 ***	–17.31	117.31
Navarra	2.68	2.46	0.22	–0.01	0.23 ***	–5.09	105.09
País Vasco	2.73	2.43	0.30	0.04	0.26 ***	12.52	87.48
Total	2.56	2.28	0.28	0.03 **	0.25 ***	9.76	90.24

*** p<0.01, ** p<0.05, * p<0.1.

vantage with respect to overeducated workers in the sense that they have a higher average potential experience (17 years versus 14.6 years for the overeducated), have higher positions of supervision (39% versus 24% for the overeducated) and part-time work is also less frequent among well-matched workers. We can also observe from tables 12 and 13 that both the characteristics and the coefficients effects tend to generate different results regarding the final effect of overeducation across regions in Spain, thus contributing to regional differences in terms of wages, productivity and economic performance. Generally, the variables that affect the endowments part of the decomposition are potential experience and responsibility and experience has also a very high impact in the coefficients part of the decomposition. These results on the wage penalty for overeducation across regions are in line with previous analyses of the total wage differences across regions across Spanish regions. García and Molina (2002) found a similar effect

[1] Results are similar to a pooled two-fold decomposition between explained and unexplained characteristics.

Table 13. Oaxaca decomposition (mean of the Oaxaca and the reverse Oaxaca decomposition). Population with ISCED 5-6 education. Pool 2004-2009

	Adjusted (lnw)	*Overqualif. (lnw)*	*Difference*	*Endowments effect*	*Coefficients effect*	*% Endow.*	*% Coeff.*
Andalucía	2.71	2.25	0.46	0.20 ***	0.26 ***	44.05	55.95
Aragón	2.81	2.34	0.47	0.09 **	0.38 ***	18.90	81.10
Asturias	2.82	2.37	0.45	–0.07 *	0.52 ***	–15.51	115.51
Baleares	2.85	2.41	0.44	0.30 ***	0.14	67.53	32.47
Castilla y León	2.78	2.29	0.49	0.13 ***	0.36 **	25.83	74.17
Castilla-La Mancha	2.90	2.31	0.59	0.14 ***	0.45 ***	24.14	75.86
C. Valenciana	2.73	2.25	0.49	0.19 ***	0.30 ***	38.45	61.55
Canarias	2.80	2.13	0.67	0.23 ***	0.43 ***	35.12	64.88
Cantabria	2.74	2.26	0.47	0.07	0.41 ***	13.81	86.19
Cataluña	2.76	2.37	0.38	0.10 ***	0.28 ***	25.84	74.16
Extremadura	2.70	2.32	0.38	0.11	0.27 ***	28.12	71.88
Galicia	2.65	2.21	0.44	0.09 **	0.35 ***	20.17	79.83
La Rioja	2.68	2.27	0.40	0.14 ***	0.26 ***	34.44	65.56
Madrid	2.76	2.38	0.38	0.10 ***	0.28 ***	25.55	74.45
Murcia	2.72	2.37	0.34	–0.01	0.36 ***	–4.08	104.08
Navarra	2.80	2.47	0.34	0.01 ***	0.33 ***	2.01	97.99
País Vasco	2.82	2.44	0.38	0.09 ***	0.28 ***	25.15	74.85
Total	2.76	2.33	0.44	0.12 ***	0.32 ***	26.98	73.02

*** p<0.01, ** p<0.05, * p<0.1.

of the endowments and coefficients component. Their results show higher differences for the coefficients effect (remuneration to characteristics) in the North and the East, related to variables with greater influence such as seniority, university level of education, activity sector, supervision tasks and occupation. Motellón *et al.* (2011) find significant regional differences in characteristics and coefficients and their impact on total wage differentials. Following Serrano (2002), these authors suggest that wage differentials due to differences in the returns to characteristics may explain the existence of inefficient regional labour markets. They also argue that a regional homogeneity in the wage distribution could only be possible through a simultaneous equalization of the worker's, firm's and workplaces' characteristics and the returns to these characteristics. A further improvement for further research would be to incorporate a quantile analysis in the Oaxaca-Blinder framework to improve comparisons with the mean and incorporate the whole distribution to compare between regions that show important signs of heterogeneity, especially because of the lack of explicit information in our data source about unobservable ability.

5. Conclusions

This paper has analyzed the overeducation problem and its effects across the Spanish regions based on the SLCS micro data for the period 2004-2009. Our starting point is the evidence drawn from the overeducation results about the Spanish situation both internationally, with a highest level of overeducated workers, and regionally, with evident disparity between regions. We have analyzed the regional overeducation disparities in several stages. First, by means of the estimation of Mincerian wage equations for each region including an overeducation dummy related to skills required for each occupation group. We have found a substantial significant negative effect of overeducation on the gross hourly wage for Spain (–25%) and for each region, ranging from –17.5% to 35%. These results may be associated with serious productivity and low wage problems. Moreover, the fact that this phenomenon has an unequal impact across the Spanish territory has also clear implications regarding regional development.

Secondly, the estimation of quantile regressions confirms the existence of a wage gap across the wage distribution in all regions, thus confirming the relevance of overeducation. Moreover, these findings suggest that the overeducation indicator is capturing genuine mismatch situations beyond the possible effect of unobservable characteristics such as innate ability or motivation, as the wage gaps related to overeducation are systematically more pronounced in the higher percentiles of the wage distribution in practically all regions. This finding rejects the assumption that individuals with lower innate ability, thus more likely located in the lower part of the wage distribution, should be more penalized than the individuals located in the upper part of the wage distribution which could compensate their apparent overeducation with other types of skills.

Finally, an Oaxaca-Blinder decomposition was estimated for all regions in order to distinguish the wage differentials between the overeducated and the matched employees. Results show, as in the previous exercises, that the effect of overeducation is greater for more educated workers (around –44% for tertiary education versus –28% for workers with at least upper secondary education). This wage gap differs from one region to another and seems to be explained by a greater extent by the coefficients effect rather than the endowments (characteristics) effect. Hence, the wage penalty is driven by the way that the labour market values the overeducated or matched worker's characteristics. This is especially evident when we analyze the workers with at least upper secondary education. In this case, characteristics account only for 10% of the wage gap. Their relevance is higher in the case of workers with tertiary education, with contributions close to 25%-30%. Nevertheless, the main part of the wage gap is still due to the different way the labour market values each characteristic.

All these results show that the effects of overeducation on the regional economies are genuine and substantial and present a considerable heterogeneity. The different analyses performed show a common feature: the existence of significant regional

differences in the effects of the wage determinants in general and the overeducation wage gap in particular. Hence, overeducation is an additional aspect to be considered when analyzing regional economies and this may imply a first step to analyze it deeper in future research, by controlling the decomposition not only at the mean but for the whole distribution. Even more, circumstances like differences in the regional incidence of temporary work or the relationship between a possible excess of high educated employees and overeducation across regions may constitute plausible explanations of the overeducation issue that should be studied in future analyses. Ultimately, our results show that the regional level is a promising research area in order to better understand the problem of overeducation and the circumstances that may aggravate or mitigate their impact on the economy.

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Section ARTICLES

Investigaciones Regionales

Falling urban wage premium and inequality trends: evidence for Brazil

Bruno de Oliveira Cruz *, Paolo Naticchioni **

ABSTRACT: In this paper, we use data from the National Household Survey (PNAD) for Brazil to investigate the dynamics of the urban wage premium and the relationship between the urban wage premium and inequality trends, and we find two main results. First, we find a decreasing urban wage premium over the period 2002-2009 using both OLS and quantile regression. Second, we show that the fall in the urban wage premium is more pronounced at the 90th percentile than at the 10th percentile. This finding suggests that the falling urban wage premium has contributed to the reduction in inequality observed in Brazil in the last decade.

JEL Classification: J31, J61, R23.

Keywords: Urban Wage Premium, Wage Inequality, Brazil.

La caída en la prima salarial urbana y la tendencia en la desigualdad: evidencia para Brasil

RESUMEN: En este trabajo utilizamos datos de la encuesta de hogares brasileños, PNAD, entre 2002-2009, para investigar la dinámica de la prima salarial urbana, y más concretamente, la relación entre la prima salarial urbana y las tendencias de la desigualdad, llegando a dos conclusiones principales. En primer lugar, los resultados muestran que la prima urbana disminuye durante el periodo 2002-2009, tanto con MCO y regresión cuantílica. En segundo lugar, se concluye que la caída de la prima salarial urbana es más fuerte en el percentil 90 con respecto al percentil 10. Los resultados obtenidos sugieren que la caída de la prima del salario urbano ha contribuido a la reducción de la desigualdad observada en Brasil en la última década.

Clasificación JEL: J31, J61, R23.

Palabras clave: Prima salarial urbana, desigualdad salarial, Brasil.

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1. Introduction

The urban wage premium is a stylised fact in urban and labour economics. The most widely accepted explanation refers to urbanisation externalities in terms of reduced transport costs, technology and knowledge spillovers, cheaper inputs and proximity to consumers (Glaeser, 1998; Kim, 1987; Ciccone and Hall, 1996), whereas other possible explanations refer to the «learning» hypothesis, which states that human capital accumulation is faster in cities (Moretti, 2004), or to the «coordination» hypothesis, which states that cities enhance the probability of a better match between workers and firms (Kim, 1990; Yankow, 2006). There is also evidence that urbanisation externalities increase along the wage distribution, even after controlling for observed and unobserved heterogeneity (Matano and Naticchioni, 2012).

Most of the literature concerns the US and advanced economies, even if there is an increasing interest in emerging countries. In this framework, the Brazilian case is one of the most interesting, being characterised by strong imbalances among regions, important differences in the degree of urban intensity, a steady reconfiguration of territory and falling wage inequality.

There is solid evidence that Brazilian wages increase with city size, even after controlling for a large set of covariates. Azzoni and Servo (2001) analyse regional wage inequality, concluding that wage differentials between metropolitan areas do not vanish, even after controlling for regional price level differentials and other covariates. Rocha *et al.* (2011) explicitly address the urban premium among cities in Brazil, using an extensive administrative record database of the Ministry of Labour, RAIS. They show that the urban premium is not negligible in the period 2000-2008 and that there is a persistent differential of approximately 10% in favour of workers in highly agglomerated regions, even after controlling for differences in observable and non-observable characteristics of workers.

The fall in the inequality of earnings is another peculiar feature of the Brazilian economy in recent years, as wages at the bottom of the distribution have increased faster than wages at the top, entailing a reduction in all standard inequality indexes. This is a very peculiar finding among advanced and emerging economies. The most well-known case of increasing differentials is the US, where earnings inequality has increased strongly since the 1980s (Autor and Acemoglu, 2011), and a wide body of literature presents investigations of the causes of this trend, such as the impact of technology, institutions and trade. In addition, the spatial explanation has been considered to address the increase in inequality in the US, as in Moretti (2012), among others. For European countries, the evidence is more mixed. Whereas trends of increasing inequality have been observed in the UK (Machin, 2011) and Germany (Dustmann *et al.,* 2009), decreasing wage inequality has been detected in France (Charnoz *et al.,* 2011), Spain (Izquierdo and Lacuesta, 2012) and Italy (Naticchioni and Ricci, 2008). Considering Europe as a whole, only the paper of Massari *et al.* (2012) concludes that wage inequality increased in Europe in the period 1996-2007.

With regard to the spatial explanation of European inequality trends, there are very few papers, which include that by Matano and Naticchioni (2012).

It is also interesting to note that Brazil displays peculiar features with respect to emerging economies as well. According to OECD (2011), Brazil is the only emerging economy that continues to grow at high rates while experiencing reductions in inequality. In terms of comparisons, China and India experienced in significant increases in inequality recent decades (for the Indian case, see also Kijima, 2006).

What are the factors driving these peculiar trends in falling inequality? In a very comprehensive work, Barros *et al.* (2006) summarise the state of the discussions on earnings inequality in Brazil. Applying decomposition techniques, they investigate the main factors contributing to the reduction in inequality among household earnings (in per capita terms). They find that the «Geographical segmentation» explains 16% of the reduction in total earnings and these spatial variables represent a crucial driver of labour income inequality trends, as approximately a third of the reduction in household income inequality is due to some geographical variable [1].

In this paper, we focus on the dynamics of the urban premium in Brazil, using data from the *Pesquisa Nacional por Amostra de Domícilios* (PNAD), to examine the falling inequality in Brazil. The first interesting finding is that even after controlling for a very rich set of covariates, the urban wage premium is found using both OLS and quantile regression to decrease substantially in Brazil. The second interesting finding is that the drop in the urban wage premium is stronger at the 90th percentile than at the 10th percentile, suggesting that falling urban wage premia have contributed to the reduction in inequality in Brazil. We also show that for any given percentile of the distribution (the 10th percentile, the median and the 90th percentile), the wage differentials between workers in the most agglomerated areas (metropolitan areas) and those in the least agglomerated areas (rural) strongly decreased over time. This finding suggests that the dynamics of returns in areas of different urban intensity have contributed to a decrease in wage inequality and deserves attention for several reasons. Among these reasons is Glaeser *et al.*'s (2009) emphasis that the benefits of income inequality reduction go beyond individual improvement and welfare enhancement, including spillovers related to decreasing crime rate and to positive impact on growth. In addition, Glaeser *et al.* (2009) also claim that because the labour market is spatially limited, it is crucial to study the dynamics of regional economies to have a full understanding of the national dynamics of wage inequality.

The paper is organised as follows. Following this introduction, in section 2, we describe some figures about regional dynamics in Brazil, whereas in section 3, we present the data used in the paper and the main findings concerning the decrease in the urban wage premium and its consequences on wage dynamics. Section 4 concludes.

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[1] Similar results are obtained by Souza and Osorio (2011), who show the importance of the metropolitan and non-metropolitan differentials to explain over 20% of the fall in inequality from 1980 to 2009. However, Ramos (2006), using a Theilde composition with region as a geographical control, claims that this contribution has been very weak. Menezes-Filho *et al.* (2006), following Gosling *et al.* (2000), run a quantile regression to study the impact of education returns and demographic factors to explain the reduction in inequality.

2. Regional Wage Dynamics and Urban Premium

2.1. Regional Wage Dynamics

Despite the disappointing results of regional convergence tests [2], the Brazilian economy is characterised by a positive trend in the less developed regions in the country, where average wages in the formal sector and growth domestic product (GDP) have been growing at an increasing rate [3]. For instance, the GDP per capita in the Northeast increased from 42% to 47% of the national average during the period 1995-2007. Similarly, real household income in the Northeast grew at an average rate of 5% per year in the last decade, above the national rate. Meanwhile, it is interesting to note that medium-sized cities are becoming more relevant in the national economy. Da Mata and Mota (2008) show that the average GDP growth rate in cities with a population between 100,000 and 500,000 inhabitants is almost twice that in cities with more than 500,000 inhabitants. Furthermore, there is a relocation of industrial employment towards inland regions and other middle-income regions, such as the interior of the state of São Paulo, the Centre-West and the South. This shift also occurred towards some metropolitan areas in the Northeast, with a subsequent increase in the share in industrial employment in these regions (Cruz and Santos, 2011).

How could this recent and incipient pattern in terms of regional dynamics be related to the observed fall in inequality in the first decade of the 21st century in Brazil? And what is the role played by the urban wage premium? In the next sub-section, we introduce these issues with some descriptive statistics concerning the urban wage premium and income distribution.

2.2. Urban Premium and Wage Dynamics

We use PNAD data for the period 2002-2009 to focus on the dynamics of wages by city size. From PNAD, it emerges that the bottom of the distribution, mainly low-skilled workers, indicates an increase in real wages in the period 2002-2009 at the country level. When this impact is investigated by city size, it can be observed that the increase at the bottom of the wage distribution is observed in all city sizes and in all states.

We use the period 2002-2009 for two reasons. First, it is the period when inequality fell at a faster rate. Second, there has been a methodological change in the occupation classification (CBO) in 2002. We also define metropolitan areas (MAs) as the 10 traditional areas defined by the Federal Government in 1973 and explicitly defined in PNAD as metropolitan areas. We define as medium-sized cities those with

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[2] See, for instance, Oliveira and Rodrigues (2011) for a survey on studies on regional convergence in Brazil or Magalhães *et. al.* (2005) that considers spatial dependence on the process of convergence.

[3] Formal Sector workers (or formal workers) are workers who declare having a formal contract with the employer, implying that they are covered by the national social security system.

urban areas that are labeled as «autorepresentativo», cities with a probability of one of being in the PNAD sample and that are not included as Metropolitan Areas. It is not possible in PNAD to identify the exact city size; we thus must aggregate the «autorepresentativo» group and label the cities as medium-sized cities. For the small cities, we use urban areas that are not included as MAs or in the «autorepresentativo» group. We exclude from analysis the rural areas in the North of the Country, as they were included in PNAD only after 2004.

Figure 1 shows the evolution of real average wages [4] between 2002 and 2009 by city size and education in PNAD. More specifically, it shows the real average income by city size in 2002 on the X-axis and the average income by city size in 2009 on the Y-axis. The dots are weighted by population in each area. Therefore, we can divide the quadrant in two spaces, above and below the 45º line. Every point above the 45º line represents a city that experienced an increase in real, whereas points below the identity line concern cities that exhibited a decreased average income.

We present this relation for two different levels of education: primary (or less than primary) and tertiary education. Figure 1.1 presents workers with primary education or less. It can be noted that the slope of the trend line is close to one and that there is a positive intercept, suggesting that unskilled workers in all cities have experienced an increase in their income. The trend is parallel to the identity line, meaning that the points for unskilled workers are located in the space of positive real growth in wages. Figure 1.2 illustrates the behaviour of workers with regard to tertiary education. This trend differs substantially from that shown in the last figure, as the slope is less than one, suggesting that for some groups of workers, the curve crosses the identity line and real labour earnings in 2009 are lower than in 2002.The value at which the trend line of individuals with tertiary education crosses the identity line is R$ 1,754.00/month. Note also that the dots for workers with tertiary educational attainment are more highly dispersed.

To summarise, workers with inferior qualifications in cities of all sizes have observed a real increase in their wages, whereas the real wages of qualified workers have decreased or remained constant [5]. It is also worth noting that highly populated areas are characterised by higher wages, which suggests that in the graph, the regions with higher wages in 2002 are the most agglomerated and those most often located below the 45º line. In Figure 2, we present Gini indexes for wages in 2002 and 2009 by five macro-regions, four degrees of urban intensity, three skill levels [6] and three education levels. In terms of city size, metropolitan areas are more unequal, and the rank

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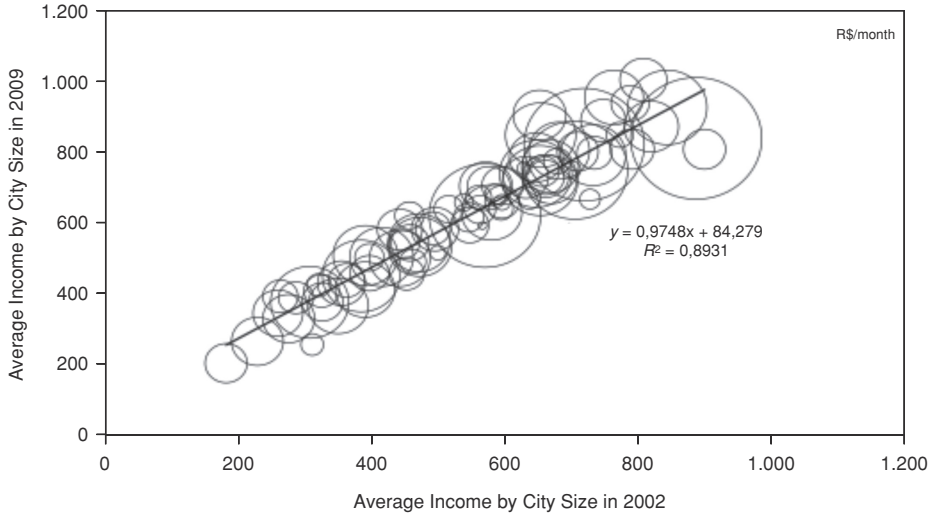
[4] Average wages are deflated by the national price index (IPCA). We did not use any regional adjustment in the price level for two reasons. First, we would like to use the same database used in the literature on inequality. Second, there is no consensus about which index to use.

[5] The reduction in the return to education explains part of the fall in inequality. The point we raise is that this reduction was not uniformly distributed among city sizes but was higher in MAs (World Bank, 2011).

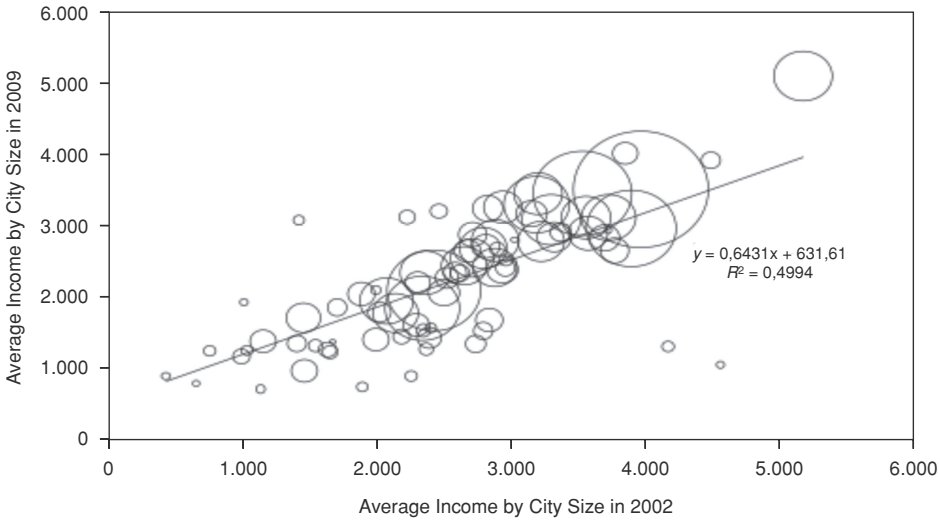
[6] Skills are classified according to their level of complexity and tasks defined in the international standards to occupations. Therefore, high-skilled workers include managers and professional occupations, medium-skilled workers are classified as technicians, and all others with lower levels of complexity are classified as low skilled.

Figure 1. Average Labour Earning by City Size and Education in 2002 and 2009

1.1. Primary or Less Education. Average Income by City Size 2002 and 2009



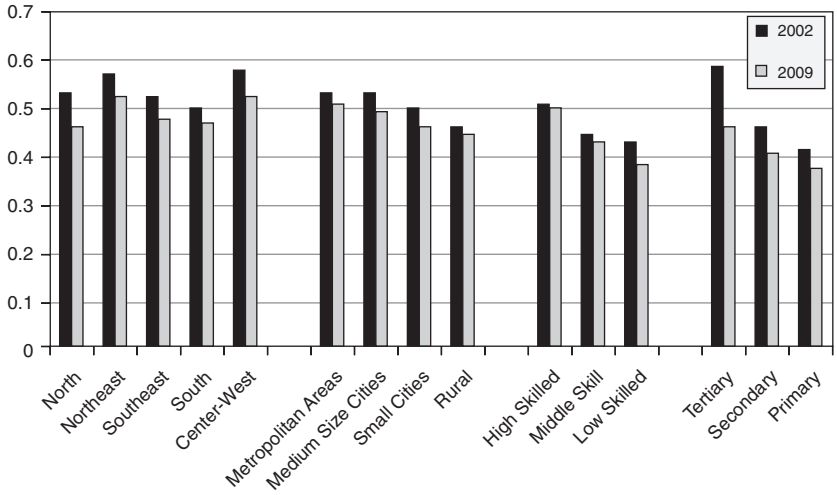
1.2. Tertiary Education. Average Income by City Size 2002 and 2009



Source: IBGE/PNAD.

of inequality is inversely related to city size: a more populated city has a higher Gini index. It is worth stressing that there has been a strong reduction in tertiary education inequality, whereas smaller reductions in inequality are observed when considering the skill levels: high-skill occupations maintain almost the same level of inequality.

Figure 2. Brazil - Gini Index for Hourly Wages (workers with more than 20 hours of labour per week) by Region, City Size, Skills and education (2002-2009)



Source: IBGE/PNAD.

To illustrate the evolution of the wages by city size, we present in table 1 the average hourly wage by city size for different percentiles (25th, 75th and 90th percentiles). There is a gain in average real wages for all types of cities, which is more pronounced for less populated cities. This stronger growth reflects an increase in the total labour income share for less populated cities, whereas MA's lose their share of total labour income to small- and medium-sized areas. The two last columns in table 1.1 present the share in total wage and total employment. Regarding employment dynamics by city size, it can be observed that rural and metropolitan areas decrease their share over time in the total working population aged 18-60 years, whereas small- and medium-sized areas increase their employment share. Table 1.2 shows the ratio between the MAs' average wage and the average wages of the other urban intensity categories. It is interesting to note that the ratio in wages between the MAs and other city sizes reduced for all groups (skills, occupation and geographical segmentation). For instance, on average, wages were 1.14 times higher in MA's than in medium-sized cities in 2002 and only 1.07 times higher in 2009.

One could ask what the relative contribution of regional variables to inequality reduction is. In figure 3, we show a between-within decomposition of the Theil index with respect to some variables of interest. The X-axis presents the decomposition of the Theil index for variables such as urban intensity, region, urban intensity refined by state, skill and education [7]. The Y-axis represents the percentage of the contribu-

[7] Regions are defined as the 5 macro regions in Brazil: North, Northeast, Centre-West, Southeast and South. By urban intensity, we use the definition already made (metropolitan area, medium cities, small

Table 1.1. Hourly Wage and the Share in national Income by City Size

City Size	*Mean*		*P25*		*P75*		*P90*		*Share in Aggregate Wages (%)*		*Share in total Employment (%)*	
	(R$/Hour)		*(R$/Hour)*		*(R$/Hour)*		*(R$/Hour)*		*(R$/Hour)*		*(R$/Hour)*	
	2002	*2009*	*2002*	*2009*	*2002*	*2009*	*2002*	*2009*	*2002*	*2009*	*2002*	*2009*
Rural	2,66	3,70	1,16	1,67	2,94	4,17	4,90	6,67	5,5	6,1	12,4	11,2
Small Cities	4,64	5,56	1,78	2,64	4,91	5,99	9,38	10,71	25,4	27,6	32,8	33,7
Medium Cities	6,96	7,84	2,23	2,98	7,06	8,09	14,71	15,75	25,6	26,2	22,1	22,7
Metrop. Areas	7,94	8,36	2,61	3,13	8,03	8,33	17,44	17,04	43,4	40,0	32,7	32,4

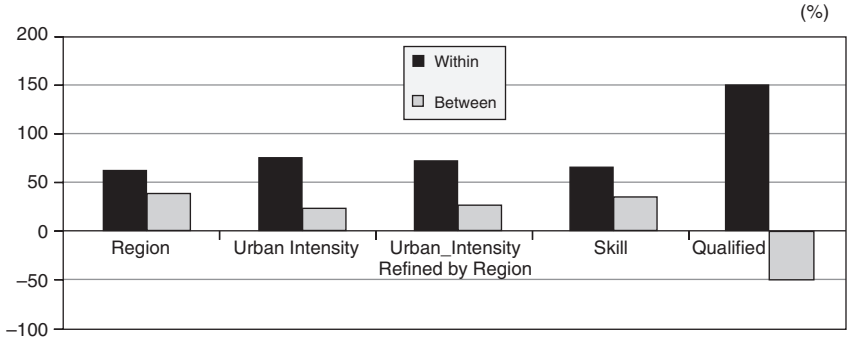
Sample weight used. Individual working at least 20 hours per week, aged 18-60 year-old.

Table 1.2. Ratio Metropolitan Areas Average Wage and Average Wage in the City in 2002 and 2009

	Mean		*P25*		*P75*		*P90*	
	2002	*2009*	*2002*	*2009*	*2002*	*2009*	*2002*	*2009*
MA/Rural	2,98	2,26	2,25	1,87	2,73	2,00	3,56	2,55
MA/Small Cities	1,71	1,50	1,47	1,18	1,64	1,39	1,86	1,59
MA/Medium Cities	1,14	1,07	1,17	1,05	1,14	1,03	1,19	1,08

Sample weight used. Individual working at least 20 hours per week, aged 18-60 year-old.

Figure 3. Within-between Theil Index Decomposition and Contribution to Inequality in wages, 2002 to 2009



Source: IBGE/PNAD. Note: Hourly Wage individuals with more than 20 hours worked.

tion of each component within and between. For each variable, the sum of each component (within and between) is equal to 100. When considering the five categories in

cities and rural areas). We refine the urban intensity by state, applying the definition of urban intensity to the 27 states in Brazil.

the region variable, the between component represents almost 40% of the reduction in the Theil index, whereas for the urban intensity it represents over a quarter of the reduction in inequality. As for the «between» component of education, it has a negative impact on the inequality measured by the Theil index. Therefore, the fall in the returns to higher education, especially when one compares metropolitan and non-metropolitan within the same qualification group, is consistent with this paper's main proposal. Regarding the decomposition of the skill variable, an important fraction of the inequality is explained by the between component, but over 50% is explained by the within component. Therefore, these findings suggest that with regard to the regional and spatial controls, the between dimension plays a crucial role in explaining inequality trends, confirming that the analysis of inequality can be enriched by the introduction of a regional dimension, whereas the within component is more important for components such as education and occupation.

3. The urban wage premium and the wage distribution

3.1. The econometric specification

So far, we have investigated the differences in wages across Brazilian regions and for different degrees of urban intensity. Our descriptive analysis shows, among other findings, a reduction in the share of wages in MA with respect to total wages in the economy. The main limitation of using a descriptive approach is that the reduction in wages in agglomerated areas may be the result of a changing composition of the labour force over time and of other factors that cannot be controlled for using a descriptive approach.

For this reason, in this section, we must move to an econometric analysis to estimate the urban wage premium for the Brazilian labour market, using PNAD data and controlling for a wide set of covariates. We make use of two different waves of the PNAD data for the years 2002 and 2009 to investigate the dynamics of the phenomenon.

The dependent variable is the (log) hourly wage. In particular, we use the monthly wage for one's primary job, computing the hourly wage by dividing the monthly wage by the hours worked per week (time 4). Wages are deflated using the IPCA deflator [8].

The main independent variable is a measure of the urban level of agglomeration. Using PNAD, we have defined a variable with four urban intensity levels: 1) rural area; 2) small city areas; 3) medium city areas; and 4) metropolitan areas (MA). As control variables, the PNAD data include a very rich set of variables. This characteristic is crucial for controlling for individual observed heterogeneity and as such correctly identifying the urban wage premium. In particular, we use the following control variables: being female; four education levels (lower than primary; primary; secondary; tertiary); experience in 8 dummies (in months: 0-4; 5-12, 13- 24; 25-48; 49-96; 97-180; 180-

[8] The sample is restricted to individuals aged 18-65 and to individuals working no less than 20 hours per week.

420; more than 420); 11 industry dummies; 8 occupation dummies; having a formal contract; being unionised; being white; being migrant [9], being a household head; and five region dummies (North, Northeast, South-East; South; Centre-West).

This set of covariates allows for accurately controlling for economic condition (sector, occupation, union, formal, and region) and for socio-individual characteristics (gender, experience, race, role in the household). It is also important to stress that we control for the five macro regions; in this way, the identification of our variable of interest, urban intensity, is not affected by the important heterogeneity between regions that characterises the Brazilian economy.

3.2. Theoretical Background

Because we aim to evaluate the impact of the region urban intensity on wages, we estimate a wage curve, including controls for observed heterogeneity (individual characteristics, sector, occupation and region). It is worth stressing that in estimating a wage curve, we follow a robust and well-established theoretical background that rationalises the relation between proxies for urban density and wages, although we are not aware of any application for the Brazilian case.

Combes *et al.* (2005) highlight two different strands in the literature to study this issue. One strand began with the seminal paper of Henderson (1974), and the second relates to the New Economic Geography (NEG). In the former case, the positive relationship between urban density and nominal wages is mainly explained by agglomeration economies, such as thickness in the labour markets, cheaper inputs, and localised knowledge spillover. Following this tradition, Moretti (2012) analyses inequality trends in the US among metropolitan areas using a simple general equilibrium model, where the mobility of workers (the relative mobility of skilled and unskilled) and the elasticity of the housing supply are the drivers of the evolution of real wages among cities in the US. Moretti is able to identify that a localised skilled-biased demand was the main driving force of inequality trends.

In the second strand of the literature, Redding and Schott (2003) developed a New Economic Geography model, where pecuniary externalities have an important role for wage inequalities, especially those among skilled and unskilled workers. In this type of model, there is an endogenous decision to accumulate human capital, which is determined by the interplay between variables such as increasing returns to scale, transport costs, input—output linkages and human capital investments. The empirical relationship among wages of skilled and unskilled workers is thus a result of the interaction of these variables. In the original paper, Redding and Schott (2003) estimate the impact of the market and supplier access on bilateral trade. They also investigate how relevant these variables are for educational attainments, as education is an endogenous decision and firms in remote locations pay greater trade costs on

[9] A migrant is defined as a worker who did not live in the city four years before the date of the survey.

both exports and intermediate imports, reducing the amount of value-added remaining to remunerate domestic factors of production. Furthermore, if skill-intensive sectors have higher trade costs, more pervasive input-output linkages or stronger increasing returns to scale, the authors demonstrate that remoteness decreases the skill premium and limits incentives for human capital accumulation. Therefore, the authors exploit structural relationships from the model to show that countries with lower market access have lower levels of educational attainments. López-Rodriguez *et al.* (2007) apply this model to the European Union regions, do not reject the main conclusion of Redding and Schott (2003) that educational attainment levels are higher in those regions with greater market access. Fallah *et al.* (2011) expand Redding and Schott's (2003) model, deriving an explicit wage curve and testing the impact on wages of market access, measured by the traditional market potential, on the skill premium in US Metropolitan Areas. They also find a positive relationship between educational attainment and market access in the US regions.

In such a theoretical framework, our work can be viewed as a first attempt to highlight the role of the urban premium in the dynamics of the inequality in Brazil.

3.3. Urban premium and wage inequality trends: results

Table 2 shows the descriptive statistics of the covariates. It is possible to note that over time, individuals become more educated and more experienced, and the female and the formal shares increase, whereas the share of white workers decreases. Interestingly, the distribution by industry and occupation remains quite constant over time. For industry, the only significant difference is in the reduction in the agriculture share, and for occupation, there is a significant increase in professional workers and the decrease in rural workers. As expected, family size reduces over time, and the regional distribution mostly remains constant.

With regard to the dynamics of the variable of interest, it is interesting to note that the distribution of workers among the different categories of urban intensity (rural area, small city area, medium city area, MA) essentially remains constant over time.

To describe further the main characteristic of the sample used in the regression analysis, we also report additional statistics in table 3 and table 4. Table 3 presents the average years of schooling by the covariates used in the regression. There is an increase in average years of schooling for all covariates, and female workers have on average a higher education than male workers. Another interesting remark is that migrants have a slightly higher level of education with respect to residents. Metropolitan areas also display higher levels of education, above the national average. By regions, it can be noted that the Northeast is below the national average and that the North is very close to the national average in terms of schooling.

In table 4, we present the evolution of the average hourly wage by covariates. With regard to the region intensity variable, small cities and rural areas are far from the national average, even if a catching-up process is at play. It is also interesting to

Table 2. Descriptive statistics of the covariates of the analysis

Year	*2002*	*2009*		*Year*	*2002*	*2009*
Rural Area	0,122	0,115		Clerical Support	0,090	0,105
Small City	0,332	0,345		Services Workers	0,209	0,207
Medium City	0,219	0,223		Sellers and reatil Workers	0,093	0,092
MA	0,327	0,317		Rural Workers	0,123	0,099
Less than primary	0,494	0,392		Plant and Machine Operators	0,267	0,267
Primary	0,173	0,154		Agriculture	0,125	0,101
Secondary	0,242	0,338		Manufacturing Industry	0,161	0,164
Tertiary	0,092	0,116		Construction	0,083	0,084
Experience (months 0-4)	0,095	0,082		Commerce, Retail and Repair	0,181	0,187
Experience (5-12)	0,104	0,119		Lodging and Food	0,038	0,039
Experience (13-24)	0,132	0,120		Transport and comunication	0,055	0,055
Experience (25-48)	0,137	0,131		Public Administration	0,060	0,061
Experience (49-96)	0,146	0,138		Education and Health	0,103	0,105
Experience (97-180)	0,132	0,132		Domestic Services Maid	0,078	0,076
Experience (180-420)	0,115	0,122		Other Collective Services	0,039	0,041
Experience (>420)	0,140	0,157		Other Services	0,077	0,087
Female	0,416	0,450		Family size (1-2)	0,217	0,256
Union	0,181	0,185		Family size (3-4)	0,524	0,547
Formal	0,533	0,603		Family size (more than 4)	0,259	0,197
White	0,555	0,500		North	0,052	0,060
Migrant	0,044	0,039		Northeast	0,250	0,259
HH head	0,559	0,519		Southeast	0,462	0,446
Manager	0,060	0,057		South	0,162	0,159
Professionals	0,065	0,083		Center-West	0,075	0,077
Techinicians	0,094	0,091				

focus on the occupation breakdown. The only category that did not have a positive real growth is that of very high-skilled workers, such as managers and professionals, which essentially remained constant over time, whereas in all other occupations there is a positive increase between 2002 and 2009. Further, despite the higher qualification, on average, female workers earn less than male.

For the first econometric analysis, we perform an ordinary least squares estimation, separately for 2002 and 2009, with all control variables (table 5). The omitted variable for the urban intensity is working in a small city area. As expected, the urban wage premium with respect to this omitted category is negative when considering rural areas, whereas it is positive for medium city areas and MAs, with the latter representing the greatest urban premium. In 2002, the penalisation for living in a rural area was equal to 11%, the premium for living in a medium city area was 16.3%, and the premium for living in a MA was 22.8%, which represents a sizeable impact.

Interestingly, the urban wage premium decreased over time: in 2009 the premium for living decreased to 13.8% for a medium city area and to 17.4% for a MA, representing for the latter a decrease of 5.4 percentage points (p.p.) with respect to 2002. This

Table 3. Average Years of Schooling by covariates (2002 and 2009)

Year	*2002*	*2009*		*Year*	*2002*	*2009*
Brazil	**8,2**	**9,2**				
Rural Area	4,7	6,0		Sellers and reatil Workers	8,8	10,0
Small City	7,6	8,8		Rural Workers	4,0	5,1
Medium City	9,1	10,1		Plant and Machine Operators	7,2	8,3
MA	9,5	10,3		Agriculture	4,0	5,2
Female	8,9	9,7		Manufacturing Industry	8,8	9,9
Male	7,8	8,9		Construction	6,2	7,3
Union	9,7	10,6		Commerce, Retail and Repair	9,1	10,2
Non-Union	8,2	9,4		Lodging and Food	7,9	9,1
Formal	9,8	10,7		Transport and comunication	8,6	9,7
Informal	6,8	8,0		Public Administration	11,0	12,0
White	9,1	10,2		Education and Health	12,0	13,1
Non-White	7,0	8,3		Domestic Services Maid	6,3	7,2
Migrant	8,4	9,8		Other Collective Services	9,2	10,6
Resident	8,1	9,2		Other Services	11,3	12,0
Manager	11,8	12,4		North	8,1	9,3
Professionals	14,6	15,2		Northeast	6,7	7,9
Techinicians	11,7	12,4		Southeast	8,9	9,8
Clerical Support	11,6	12,2		South	8,7	9,7
Services Workers	7,0	8,2		Center-West	8,4	9,5

Sample weight used. Individual working at least 20 hours per week.

represents an interesting finding of the paper because as far as we know, this is the first contribution showing declining urban wage premiums in Brazil. This is also particularly interesting because Brazil has been in a high growth cycle in the last ten years, and high growth can be expected to be correlated to agglomeration dynamics and spillovers, which should have increased rather than decreased the urban wage premium.

From table 5, it is also interesting to investigate the dynamics of other covariates. For instance, our analysis confirms the significant decrease in the returns to education. The returns to having a tertiary degree relative to having a primary degree range from 87% to 63%, whereas the returns to having a secondary degree range from 20.9% to 14.1%, consistent with the World Bank's (2011) analysis. This compression in the returns to education is another driver reducing inequality in Brazil: in 2002, the differences between the most and the least educated amounted to 102.2 p.p. on average (87.9 plus 14.3), whereas in 2009, this difference reduced to 76 p.p. (63 plus 12.7).

The other covariates for which we have a sizeable coefficient variation over time are being formal, which increases by 3.6 p.p., being a household head, which strongly decreases by 7.2 p.p., and being white, which decreases by 3.1 p.p. The gender wage gap also increases by 3.1 p.p., suggesting that the gender differentials are slightly increasing in Brazil. With regard to returns from experience, they do not change substantially over time, nor do the returns to having a given occupa-

Table 4. Average hourly wage (Reais per hour) by covariates (2002 and 2009)

Year	*2002*	*2009*		*Year*	*2002*	*2009*
Brazil	**5,87**	**6,69**				
Rural Area	2,66	3,70		Sellers and reatil Workers	4,10	4,57
Small City	4,64	5,56		Rural Workers	2,70	3,53
Medium City	6,96	7,84		Plant and Machine Operators	4,21	4,93
MA	7,94	8,36		Agriculture	2,74	3,58
Female	5,22	5,88		Manufacturing Industry	5,98	6,43
Male	6,24	7,20		Construction	4,43	5,08
Union	9,16	9,62		Commerce, Retail and Repair	5,52	5,84
Non-Union	5,14	6,02		Lodging and Food	3,90	4,65
Formal	7,59	8,04		Transport and comunication	6,62	7,33
Informal	7,59	8,04		Public Administration	10,43	12,78
White	7,40	8,27		Education and Health	8,51	9,62
Non-White	3,97	5,08		Domestic Services Maid	2,18	2,87
Migrant	6,25	7,99		Other Collective Services	5,78	6,28
Resident	5,86	6,64		Other Services	10,37	10,27
Manager	16,39	16,74		North	5,13	5,98
Professionals	17,43	17,40		Northeast	3,57	4,56
Techinicians	8,77	9,51		Southeast	6,94	7,40
Clerical Support	5,87	6,11		South	6,06	7,42
Services Workers	3,02	3,66		Center-West	6,65	7,98

Sample weight used. Individual working at least 20 hours per week.

tion, with some important exceptions: the return to being a professional increases by 8.5 p.p., and the return to being a rural worker decreases by 12.2 p.p. One interesting remark concerns the industry returns, which decrease substantially for virtually all industries, suggesting that industries matter less over time in determining the wage structure. A similar argument applies for family size. Finally, the returns to being in the Southeast decrease by 5.7 p.p., whereas the returns to being in the Centre-West increase by 2.9 p.p.

By means of OLS results, it is possible to claim that returns to the different categories of urban intensity (rural, small size, medium size, MA) are compressed over time, as the penalisation for living in a rural area (with respect to a small city area) reduced as well as the urban premium for being in a medium city area or in a MA. From this evidence, one might argue that urban intensity contributes to the reduction in wage differentials between individuals across regions.

A step further in analysing the relation between the dynamics of the urban wage premium and the wage distribution is to apply quantile regressions (Koenker and Basset, 1978). Quantile regressions enable investigating the magnitude and the dynamics of the urban wage premium along the wage distribution and thus analysing whether the reduction in urban wage premia is stronger for skilled or unskilled individuals. Quantile regressions have been extensively used to study inequality trends in

Table 5. OLS estimates for the urban wage premium in Brazil (2002–2009)

	2002		*2009*	
	Coeff.	*t–stat*	*Coeff.*	*t–stat*
Rural Area	–0,110	–12,44	–0,077	–10,73
Medium City	0,163	29,68	0,138	30,54
MA	0,228	46,70	0,174	42,82
Less than primary	–0,143	–26,13	–0,127	–25,52
Secondary	0,209	33,37	0,141	28,59
Tertiary	0,879	73,69	0,630	71,15
Female	–0,175	–32,28	–0,206	–48,01
Union	0,100	17,72	0,090	19,13
Formal	0,195	41,39	0,231	58,10
White	0,142	32,62	0,112	30,94
Migrant	0,100	10,25	0,117	12,85
HH head	0,196	42,59	0,124	33,53
Experience (0-4)	–0,134	–18,06	–0,072	–11,51
Experience (5-12)	–0,048	–6,91	–0,024	–4,34
Experience (25-48)	0,066	9,88	0,062	11,09
Experience (49-96)	0,157	23,01	0,141	24,70
Experience (97-180)	0,240	32,91	0,204	33,53
Experience (180-420)	0,358	44,27	0,328	48,86
Experience (>420)	0,203	6,22	0,178	7,46
Manager	0,756	61,85	0,751	71,42
Professionals	0,508	36,39	0,594	58,33
Techinicians	0,412	45,16	0,408	54,71
Clerical Support	0,136	16,55	0,129	20,59
Sellers and reatil Workers	0,114	11,14	0,118	14,04
Rural Workers	–0,006	–0,25	–0,128	–5,60
Plant and Machine Operators	0,103	13,14	0,104	16,24
Manufacturing Industry	0,199	8,40	0,063	2,82
Construction	0,232	9,55	0,105	4,63
Commerce, Retail and Repair	0,151	6,29	–0,002	–0,07
Lodging and Food	0,132	5,14	–0,004	–0,19
Transport and comunication	0,359	14,43	0,158	6,77
Public Administration	0,360	14,69	0,320	13,82
Education and Health	0,227	9,32	0,073	3,21
Domestic Services Maid	0,100	4,06	0,021	0,91
Other Collective Services	0,247	9,50	0,101	4,20
Other Services	0,303	12,32	0,152	6,63
Family size (3-4)	0,062	11,60	0,017	3,99
Family size (more than 4)	0,025	3,97	–0,018	–3,36
Northeast	–0,286	–37,93	–0,266	–42,54
Southeast	0,122	17,06	0,066	11,03
South	0,086	10,56	0,105	15,53
Center-West	0,107	12,91	0,136	20,00
Constant	0,353	13,47	0,783	32,26
R2	0,56		0,53	
Observation	118699		149690	

Sample weight used. Individual working at least 20 hours per week. T–statistics are computed using robust standard errors.

Table 6. Quantile regressions on the 10, 50, and 90 percentiles (2002-2009)

	2002						*2009*					
	10		*50*		*90*		*10*		*50*		*90*	
	Coeff.	*t-stat*	*Coeff.*	*t-stat*	*Coeff.*	*t-stat*	*Coeff.*	*t-stat*	*Coeff.*	*t-stat*	*Coeff.*	*t-stat*
Rural Area	–0,113	–9,73	–0,075	–9,03	–0,093	–5,43	–0,084	–9,55	–0,059	–9,00	–0,054	–4,31
Medium City	0,137	16,42	0,156	27,07	0,159	15,78	0,110	17,08	0,115	24,70	0,128	15,07
MA	0,180	25,36	0,222	42,82	0,252	27,28	0,144	21,80	0,138	36,29	0,175	22,46
Less than primary	–0,120	–14,27	–0,108	–18,28	–0,160	–15,13	–0,106	–15,03	–0,092	–17,73	–0,124	–12,53
Secondary	0,141	14,63	0,191	28,97	0,268	23,24	0,109	14,93	0,126	23,95	0,168	17,40
Tertiary	0,729	41,86	0,887	82,63	0,988	53,76	0,426	34,59	0,639	79,18	0,790	55,69
Female	–0,166	–19,41	–0,159	–28,77	–0,177	–19,16	–0,159	–25,68	–0,177	–41,63	–0,217	–28,76
Union	0,099	11,87	0,103	18,01	0,117	11,90	0,062	9,68	0,088	19,37	0,127	15,40
Formal	0,420	64,80	0,173	36,28	0,006	0,68	0,505	104,05	0,187	48,14	0,044	5,89
White	0,108	16,19	0,125	27,43	0,172	21,87	0,071	13,85	0,092	25,00	0,149	22,13
Migrant	0,054	3,78	0,079	7,98	0,129	7,77	0,032	2,73	0,074	8,76	0,219	14,20
HH head	0,163	22,53	0,176	36,39	0,226	27,56	0,083	15,88	0,107	28,82	0,155	22,70
Experience (0-4)	–0,132	–11,28	–0,092	–11,33	–0,158	–10,96	–0,074	–7,68	–0,045	–6,50	–0,111	–8,68
Experience (5-12)	–0,054	–4,73	–0,040	–5,13	–0,057	–4,07	–0,025	–2,87	–0,016	–2,58	–0,036	–3,14
Experience (25-48)	0,029	2,71	0,063	8,60	0,095	7,29	0,030	3,49	0,063	10,20	0,093	8,20
Experience (49-96)	0,105	9,99	0,155	21,20	0,205	15,82	0,080	9,39	0,127	20,73	0,202	17,97
Experience (97-180)	0,151	13,88	0,245	32,51	0,336	25,18	0,118	13,68	0,191	30,47	0,297	25,56
Experience (180-420)	0,236	20,54	0,359	44,99	0,524	37,35	0,185	20,49	0,315	48,52	0,508	42,39
Experience (>420)	–0,127	–3,98	0,159	7,16	0,633	16,32	–0,154	–6,73	0,150	8,97	0,467	15,27

Manager	0,527	31,54	0,754	67,60	1,018	52,46	0,464	34,92	0,755	83,04	1,038	62,97
Professionals	0,363	17,63	0,504	39,74	0,676	31,28	0,447	30,94	0,578	61,27	0,760	45,98
Techinicians	0,293	20,38	0,438	45,44	0,482	28,57	0,244	21,70	0,409	52,23	0,556	39,46
Clerical Support	0,156	11,06	0,138	14,31	0,129	7,73	0,105	9,97	0,125	16,91	0,155	11,58
Sellers-retail Workers	0,028	1,80	0,094	8,87	0,257	14,42	0,023	1,94	0,097	11,37	0,262	17,16
Rural Workers	–0,102	–2,92	–0,028	–1,12	–0,001	–0,02	–0,296	–10,74	–0,111	–4,47	–0,044	–0,87
Plant, Machine Oper.	0,114	8,82	0,104	11,75	0,118	7,80	0,080	7,82	0,110	15,31	0,128	9,93
Manufacturing	0,248	7,31	0,205	8,23	0,077	1,94	0,110	4,07	0,058	2,36	–0,007	–0,14
Construction	0,336	9,56	0,231	8,94	0,064	1,53	0,172	6,17	0,086	3,45	–0,005	–0,09
Commerce, Retail, Rep.	0,191	5,54	0,135	5,35	0,045	1,12	0,026	0,94	–0,020	–0,82	–0,076	–1,52
Lodging and Food	0,162	4,35	0,130	4,83	0,090	2,07	0,008	0,27	–0,012	–0,49	–0,050	–0,96
Transport-comunic.	0,346	9,69	0,346	13,25	0,333	7,91	0,126	4,45	0,135	5,39	0,185	3,61
Public Administ.	0,396	11,08	0,344	13,24	0,242	5,83	0,264	9,31	0,283	11,30	0,278	5,48
Education–Health	0,361	10,23	0,228	8,84	0,065	1,56	0,147	5,25	0,065	2,63	–0,054	–1,07
Domestic Services	0,175	4,81	0,089	3,38	–0,048	–1,12	–0,004	–0,14	0,019	0,75	–0,027	–0,53
Other Collective Serv.	0,236	6,41	0,236	8,81	0,223	5,16	0,081	2,76	0,088	3,45	0,104	2,02
Other Services	0,354	10,02	0,296	11,43	0,183	4,37	0,154	5,51	0,123	4,95	0,078	1,54
Family size (3–4)	0,047	6,00	0,059	10,75	0,073	7,63	0,012	2,18	0,014	3,42	0,013	1,72
Family size (more than 4)	0,007	0,73	0,024	3,77	0,030	2,70	–0,014	–1,97	–0,017	–3,21	–0,015	–1,55
Northeast	–0,306	–28,61	–0,246	–33,12	–0,258	–19,90	–0,279	–33,39	–0,228	–37,93	–0,230	–20,92
Southeast	0,131	12,34	0,152	20,77	0,096	7,54	0,076	9,00	0,080	13,43	0,031	2,83
South	0,115	9,41	0,109	13,05	0,049	3,37	0,120	12,59	0,114	16,80	0,063	5,11
Center-West	0,089	7,33	0,100	12,01	0,097	6,79	0,083	8,82	0,121	18,02	0,133	10,95
Constant	–0,369	–9,65	0,327	11,80	1,151	25,53	0,140	4,62	0,805	30,68	1,474	27,90

Sample weight used. Individual working at least 20 hours per week.

Brazil (among others, Silveira Neto and Campelo, 2003; Ferreira *et al.,* 2006, Rocha, M. *et al.,* 2010), However, as far as we know, the study of the relationship between the urban premium and inequality in the Brazilian context represents an original contribution to the literature.

We performed three quantile regressions, estimated at the 10th, 50th and 90th percentiles, controlling for all covariates used in the OLS estimations. The results are presented in table 6.

As a first remark, it is interesting to note that urban intensity returns increase along the wage distribution. For instance, in 2002, the returns to being in a MA are equal to 17% at the 10th percentile and to 25.2% at the 90th percentile. This finding is consistent with those of Matano and Naticchioni (2012): returns to agglomeration are not uniformly distributed and increase along the wage distribution. Another interesting remark concerns the dynamics of such returns. Quantile regressions confirm that returns to being in a medium size area or in a MA decreases in the period 2002-2009. In particular, the returns to being in a MA range, at the 90th percentile, from 25.2% in 2002 to 17.5% in 2009; that is, –7.7 p.p. Similar findings are derived at the 50th percentile: returns to being in MA decreased from 22.2% to 13.8% (–8.4 p.p.). Interestingly, the reduction is smaller when considering the 10th percentile, for which the returns to being in MA ranged from 18% to 14.4% (–3.6 p.p).

These differences provide a first insight concerning the consequences on inequality issues. In 2002, the difference in the returns to being in a MA between workers at the 90th percentile and workers at the 10th percentile was equal to 7.2 p.p. (25.2 minus 18.0), whereas in 2009, it was equal to 3.1 p.p.; the reduction in the urban wage premium brings the wages of unskilled and skilled workers closer together, reducing inequality.

With regard to the returns to living in a medium city area, the reduction between 2002 and 2009 is flatter along the distribution, being equal to 3.1 p.p. at the 90th percentile, to 4.1 p.p. at the median and to 2.7 p.p. at the 10th percentile. Furthermore, as observed for the OLS case, the penalisation for being in rural areas decreases over time, by 2.9 p.p. at the 10th percentile, 1.6 p.p. at the median, and 3.9 p.p. at the 90th percentile.

Putting together the fall in the urban premium in MAs and the decrease in the penalisation for being in rural areas, it is found that at the 90th percentile, the difference in wages between workers in rural areas and those in MAs was equal to 34.5 p.p. (25.2 plus 9.3) in 2002 and decreased to 22.9 p.p. (–11.6 p.p.) by 2009, suggesting that wage differentials at the 90th percentile due to urban intensity decreased strongly over time. A similar finding applies for the median, where the distance between workers in MAs and rural areas decreased from 29.7 p.p. in 2002 to 17.4 p.p. in 2009 (–12.3 p.p.). Interestingly, for the 10th percentile, this difference is only 7.1 p.p. This finding indicates that along the wage distribution, there is a strong compression due to the fall in the urban wage premia, which has a negative effect on wage differentials across regions. Further, this compression is much stronger for skilled workers at the 90th percentile and for the median worker, reinforcing the compression effect on inequality.

4. Conclusions

In this paper, we investigate the trends in the urban wage premium in Brazil as well as the consequence on the reduction in inequality in the first decade of the 21st century. We find, using both OLS and quantile regressions, a decreasing urban wage premium over the period 2002-2009. Second, we show that the decrease in the urban wage premium is stronger at the 90th percentile than at the 10th percentile. These findings suggest that the falling urban wage premium have contributed to the reduction in inequality observed in Brazil in the last decade. We also note that for any given percentile of the distribution, the wage differential between workers in the most agglomerated areas and those in the least agglomerated areas (rural) strongly dampened over time, reinforcing the reducing impact on inequality.

Future research must propose explanations for the falling urban wage premia in Brazil and their impact on inequality. Moretti (2012) develops a general equilibrium model to explain the increasing inequality in the US, in which he disentangles demand from supply shocks, which affect the return to education, by region. Another strand in the literature, following the concept of New Economic Geography, stresses the importance of pecuniary externalities. Recent findings did not reject this hypothesis for European regions or for the US. The relative importance of each possible cause is, of course, an empirical matter (Redding and Schott, 2003; López-Rodriguez *et al.,* 2007, and Fallah *et al.,* 2011). Another possible extension is the potential use of spatial econometric techniques to control for spatial effects.

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Comment on «Falling urban wage premium and inequality trends: evidence for Brazil», by Bruno de Oliveira Cruz and Paolo Naticchioni

Hipólito Simón *

The article «Falling urban wage premium and inequality trends: evidence for Brazil» aims to answer to what extent the evolution of the urban wage premium is a relevant factor behind the evolution of income inequality in Brazil from 2002 to 2009. The subsequent empirical examination is carried out on the basis of a household survey (PNAD) and the use of ordinary least squares and quantile regression econometric techniques to control for a rich set of covariates (region, gender, occupation, experience, race, sector and family characteristics). Two main results are derived. First, the urban wage premium has followed a decreasing path from 2002 to 2009. Second, the fall in the urban wage premium could have contributed to the reduction of inequality in Brazil in the last decade, given that the reduction in the wage premium over time is significantly higher at the top of the wage distribution (90^{th} percentile) than at the bottom (10^{th} percentile). Undoubtedly, this is the most relevant finding of the research.

In my opinion, the article offers interesting evidence for several reasons. First, it examines the urban wage premium, a highly relevant topic. Accordingly, it deserves much attention, both by regional and labour economists, who have tried to disentangle if the urban wage premium is mostly caused by urbanisation externalities or alternative reasons, such as those stated in «learning» and «coordination» hypotheses (*i. e.,* that in cities, human capital accumulation is faster and there is a higher probability of a better match between workers and firms). Second, whereas most of the literature on the urban wage premium concerns advanced economies (specifically, the US and European countries), the article investigates an emerging country with additional interesting characteristics (namely, very strong regional imbalances, significant differences in the degree of urban intensity and a distinctive pattern of falling wage inequality). Finally, the research is well motivated (the authors make an important effort to convince the reader about the relevance of the Brazilian case, stressing the reasons that justify the analysis of this particular country), and the technical approach, although quite standard, is well developed. As a consequence, the study certainly makes an interesting contribution to the general knowledge about the effect of the evolution of the urban wage premium in reducing inequality in Brazil.

However, it must be noted that the methodology used to examine this question has certain limitations. First, the independent variable in the empirical analysis is a measure of the urban level of agglomeration, whose definition, according to four

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urban intensity levels (rural areas, small city areas, medium city areas and metropolitan areas), is constrained by the dataset construction methodology. Unfortunately, it apparently implies that the actual size of the cities in each category (*i. e.,* the number of inhabitants that delimits each category) is unknown, which hinders an appropriate interpretation of the empirical findings and comparisons with existing evidence from other countries. Second, the employed methodology does not distinguish between the relative impact of the fall of the urban wage premium on the reduction of inequality and that of other relevant alternative factors with potentially significant contributions to the reduction of inequality (notably, a decrease in the returns on education and spatial and sectoral changes experienced in the Brazilian labour market). As a result, the empirical analysis would have benefited from the use of more sophisticated decomposition techniques (such as that of Firpo, Fortin and Lemieux, 2011; chapter 1, vol. 4, *Handbook of Labor Economics*) to disentangle the relative impact of the urban wage premium on the evolution of inequality. Finally, the use of spatial econometric techniques to control for spatial effects would have been appropriate. In any case, it must be concluded that, despite these concerns, the article provides interesting novel evidence on an exciting research topic.

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Section ARTICLES

Investigaciones Regionales

Wage inequality and economic growth in Mexican regions

Claudia Tello *, Raúl Ramos **

ABSTRACT: Only a few studies have analysed the relationship between intra-regional inequality and growth, although several studies have measured inequality at the regional level. The objective of this paper is to analyse the relationship between income (wage) inequality and economic growth in different regions of Mexico. We also try to identify factors that explain the variation of intra-regional inequality across Mexican regions and over time. Using macroeconomic databases and publicly available microdata, we apply techniques used in the fields of statistics and econometrics to obtain robust evidence on the relationship between growth and inequality. Our aim is to provide policy recommendations to support the design and implementation of growth-promoting measures thatavoid the exclusion of certain social groups. This paper provides reasons to use a spatial approach and an analysis of particular regions to avoid «one size fits all» policy recommendations.

JEL Classification: J24, J31.

Keywords: Regional inequality, economic growth, Mexican regions.

Desigualdad salarial y crecimiento económico en las regiones de México

RESUMEN: Sólo unos pocos estudios han analizado la relación entre la desigualdad intra-regional y el crecimiento, a pesar de que varios estudios han medido la desigualdad a nivel regional. El objetivo de este trabajo es analizar la relación entre la desigualdad del ingreso (salario) y el crecimiento económico en diferentes regiones de México. También tratamos de identificar los factores que explican la variación de la desigualdad intra-regional a lo largo del tiempo. Para ello, se utilizan bases de datos macroeconómicos y de microdatos a disposición del público

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y aplicamos técnicas estadísticas y econométricas para obtener evidencia robusta sobre la relación entre crecimiento y desigualdad. Nuestro objetivo es intentar ofrecer recomendaciones de política para apoyar el diseño y la implementación de medidas que promuevan el crecimiento y que eviten así la exclusión de ciertos grupos sociales. El artículo ofrece motivos para utilizar un enfoque espacial y el análisis de determinadas regiones para evitar recomendaciones de política del tipo *«one size fits all»*.

Clasificación JEL: J24, J31.

Palabras clave: Desigualdad regional, crecimiento económico, regiones de México.

1. Introduction

There has been growing interest in analysing the relationship between inequality and growth since the pioneering work of Kuznets (1955) that found that inequality first increases and later decreases during the process of economic development, suggesting a non-linear relationship between these two variables. However, theoretical papers and empirical applications have produced conflicting results. While a considerable part of the literature has shown that inequality is detrimental to growth, more recent studies have challenged this result and found inequality to have had a positive effect on growth. The first group of authors argue that there is less demand for redistribution in more egalitarian societies and therefore less tax pressure, which creates greater accumulation of capital and higher growth (Persson and Tabellini, 1994). A second argument in this line of reasoning is related to political instability (Alesina and Perotti, 1996) and posits that greater levels of inequality imply a distortion in the functioning of markets, reducing labour productivity. By contrast, the authors who defend a positive relationship between inequality and growth base their arguments on the effects of inequality in the accumulation of factors of production. If the savings rate of the rich is higher than that of the poor, the reduction of inequality implies a reduction in aggregate savings and therefore of capital accumulation and growth (Fields, 1989; Campanale, 2007). Moreover, agglomeration economies produce higher returns to high-skilled workers and consequently produce simultaneously higher inequality and higher economic growth (Borjas *et al*., 1992; Wheaton and Lewis, 2002; Glaeser and Maré, 2001). If both variables are influenced by identical factors, it is likely that they are produced by the same causes.

The recent meta-analysis by de Dominicis *et al*. (2008) concluded that it would be misleading to simply speak of a positive or negative relationship between income inequality and economic growth when looking at the available studies, although policy conclusions clearly depend on the type of relationship. Differences in methodologies, data quality and sample coverage substantially affect the magnitude of the estimated effect of income inequality on economic growth. For this reason, these authors propose to focus their research on determining the effect of income inequality on economic growth using single-country data at the regional level because most of the

factors explaining the bulk of the differences between studies, data-related issues and structural or institutional issues, will thereby be eliminated. However, the international evidence for using this approach is scarce, see Partridge (2005), Frank (2009) and Fallah and Partridge (2007) for the US, Perugini and Martino (2008), Barrios and Strobl (2009) for the EU-15 countries, Castelló (2010) for OECD countries (focusing on groups of countries with distinct income levels), Herzer and Vollmer (2011) for a sample of 46 countries and Székely and Hilgert (1999) for 18 Latin American countries. To the best of our knowledge, there are only a few similar studies for a single country, including Rooth and Stenberg (2011) for Swedish regions and, for developing countries, we find studies of Argentina by Cañadas (2008) and Araujo, *et al*. (2009) and a study of Brazil by Azzoni (2001).

The objective of this paper is to provide evidence about the association of inequality and growth across 32 Mexican states (31 states and the Federal District) over a period of 10 years (1998-2008) by using several measures of inequality and different econometric specifications. Moreover, we would like to determine whether other factors simultaneously influence inequality and growth, such as previous growth rates, which have been found to influence both present inequality and subsequent growth in the regional convergence literature.

The Mexican case is particularly interesting in this context for several reasons. First, the labour structure of Mexico has undergone different political, economic and demographic changes affecting both inequality and regional economic growth over the past three decades. Second, inequality trends have been substantially different than those observed in other developing countries.

After a critical period of economic adjustment characterised by the debt crisis in the 1980's, Mexico enjoyed a period of economic growth. In the mid-1980s, Mexico was in the initial stages of implementing new trade liberalisation policies and export promotion that was expected to increase the country's productivity and competitiveness. During that period, trade barriers were reduced through various rounds of negotiations under the GATT and the WTO; Mexico also experienced a radical reduction in the size of its public sector and in the strength of its unions, while it sawa massive increase in the rate of underemployment and in workers moving into the informal sector (Gong *et al*., 2004; Meza, 2005). From 1989 to 1994, GDP grew at an average rate of approximately 3.9% per year [1], but growth ended abruptly in 1995, when GDP fell by 6.2% in the aftermath of the so-called «Peso Crisis». After the crisis of 1995, the GDP contracted by approximately 8%; thereafter, the economy quickly recovered but not with significant levels of growth, and Mexico's per capita GDP grew at an annual rate of 4% from 1996 to 2000, falling to an annual rate of 1% between 2001 and 2006 [2].

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[1] World Bank (1997).

[2] The introduction of trade liberalisation has generated important changes in the Mexican economy. However, the research has shown that there are heterogeneous (positive and negative) outcomes. For instance, apparently NAFTA did not break down the divergent pattern in regional per-capita output observed after the initial stages of the reforms; the degree to which trade will reduce regional inequality in a given country is mediated by the geographic distribution of its endowments, and trade openness has increased

Under this macroeconomic framework, there is overwhelming evidence that Mexico has faced increasing inequality not only in economic but also in social terms since the mid-1980s, although it seems to have decreased from 2000 onwards. The inequality increase observed during the 1990s was a common feature of several OECD industrialised countries [3], but was not common in most developing countries (Autor *et al*., 2005 and 2008; Arellano *et al.*, 2001; Acemoglu, 2003; Morley, 2000; Bandeira and García, 2002; Ferreira, *et al*., 2008 and Cornia, 2010) [4].

The remainder of this paper is structured as follows. Section 2 discusses data sources. Section 3 focuses on methodology and the econometric model to be estimated. Section 4 shows the results about the influence of wage inequality on economic growth from a regional perspective. Finally, Section 5 concludes.

2. Data sources

The dataset used in this paper comes from the National Survey of Labour and Employment (ENOE) and the National Urban Employment Survey (ENEU), conducted by the National Institute of Statistics and Geography of Mexico (INEGI), from 1987 to 2008.

In the rest of the analysis, we use ENEU-ENOE microdata covering the period from 1998 to 2008to describe the evolution of inequality in Mexico. The size of the sample is 1,391,438 observations in an urban aggregate of 32 metropolitan areas. Our basic sample consists of workers between 15 and 65 years of age who are working full-time, and hours are measured against the hours customarily worked in the principal job. Wefocused on the formal or mains tream labour market and chose not to consider self-employed, seasonal or unpaid workers to avoid problems addressing retained earnings.

The scarce availability of sub-national data in Mexico hasthusfar strongly influenced the research on the causes and effects of regional inequality in Mexico. This suggests that analyses covering all 32 states [5] may be conducted, providing a

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regional inequality in Mexico, favouring states located in the north of Mexico in particular. While it appears that human capital policies might have a great effect in closing disparities among regions in the Mexican context, some policies cannot be dismissed because building local capacities requires a great deal of time and a coordinated and well-focused regional policy. In all cases, the findings show that there is increasing polarisation between the Mexican states. See, in particular, Jordaan and Rodriguez (2012), González (2007), Rodríguez-Oreggia (2005) and Chiquiar (2005) for a review of these arguments and Rodríguez-Oreggia (2007) for a review of the polarisation between the Mexican states, where rich states are becoming richer and experiencing higher growth.

[3] For evidence that inequality measures are sensitive to the sample of workers examined and the earnings measure, see Handcock, *et al*. (2000) and Lemieux (2002, 2006).

[4] This contrasts with the slight increases or even declines in other countries such as the Netherlands, Sweden or Belgium, US, UK, Germany, Canada and some countries in Latin America.

[5] Aguascalientes, Baja California, Baja California Sur, Campeche, Coahuila de Zaragoza, Colima, Chiapas, Chihuahua, Distrito Federal, Durango, Guanajuato, Guerrero, Hidalgo, Jalisco, México Federal District, Michoacán de Ocampo, Morelos, Nayarit, Nuevo León, Oaxaca, Puebla, Querétaro Arteaga,

number of observations (in our case, regions) sufficient to allow econometric analysis. We built regional measures of wage inequality using hourly wages (derived from monthly earnings and weekly hours multiplied by 4.3) [6]. For individuals who report their wages as a multiple of the minimum wage, we assigned the mean of the interval [7]. Wages were deflated by the consumer price index (CPI) to the second quarter, using 2002 as the base year. The regional CPI disaggregates indices covering six geographical regions that include 46 cities classified by size (small, medium and big). This structure allows for at least one representative city in each state [8].

In view of the high variability of outcomes highlighted by the literature with respect to the measures employed and the geographical scope, wealso considered regional population, regional GDP (current) [9], population density, sectoral employment structure, level of qualification (as a proxy of human capital), educational inequality and measures of labour market performances (labour force participation, unemployment and informal labour rates). Geographical information, such as the coastal strip and the distance in kilometres from the capital of each state to Mexico City, are used to represent proximity among markets. Distance to important markets is an important variable in the new economic geography. This strand of the literature assumes that a shift in the relevant market occurs once trade is introduced [10]. The data sources for each of the variables are shown in table A1.1 (see Annex 1).

3. Methodology

3.1. Measuring inequality

A substantial and growing literature has developed different measures or indices as proxies for economic inequality. Several authors have used the Gini coefficient and other measures or relationships drawn from Lorenz curves, other authors have chosen to use different indicators of dispersion, such as an entropy index or axiomatic deriva-

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Quintana Roo, San Luis Potosí, Sinaloa, Sonora, Tabasco Tamaulipas, Tlaxcala, Veracruz, Yucatán, Zacatecas.

[6] The definition of earnings in the publicly available version of the surveys refers to monthly «equivalent» earnings from the main job after taxes and Social Security contributions, including overtime premiums and bonuses. For those paid by the week, the survey transforms weekly earnings into monthly. Similar adjustments are used for workers paid by the day or every two weeks.

[7] During the period, the population that does not declare income was less than one percent.

[8] The NCPI has been calculated since 1969 and it has changed its base year four times to 1978, 1980, 1994 and 2002. For this study, we used the base year 2002 that corresponds to a weighting of the consumer population structure in 2000. The NCPI is calculated and published on a monthly basis by the Central Bank (Bank of Mexico). The index gathers the prices of a family shopping basket, using prices of goods and services found at *www.banxico.org.mx*.

[9] The regional GDP in constant prices is only available for 2005-2009.

[10] In the Mexican case, the relevant market should be Mexico City during ISI (Import Substitution Industrialisation) and the border with the US during the GATT (General Agreement on Tariffs and Trade), particularly since the implementation of NAFTA (North American Free Trade Agreement) (Hanson, 1997; Hanson and Harrison, 1999; Krugman and Livas, 1996).

tions of inequality indices, and still others advocate the use of normative measures derived from social welfare functions [11].

The most commonly used inequality index remains the Gini coefficient (G), which ranges from 0 (perfect equality) to 1 (perfect inequality). As the ratio of the area enclosed by the Lorenz curve (L) and the perfect equality line to the total area below that line, the Gini coefficient is twice the area defined between p and $\theta(p)$, where $\theta(p)$ is the Lorenz curve and shows the income value (Y) below a fraction $0 \leq p \leq 1$ [12]:

$$G(Y) = 1 - 2\int_0^1 L(p_i Y)dp \tag{1}$$

When compared to other measures, the Gini coefficient is the most sensitive to income differences in the middle of the distribution (more precisely, around the mode). This index is usually completed by using other Lorenz-based measures such as the Mehranindex and the Piesch index, which are more sensitive to differences between the lowest and the highest income individuals.

A different family of inequality indices can be derived utilising the considerations summarised by Cowell and Kuga (1981). This family of indices is known as Generalised Entropy indices (E_α); given an appropriate normalisation and using the standard population principle (Dalton, 1920), they can be calculated as follows [13]:

$$E_\alpha(Y) = \frac{1}{\alpha^2 - \alpha}\int\left(\left(\frac{y_i}{\mu Y}\right)^\alpha - 1\right)f(y_i)dy \tag{2}$$

where α is the order of the index, y_i is the income share that is individual *i's* total income share as a proportion of total income for the entire regional population and μY is the mean income. The more positive or negative α is, the more sensitive (E_α) is to income differences at the top or bottom of the distribution, respectively; E_0 is equivalent to the mean logarithmic deviation [14], E_1 corresponds to the Theil index [15] and E_2 is half the square of the coefficient of variation [16].

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[11] The extent of this work is indicated by the recent publication of two handbooks, the *Handbook of Income Distribution* edited by Atkinson and Bourguignon (2000), much of which addresses measurement problems, and the *Handbook on Income Inequality Measurement* edited by Silber (1999), devoted entirely to the subject. See also, Cowell (2000) and Lambert (2001) for an excellent survey.

[12] Yitzhaki (1998) reviews other alternative formulae.

[13] Using an analogy with the entropy concept in information theory, Theil (1967) opened and explored a new area in inequality measurement and for the axiomatic approach to inequality measurement. The entropy concept is the expected information in the distribution. Theil's application of this to income distribution replaced the concept of event probabilities by income share.

[14] This inequality index is an example of the concept of conditional entropy that allows the comparison distribution and has been applied to the measurement of distributional change (see Cowell, 1980).

[15] The most commonly used values of α, are 0, 1 and 2. When $\alpha = 0$, more weight is given to distances between wages in the lower range, when $\alpha = 1$, equal weights are applied across the distribution, while a value of $\alpha = 2$ gives more weight proportionately to gaps in the upper range (see Litchfield, 2003).

[16] For more details of these measures, see Tello (2012).

The Atkinson index explicitly manifests value judgements in a parameter, ε, that represents the degree of inequality aversion. The Atkinson class of measures has the general formula:

$$A_{\varepsilon} = 1 - \left[\frac{1}{n} \sum\nolimits_{i=1}^{n} \left[\frac{y_i}{y} \right]^{1-\varepsilon} \right]^{\frac{1}{1-\epsilon}} \tag{3}$$

where ε is an inequality aversion parameter, $0 < \varepsilon < \infty$, and the higher the value of ε, the more society is concerned about inequality (Atkinson, 1970). The Atkinson class of measures ranges from 0 to 1, with zero representing no inequality. Setting $\alpha = 1-\varepsilon$, the GE class becomes ordinally equivalent to the Atkinson class, for values of $\alpha < 1$ (Cowell and Jenkins, 1995) [17]. The more that $\varepsilon > 0$ (the «inequality aversion parameter»), the more sensitive the index is in different parts of the income distribution. Thus, the most commonly used values of ε are the following: A(0.5), A(1) and A(2).

3.2. Methodology

The standard procedure for estimating the effect of inequality on growth is to assume a simple linear relationship in which the logarithmic difference of per capita income at the beginning and at the end of the time period is regressed on a number of explanatory variables that potentially explain differences in the growth rates of countries, including a measure of income inequality. Specifically,

$$\ln y_{i,t} - \ln y_{i,t-1} = \alpha + \beta \cdot \ln y_{i,t-1} + \gamma \cdot Ineq_{i,t-1} + \upsilon_{i,t} \quad t = 1998,\ldots,2008 \tag{4}$$

where $lny_{i,t}$ is the logarithm of real GDP per capita in region i at time t, $Ineq_{i,t}$ represents an inequality measure (Gini index, Mehran and Piesch measures, Generalised Entropy index and Atkinson class), and $\upsilon_{i,t}$ is an error term that varies across regions and periods. In this model, the coefficient β will be related to the convergence rate across economies while the coefficient γ will permit the assessment of the effect of regional inequality on growth. As previously mentioned, studies based on cross-national regressions typically report a negative and significant relationship between initial income inequality and growth. The negative coefficient usually holds for different measures of inequality, different country samples, and different time periods.

One of the main critiques of this type of regression is that cross-national estimates may be biased because variables may be omitted. Country-specific factors such as technology, climate and institutional structures may be important determinants of growth rates and may correlate with explanatory variables in the model. Although

[17] Atkinson proposes to define the index not according to the difference between actual social welfare and the social welfare that would ensue with equally distributed income, but in terms of the difference between mean actual income and *equally distributed equivalent income*, *i. e.,* income which, being equal for everyone, would provide the same level of actual social welfare.

control variables may be included in the model, many factors are typically unobservable. Assuming that those factors are constant over time and using longitudinal rather than cross-sectional data, the suggested specification results in a modified panel data version of the previous equation that can be used to control for unobservable factors using a fixed effects model. The modified model will adopt the following form:

$$\ln y_{i,08} - \ln y_{i,98} = \alpha + \beta \cdot \ln y_{i,98} + \gamma \cdot Ineq_{i,98} + \varphi X_{i,98} + \eta_{08} + \mu_i + \varepsilon_{i,08} \qquad (5)$$

where $lny_{i,t}$ is the logarithm of real GDP per capita in region i at time t, $Ineq_{i,t-1}$ represents the different inequality measures in region i lagged 1 year, $X_{i,t-1}$ includes k explanatory variables suggested in the literature as important determinants of the growth rates [18]; β, γ and φ represent the parameters of interest that are estimated, η_t is a time specific effect, μ_i is a region specific effect, and $\varepsilon_{i,t}$ is an error term that varies across regions and periods.

However, panel data estimations have a list of drawbacks; if most of the variation in the key variables is cross-sectional rather than within regions, fixed effect approaches may produce misleading results (Barro, 2000). In other words, if the underlying causal factors in the growth process are persistent, the long-run cross-sectional effects will be subsumed into the country-fixed effects, and the explanatory variable coefficients would be much less informative (Rodríguez-Pose and Tselios, 2010). Consequently, OLS cross-sectional models capture how persistent cross-sectional differences in inequality affect long-term growth rates, which is relevant to understanding growth disparities, while panel techniques capture how time-series changes in inequality within a region affect changes in its growth rate over the short term. Therefore, the two methods are complementary and may reflect different responses.

Consequently, both cross-sectional and panel data models will be considered. The econometric estimation of panel data systems must address similar problems, such as the measurement error of the endogenous variable, the inclusion of the lagged endogenous variable as a regressor, the potential endogeneity of growth and, lastly, the potential existence of spatial spillovers. The inclusion of additional explanatory variables at the regional level will permit an assessment of our second research hypothesis. However, the choice between various techniques to estimate the panel data model is governed by assumptions about the error term and its correlation with the explanatory variables. Most panel data growth studies use the fixed effects estimator, as opposed to the random effects estimator. However, as Temple (1999) stressed, this approach does not correctly analyse the effect of variables that are fairly constant over time or that will have only a long-term effect on growth, as could be the case for inequality. An additional problem with both the fixed and random effects estimators is that our specification contains a lagged regressor undermining the strict exogeneity assumption of the explanatory variables, so we recommend the exclusive use of the

[18] These variables are the logarithm of GDP per capita, educational attainment, educational inequality, the labour force, unemployment and informal labour rates, the coastal localisation of the region, the distance to DF and occupation by economic sector. A more detailed description of each variable and its sources is included in Table A1.1 in the Annex 1.

GMM estimator initially developed by Arellano and Bond (1991) and improved by more recent contributions that takes into account problems related to panel dimensions. This estimator first takes differences to eliminate the source of inconsistency and uses the levels of the explanatory variable lagged as instruments.

4. Empirical results

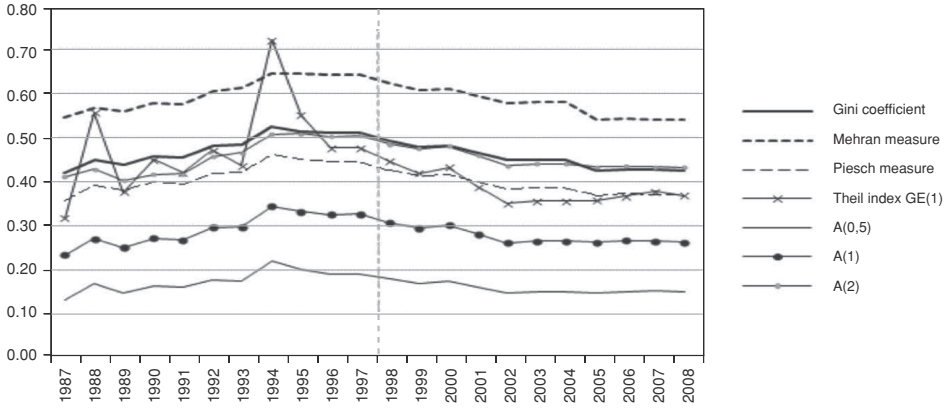
4.1. The evolution of wage inequality in Mexican regions

Mexico has experienced significant increasesin wage disparity across regions since the mid-1980s. During the nineties, NAFTA had heterogeneous effects in several regions because not all regions within Mexico are equally linked to the international (global) economy. While the degree of regional exposure to globalisation appears to be an important determinant of the differences in the evolution of state-specific wage profiles, it is important to note that Mexico's regions exhibit large differences in natural resource endowments, infrastructure, regional policies and historically determined agglomerations of population.

Figure 1 shows the evolution of the different inequality measures considered in this paper. From this figure, we can conclude that there is a general trend of inequality in Mexico that follows an inverted «U» pattern, with a sharp decline since 1997. If we focus on the Gini index, it shows that a major increase in inequality has taken place since 1994 (when the value of the Gini index was 0.52). After the Mexico crisis, the level of inequality declined slightly. Finally, the General Entropy indices show that the volatility of the index is higher for extreme values of the sensitivity parameter (most likely because of top coding problems); however, focusing on levels shows that GE(–1), GE(0) and GE(1) follow a pattern close to the Gini index.

Table 1 shows different measures of inequality for 32 states in Mexico for the period from 1998 to 2008. Important differences in the inequality indices can be

Figure 1. Inequality measures in Mexico, 1987-2008



Source: Our elaboration from ENEU-ENOE 1987-2008.

Table 1. Descriptive statistics of main variable by region

	lgdppc		*Gini coefficient*		*Mehran*		*Piesch*		**Inequality measures** *Generalized Entropy Index*								*Atkinson class*					
									GE(–1)		*GE(0)*		*GE(1)*		*GE(2)*		*A(0.5)*		*A(1)*		*A(2)*	
	1998	*2008*	*1998*	*2008*	*1998*	*2008*	*1998*	*2008*	*1998*	*2008*	*1998*	*2008*	*1998*	*2008*	*1998*	*2008*	*1998*	*2008*	*1998*	*2008*	*1998*	*2008*
Aguascalientes	4,16	4,45	0,48	0,40	0,61	0,51	0,41	0,35	0,43	0,33	0,34	0,27	0,41	0,31	0,95	0,48	0,17	0,13	0,29	0,24	0,46	0,40
Baja California	4,32	4,40	0,42	0,37	0,53	0,47	0,37	0,32	0,29	0,26	0,27	0,23	0,33	0,28	0,62	0,57	0,14	0,12	0,24	0,21	0,37	0,34
Baja California Sur	4,29	4,55	0,47	0,45	0,59	0,55	0,40	0,39	0,43	0,41	0,35	0,34	0,40	0,46	0,79	1,39	0,17	0,17	0,29	0,29	0,46	0,45
Campeche	4,39	5,17	0,49	0,44	0,62	0,56	0,43	0,38	0,49	0,44	0,39	0,33	0,43	0,38	0,74	0,66	0,19	0,16	0,32	0,28	0,50	0,47
Coahuila	4,34	4,57	0,49	0,43	0,62	0,53	0,43	0,37	0,48	0,38	0,37	0,30	0,45	0,36	0,99	0,70	0,18	0,15	0,31	0,26	0,49	0,43
Colima	3,99	4,20	0,49	0,42	0,62	0,53	0,42	0,36	0,45	0,37	0,36	0,29	0,45	0,32	1,38	0,48	0,18	0,14	0,30	0,25	0,47	0,42
Chiapas	3,08	3,32	0,53	0,47	0,67	0,59	0,46	0,40	0,67	0,51	0,46	0,37	0,47	0,44	0,78	1,47	0,21	0,18	0,37	0,31	0,57	0,50
Chihuahua	4,35	4,59	0,43	0,41	0,54	0,50	0,37	0,36	0,30	0,29	0,28	0,28	0,34	0,40	0,58	1,21	0,14	0,15	0,25	0,24	0,38	0,37
Distrito Federal	4,87	5,25	0,51	0,44	0,63	0,55	0,44	0,38	0,48	0,39	0,39	0,32	0,47	0,37	0,90	0,67	0,19	0,16	0,33	0,27	0,49	0,44
Durango	3,80	4,11	0,50	0,42	0,63	0,53	0,43	0,36	0,46	0,36	0,37	0,29	0,46	0,32	1,40	0,52	0,18	0,14	0,31	0,25	0,48	0,42
Guanajuato	3,61	3,98	0,45	0,35	0,57	0,44	0,39	0,30	0,32	0,22	0,29	0,21	0,36	0,27	0,88	0,58	0,15	0,11	0,25	0,19	0,39	0,31
Guerrero	3,32	3,65	0,51	0,43	0,63	0,55	0,44	0,38	0,45	0,43	0,37	0,33	0,48	0,42	1,50	1,33	0,19	0,17	0,31	0,28	0,47	0,46
Hidalgo	3,44	3,82	0,49	0,45	0,64	0,57	0,42	0,39	0,48	0,44	0,36	0,34	0,38	0,37	0,57	0,59	0,17	0,16	0,30	0,29	0,49	0,47
Jalisco	3,94	4,22	0,50	0,40	0,64	0,50	0,43	0,35	0,42	0,31	0,34	0,27	0,41	0,32	0,86	0,56	0,17	0,13	0,29	0,23	0,45	0,39
México	3,72	3,94	0,48	0,38	0,61	0,49	0,41	0,33	0,39	0,31	0,33	0,25	0,39	0,32	0,75	0,94	0,16	0,13	0,28	0,22	0,44	0,38
Michoacán	3,35	3,76	0,44	0,42	0,58	0,54	0,37	0,37	0,32	0,37	0,26	0,30	0,30	0,36	0,57	0,74	0,13	0,15	0,23	0,26	0,39	0,43
Morelos	3,82	4,04	0,46	0,38	0,58	0,49	0,39	0,33	0,34	0,29	0,30	0,25	0,36	0,29	0,66	0,50	0,15	0,12	0,26	0,22	0,40	0,36
Nayarit	3,45	3,80	0,49	0,41	0,64	0,54	0,42	0,35	0,48	0,39	0,34	0,29	0,41	0,31	1,25	0,48	0,17	0,14	0,29	0,25	0,49	0,44
Nuevo León	4,58	4,97	0,50	0,42	0,62	0,52	0,44	0,37	0,45	0,35	0,39	0,29	0,47	0,35	0,93	0,64	0,19	0,15	0,32	0,25	0,48	0,41
Oaxaca	3,04	3,53	0,54	0,43	0,68	0,55	0,46	0,37	0,65	0,44	0,42	0,32	0,51	0,34	1,70	0,52	0,20	0,15	0,35	0,27	0,56	0,47
Puebla	3,66	3,90	0,44	0,40	0,58	0,51	0,37	0,34	0,35	0,33	0,28	0,27	0,31	0,30	0,47	0,47	0,14	0,13	0,25	0,23	0,41	0,40
Querétaro	4,20	4,44	0,49	0,39	0,62	0,50	0,43	0,34	0,48	0,29	0,37	0,25	0,43	0,30	0,82	0,48	0,18	0,13	0,31	0,22	0,49	0,36

Quintana Roo	4,47	4,65	0,46	0,43	0,57	0,53	0,40	0,38	0,36	0,34	0,33	0,31	0,49	0,42	2,20	1,20	0,18	0,16	0,28	0,27	0,42	0,40
San Luis Potosí	3,64	4,05	0,55	0,42	0,66	0,53	0,49	0,36	0,58	0,36	0,50	0,29	1,07	0,33	31,21	0,53	0,28	0,14	0,39	0,25	0,54	0,42
Sinaloa	3,67	4,03	0,49	0,41	0,62	0,53	0,42	0,36	0,46	0,34	0,36	0,28	0,42	0,33	0,81	0,58	0,18	0,14	0,30	0,25	0,48	0,40
Sonora	4,11	4,48	0,48	0,42	0,60	0,52	0,42	0,36	0,43	0,35	0,36	0,29	0,44	0,37	0,90	0,91	0,18	0,15	0,30	0,25	0,46	0,41
Tabasco	3,51	4,31	0,49	0,44	0,64	0,57	0,42	0,38	0,52	0,42	0,38	0,33	0,39	0,35	0,55	0,53	0,18	0,16	0,32	0,28	0,51	0,46
Tamaulipas	4,04	4,46	0,48	0,48	0,60	0,59	0,42	0,42	0,45	0,48	0,36	0,39	0,43	0,51	0,97	1,75	0,18	0,20	0,30	0,32	0,48	0,49
Tlaxcala	3,32	3,52	0,51	0,42	0,65	0,53	0,44	0,36	0,56	0,39	0,36	0,30	0,39	0,34	0,67	0,61	0,17	0,14	0,30	0,26	0,53	0,44
Veracruz	3,49	3,82	0,51	0,40	0,64	0,51	0,44	0,34	0,52	0,33	0,40	0,27	0,46	0,31	0,93	0,50	0,19	0,13	0,33	0,24	0,51	0,40
Yucatán	3,73	4,09	0,51	0,45	0,64	0,56	0,45	0,39	0,52	0,39	0,41	0,33	0,47	0,39	0,94	0,68	0,20	0,16	0,33	0,28	0,51	0,44
Zacatecas	3,36	3,83	0,51	0,47	0,65	0,59	0,44	0,42	0,50	0,48	0,39	0,39	0,45	0,53	1,04	2,59	0,19	0,20	0,32	0,32	0,50	0,49

Source: Our calculations. For full definition of the variables, see Table A1.1 in Annex 1.
Notes: lgdppc: Natural logarithm of real GDP per capita.
Inequality measures: Gini index (Gini), Mehran and Piesch measures, Generalised Entropy GE (-1, 0, 1, 2), Atkinson class A (0.5, 1, 2).

identified among regions over the period. In 1998, the Gini coefficient was 0.49 and this coefficient ranges between 0.42 and 0.54 by region. Chiapas, D. F., Guerrero, Jalisco, Nuevo León, Oaxaca, San Luis Potosí, Tlaxcala, Veracruz Yucatán and Zacatecas showed Gini coefficient values of 0.50 or over. Maps 1a and 1b (in Annex 2) show the changes among regions between 1998 and 2008. The evolution of disparities among regions during this period shows a clear downward trend, with the average measure of the Mehran index decreasing from 0.62 to 0.53, the Piesch from 0.42 to 0.36 and the Generalised Entropy indices in values (–1, 0, 1 and 2) declining from 0.45 to 0.37, 0.36 to 0.30, 0.44 to 0.36 and 1.89 to 0.81, respectively.

The Atkinson class with three different values of the inequality aversion (0.5, 1 and 2) fell significantly over the period, from 0.18 to 0.15, 0.30 to 0.26 and 0.47 to 0.42, respectively. However, the magnitude of the drop clearly increases with aversion to inequality, indicating that inequalities reduce mostly through movements in the lower end of the distribution. In other words, the poorest regions are becoming richer rather than the richest regions becoming poorer. The fact that regional disparities decline when considering the regions as a whole does not prevent disparities from increasing within an important number of regions, such as those regions at the border).

The trends in the average of the distribution of earnings in Mexico differ from the trends in the distribution at the upper and lower ends of the spectrum. For example, on the one hand, the Mehran and the Piesch measures, which are more sensitive to the differences between low income and high income individuals, respectively, andthe Generalised Entropy indices and the Atkinson class, on the other hand, show important differences in values of inequality among regions (see table 1 and also maps 2a-8b in the Annex 2).

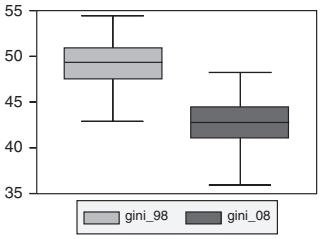
We have drawn box plots for three inequality measures to highlight regional differences in the levels and dispersion of wage inequality, *w* (figures 2a, 2b and 2c). From these figures, time period differences are clear-cut in terms of both levels and intra-regional inequality.

Figure 3 shows economic fluctuations over two decades in which economic instability (with volatility and negative growth rates) characterised the Mexican economy. After the severe recession in 1995, the economy recovered quickly in 1996, maintaining relatively high growth rates for the rest of the decade. From 2000 to 2003, Mexico experienced another recession and slightly positive growth rates thereafter until 2006. Finally, in 2007-2008, there was an economic slowdown; the graph shows here that the average rate of growth from 1998 to 2008 was 3.1%, which, according to INEGI's official figures [19], continued and worsened during the next years. In this paper, we review the changes in economic growth and inequality measures at the regional level.

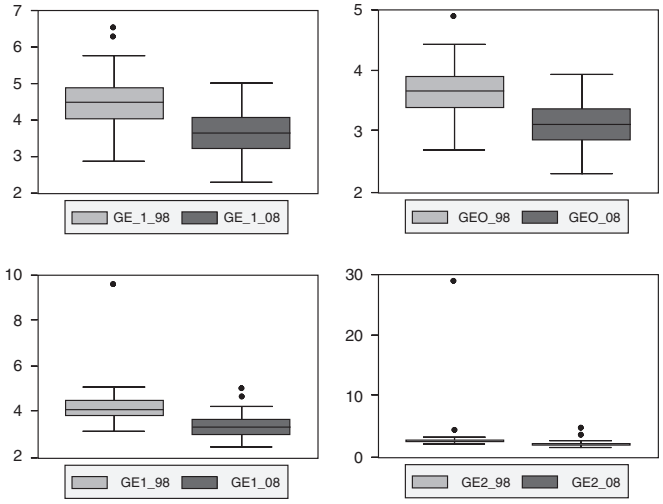
[19] Mexican National Accounts are available through INEGI's webpage at *http://dgcnesyp.inegi.org.mx/bdiesi/bdie.html*.

Figure 2. Box plots of inequality measures
(Intra-regional inequality evolution in Mexico)

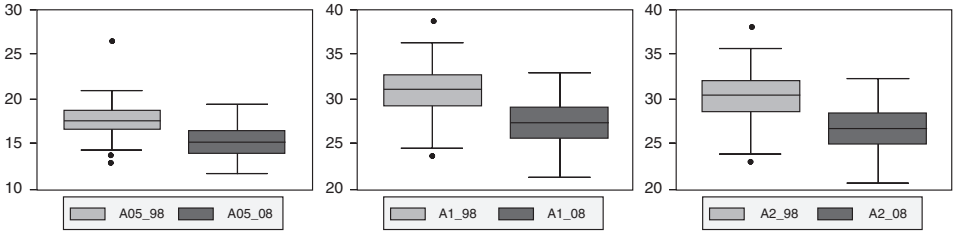
a) Gini index 1998-2008



b) Generalised entropy 1998-2008

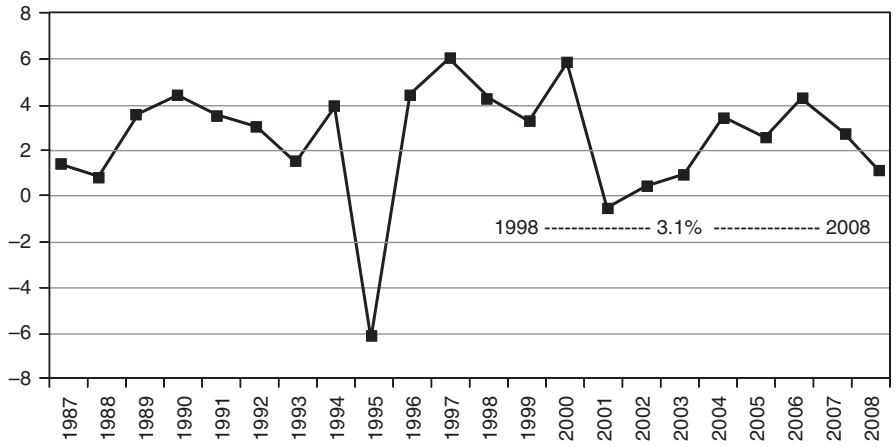


c) Atkinson class 1998-2008



Source: Our elaboration from ENEU-ENOE 1987-2008.

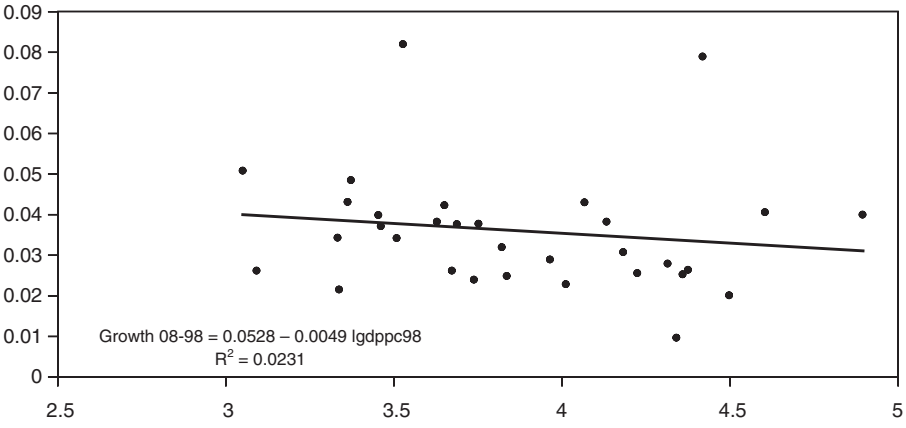
Figure 3. Annual rate of growth GDP for Mexico, 1987-2008 (percentages)



Source: Our elaboration from System of National Accounts: Mexico 1987-2008.

In the initial assessment, Figure 4 plots the real per capita growth rate from 1998 to 2008 against the initial level of per capita income in Mexican regions. The regression results show that the rate of convergence is equal to –0.0049, representing a slow cross-regional convergence process for the entire period (at approximately 0.5% per year)[20]. The low explanatory power of the estimate suggests that additional structural variables can influence the growth performance of regions.

Figure 4. Beta-convergence in real GDPpc between 1998 and 2008

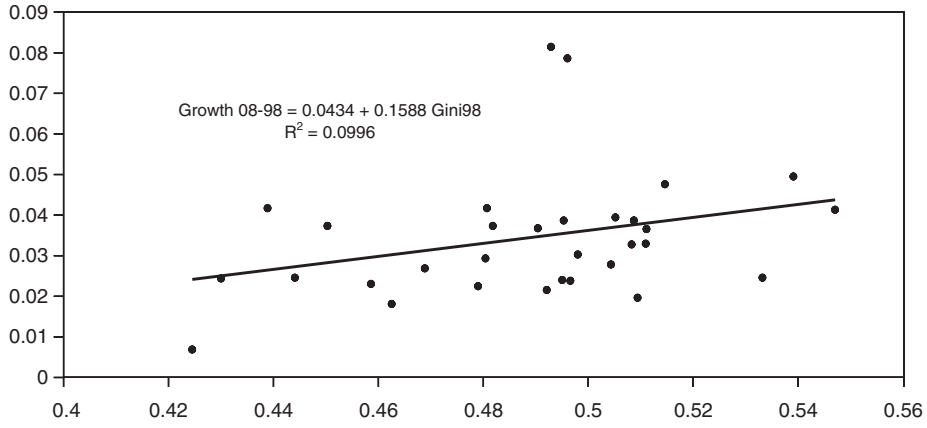


Source: Our elaboration from System of National Accounts: Mexico 1987-2008.

[20] A negative sign of the beta coefficient indicates that regions with a lower initial level of per capita income grew faster than regions with a higher initial level of per capita income.

Figure 5 shows the relationship between average real per capita growth rate between 1998 and 2008 with the 1998 Gini coefficient. A positive relationship between inequality and growth is found. Over 15% of the variation in growth over the 10-year span can be explained by the 1998 Gini coefficient. However, although outliers seem to produce this pattern, the results should be cautiously interpreted because omitted variables could also explain this relationship.

Figure 5. Cross-state scatter plot of inequality. Gini coefficient and Growth, 1998-2008



Source: Our elaboration from ENEU-ENOE 1987-2008 and System of National Accounts: Mexico 1987-2008.

4.2. The relationship between inequality and growth

To assess whether inequality matters for regional growth in Mexico and to determine whether inequality is more relevant for growth than other control variables, we use cross-sectional and panel data analyses to capture different responses to the growth model and to better justify the results. We estimate pooled OLS, Fixed Effects (FEs) and Fixed Effects with instrumental variables models. First, OLS models assume that there is no correlation between the explanatory variables and the composite error. Second, we gauge the relationship between inequality and growth without control variables and, in a further step, with control variables.

Following the work of Forbes (2000) and Partridge (2005), we estimate the FEs model in which the coefficients can be interpreted as short-run, medium-run or time series effects because they reflect within-region time-series variation (in our case, over a period of ten years). FEs models with instrumental variables eliminate any omitted-variable bias that may occur in the event of unobserved regional characteristics that affect growth and are correlated with the explanatory variables included. We use one lag in the income per capita (explanatory variable) and one lag in the rest of the explanatory variables. Table 2 displays the cross-sectional regression results for

Table 2. Cross-sectional analysis: OLS results

	Without controls variables										*With controls variables*									
dlgdppc9808	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*
lgdppc_98	–0,00175 [0.00638]	0,000882 [0.00672]	–0,00311 [0.00624]	–0,0001 [0.00658]	–0,00292 [0.0061]	–0,0047 [0.00627]	–0,00475 [0.00632]	–0,0042 [0.00613]	–0,00299 [0.00609]	–0,0004 [0.00649]	0,00158 [0.00750]	0,00355 [0.00766]	0,00062 [0.00749]	0,0035 [0.00769]	0,001 [0.00737]	–4,74E–05 [0.00778]	0,000192 [0.00790]	7,800E–05 [0.00755]	0,000898 [0.00735]	0,00309 [0.00758]
Gini_98	0.150** [0.0726]										0.134* [0.0692]									
Mehran_98		0.159** [0.071]										0.144* [0.0713]								
Piesch_98			0.134* [0.071]										0.119* [0.0655]							
GE (–1)_98				0.0584* [0.033]										0.0532* [0.0307]						
GE(0)_98					0.0971* [0.0479]										0.0898** [0.0430]					
GE(1)_98						0,0142 [0.00966]										0.0156* [0.00785]				
GE(2)_98							0,000177 [0.000118]										0.000308** [0.000132]			
A(0.5)_98								0.138* [0.072]										0.130** [0.0575]		
A(1)_98									0.141* [0.0691]										0.130** [0.0622]	
A(2)_98										0.110* [0.0573]										0.100* [0.0533]
Constant	–0,0323 [0.0509]	–0,0675 [0.0612]	–0,0106 [0.0446]	0,00779 [0.0335]	0,0102 [0.0315]	0.0457* [0.0252]	0.0518** [0.024]	0,0255 [0.0287]	0,00283 [0.0341]	–0,0163 [0.043]	–0,0391 [0.0494]	–0,0703 [0.0613]	–0,0204 [0.0432]	–0,00478 [0.0361]	–0,00346 [0.0339]	0,0258 [0.0317]	0,031 [0.0310]	0,00918 [0.0325]	–0,00998 [0.0358]	–0,0263 [0.0435]
R-squared	0,102	0,131	0,084	0,128	0,128	0,038	0,027	0,081	0,131	0,143	0,159	0,181	0,145	0,184	0,188	0,116	0,11	0,15	0,189	0,196
Observations	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32

Source: Our calculations. For a full definition of the variables, see Table A1.1 in the Annex 1.
Notes: lgdppc: Natural logarithm of real GDP per capita
Inequality measures: Gini index (Gini), Mehran and Piesch measures, Generalised Entropy GE (–1, 0, 1, 2), Atkinson class A (0.5, 1, 2)
Including the following controls: coast, distance to DF, agriculture, manufacturing, construction, trade, transportation and communications, services, qualified and no qualified workers, education inequality (Theil index), part time share, unemployment rate and the share of informality
Robust standard errors in brackets: *** p<0.01, ** p<0.05, * p<0.1

models (1 to 10) using income per capita and different inequality measures for the entire population as independent variables. This table reports OLS estimations with and without control variables, which reflect unconditional and conditional responses to the growth model, respectively. Positive coefficients are found for the inequality measures at the beginning of the period for all regressions. When estimates are made without controls, the coefficients of GE(1) and GE(2) are not significant; using some controls, the coefficients of inequality measures are still statistically significant in most cases. Following this approach, inequality at the beginning of the period positively affects average regional economic growth over the period. This implies that states with greater overall economic inequality subsequently experience greater economic growth, which is inconsistent with results from cross-national studies (*e. g.,* Guerrero, *et al.,* 2009). However, these results may be caused by omitted factors that are correlated with both economic growth and initial-period inequality. Thus, regional dummy variables are added in table 3 to capture omitted regional fixed effects; additional control variables related to human capital, such as employment by economic sector and unemployment rate, are also introduced here to capture missed effects. In this case, the other coefficients reflect the influence of the within-regional variation of the independent variables on per capita income growth, whereas cross-regional effects are reflected in the regional dummy coefficients. These results suggest the elasticity coefficient on the lagged income per capita is negative, indicating convergence. The findings also show positive, significant, and robust to the inclusion of control variables (qualified workers, construction employment and the unemployment rate) on regional economic growth. Thus, the current educational endowment of a region in Mexico seems to matter more for economic growth than its relative wealth. However, the magnitude and statistical significance of the different inequality coefficients are not relevant in this model.

One important concern in this analysis is the existence of endogeneity in the determination of inequality measures and per capita GDP. To assess the relationship between income distribution and growth in per capita income, instrumental variable (IV) regressions are used to address the endogeneity problem. The results of the OLS regressions may also be biased because of reverse causation and simultaneity bias. We extract the exogenous component of income distribution using the lagged inequality measure (one period) in each model (1 to 10) [21]. The results in Table 4 show that the coefficient of the lagged income per capita is negative and significant, indicating convergence, as in previous models. Moreover, our results clearly show a negative and statistically significant effect of inequality measures on the per capita income growth rates, except when the GE(1) and GE(2) inequality indices are used. On the one hand, the evidence shows that inequality measures have different effects on growth depending on which part of the distribution or sensitivity of each index is affected; on the other hand, the results suggest that the mechanisms at work differ among regions. Similarly, Castelló (2010) finds that using different inequality mea-

[21] Finding the correct structure of time lags for estimating this model is also a problem. Banerjee and Duflo (2003) show that using long lags substantially reduces the number of changes in inequality, and therefore they use short lag periods in their study (5 year lag periods).

Table 3. Fixed-effects (within) regression

dlgdppc9808	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*
lag1lgdppc	–0.0609* [0.0335]	–0.0651* [0.0348]	–0.0601* [0.0327]	–0.0707** [0.0308]	–0.0669** [0.031]	–0.0735** [0.03]	–0.0794*** [0.0294]	–0.0683** [0.0306]	–0.0667** [0.0309]	–0.0688** [0.0308]
Gini	0,125 [0.114]									
Mehran		0,0741 [0.102]								
Piesch			0,152 [0.119]							
GE (–1)				0,0429 [0.0508]						
GE (0)					0,0919 [0.0794]					
GE (1)						0,0303 [0.0386]				
GE (2)							–0,0003 [0.00149]			
A (0.5)								0,173 [0.149]		
A (1)									0,132 [0.11]	
A (2)										0,0917 [0.0875]
Qualified workers	0.308** [0.124]	0.306** [0.124]	0.309** [0.124]	0.312** [0.124]	0.312** [0.124]	0.307** [0.124]	0.307** [0.124]	0.310** [0.124]	0.311** [0.124]	0.310** [0.124]
Employment (sector)	0.543** [0.22]	0.539** [0.222]	0.540** [0.219]	0.510** [0.217]	0.511** [0.217]	0.504** [0.217]	0.506** [0.218]	0.510** [0.217]	0.513** [0.217]	0.515** [0.217]
Unemployment rate	0.0241** [0.00959]	0.0246** [0.00958]	0.0238** [0.0096]	0.0240** [0.00963]	0.0234** [0.00965]	0.0245** [0.00959]	0.0250*** [0.00957]	0.0236** [0.00962]	0.0233** [0.00965]	0.0236** [0.00965]
Constant	0,0297 [0.152]	0,0609 [0.166]	0,0237 [0.143]	0,108 [0.113]	0,0817 [0.117]	0,127 [0.104]	0.162* [0.0965]	0,0901 [0.112]	0,0744 [0.119]	0,0784 [0.123]
R–within	0,063	0,062	0,065	0,062	0,064	0,062	0,06	0,064	0,064	0,063
Observations	352	352	352	352	352	352	352	352	352	352

Source: Our calculations. For a full definition of the variables, see Table A1.1 in the Annex 1.
Notes: lgdppc: Natural logarithm of real GDP per capita
Inequality measures: Gini index (Gini), Mehran and Piesch measures, Generalised Entropy GE (–1, 0, 1, 2), Atkinson class A (0.5, 1, 2)
Standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1

sures (such as the Gini coefficient and income percentiles ratios) on income inequality has a negative influence on the per capita income growth rates in less developed countries [22]. The results of the education variable show a positive and significant effect on growth in models 1-4 and 7 of table 4. The unemployment rate also has a positive coefficient, but the magnitude of the effect is small [23].

[22] For example, the negative effect of income inequality on growth in low- and middle-income countries, and in high-income countries not belonging to the OECD, is identified with five countries in the sample (Mexico, Hungary, Poland, Israel and Taiwan).

[23] As for the unemployment rate, the theoretical work of Hall (1991) and Caballero and Hammour (1994) note that unemployment and inactivity during recessions may stimulate growth in the short run.

Table 4. Fixed–effects (within) IV regression

dlgdppc9808	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*
lag1lgdppc	–0.260*** [0.0645]	–0.257*** [0.0592]	–0.256*** [0.068]	–0.169*** [0.0459]	–0.219*** [0.0616]	–2,268 [16.4]	–0,0492 [0.0439]	–0.241*** [0.0844]	–0.208*** [0.0577]	–0.167*** [0.0449]
Gini	–1.263*** [0.375]									
Mehran		–0.971*** [0.263]								
Piesch			–1.440*** [0.465]							
GE (–1)				–0.477*** [0.163]						
GE (0)					–1.086*** [0.372]					
GE (1)						–12,45 [93.18]				
GE (2)							0,0141 [0.0139]			
A (0.5)								–2.680** [1.195]		
A (1)									–1.407*** [0.478]	
A (2)										–0.812*** [0.269]
Qualified workers	0.302** [0.151]	0.321** [0.144]	0.288* [0.156]	0.251* [0.145]	0,25 [0.163]	0,135 [2.635]	0.300** [0.142]	0,264 [0.184]	0,261 [0.159]	0.281* [0.144]
Employment (sector)	0,108 [0.288]	0,05 [0.28]	0,163 [0.293]	0.435* [0.252]	0,422 [0.284]	0,622 [4.067]	0,402 [0.267]	0,413 [0.323]	0,406 [0.278]	0,406 [0.253]
Unemployment rate	0.0340*** [0.012]	0.0302*** [0.0113]	0.0366*** [0.0127]	0.0358*** [0.0118]	0.0440*** [0.0143]	0,277 [1.898]	0.0249** [0.011]	0.0466*** [0.0174]	0.0427*** [0.0138]	0.0369*** [0.0119]
Constant	1.463*** [0.406]	1.442*** [0.366]	1.439*** [0.432]	0.723*** [0.224]	1.071*** [0.339]	13,36 [98.84]	0,0391 [0.158]	1.226** [0.499]	1.061*** [0.331]	0.870*** [0.262]
Observations	351	351	351	351	351	351	351	351	351	351
Hausman (IV) test	15,12 (0.009)	18,63 (0.002)	12,58 (0.027)	11,26 (0.046)	10,5 (0.062)	0,02 (0.900)	1,12 (0.952)	5,8 (0.326)	10,96 (0.052)	12,65 (0.026)

Source: Our calculations. For a full definition of the variables, see Table A1.1 in the Annex 1.
Notes: lgdppc: Natural logarithm of real GDP per capita
Inequality measures: Gini index (Gini), Mehran and Piesch measures, Generalised Entropy GE (–1, 0, 1, 2), Atkinson class A (0.5, 1, 2)
Instruments: L. Gini, L. Mehran, L. Piesch, L. GE(–1) L.GE(0) L. GE(1) L.GE(2) L.A(0.5) L.A(1) L.A(2)
Standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1

Table 5 reports estimates obtained using Arellano and Bond's GMM technique. All inequalities measured have a positive effect on growth and some are also significant, except under the Mehran measure. However, these inequality measures show differences in magnitude, indicating that inequality in different parts of the income distribution has different effects on growth and therefore that the profile of the inequality matters for economic growth. On the basis of the data and the instrument set, it therefore seems that the Theil index GE(1), GE(2) and Atkinson class A(0.5) are the most efficient at capturing the effects of inequality on per capita income growth over a ten year period.

Table 5. Instrumental variables (3SLS-GMM) regression

dlgdppc9808	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*
lpibpc_98	0,0136 [–0.0101]	0,0162 [–0.0119]	0,00986 [–0.00919]	0,0155 [–0.0108]	0,00712 [–0.00827]	0,00275 [–0.0111]	0,00314 [–0.0101]	0,00432 [–0.00898]	0,00686 [–0.0083]	0,0139 [–0.0105]
Gini_98	0.610** [–0.3]									
Mehran_98		0,404 [–0.249]								
Piesch_98			0.706** [–0.317]							
GE (–1)_98				0.174** [–0.0857]						
GE (0)_98					0.338** [–0.139]					
GE (1)_98						0.283*** [–0.0848]				
GE (2)_98							0.00547*** [–0.00155]			
A (0.5)_98								0.895*** [–0.313]		
A (1)_98									0.481** [–0.205]	
A (2)_98										0.307* [–0.155]
Qualified workers_98	0,0353 [–0.0692]	0,0405 [–0.0743]	0,0386 [–0.0643]	0,0357 [–0.0669]	0,0313 [–0.0616]	0,0573 [–0.0522]	0.102* [–0.0505]	0,0329 [–0.0574]	0,0302 [–0.0631]	0,0305 [–0.0693]
Employment (sector)_98	0,141 [–0.185]	0,151 [–0.183]	0,132 [–0.185]	0,123 [–0.196]	0,129 [–0.182]	0,182 [–0.184]	0,212 [–0.187]	0,132 [–0.18]	0,13 [–0.183]	0,127 [–0.194]
Unemployment rate_98	–0,0066 [–0.00852]	–0,0073 [–0.00903]	–0,0057 [–0.00824]	–0,0073 [–0.00876]	–0,005 [–0.00796]	0,00585 [–0.0111]	0,00616 [–0.0115]	–0,0025 [–0.00824]	–0,0051 [–0.00798]	–0,0075 [–0.00905]
Constant_98	–0.330** [–0.151]	–0.293* [–0.165]	–0.318** [–0.134]	–0.117** [–0.0559]	–0.128** [–0.0546]	–0.139** [–0.0638]	–0,0458 [–0.0479]	–0.158** [–0.0619]	–0.150** [–0.0628]	–0.174** [–0.0804]
R-≠squared	–0,69	–0,105	–1,103	–0,29	–0,583	–5,306	–3,475	–1,789	–0,551	–0,232
lpibpc_93	–0,0194 [–0.0125]	–0.0318** [–0.0133]	–0,0127 [–0.0124]	–0.0720** [–0.0333]	–0,0211 [–0.0212]	–0,0245 [–0.0574]	–1,03 [–2.408]	–0,0062 [–0.0115]	–0,014 [–0.0148]	–0.0352* [–0.0189]
Gini_93	0.195* [–0.112]									
Mehran_93		0.284** [–0.125]								
Piesch_93			0,16 [–0.107]							
GE (–1)_93				0.468*** [–0.161]						
GE (0)_93					0.299** [–0.132]					
GE (1)_93						0,175 [–0.19]				
GE (2)_93							2,093 [–2.106]			
A (0.5)_93								0,203 [–0.131]		

Table 5. *(cont.)*

dlgdppc9808	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*
A (1)_93									0.282** [–0.124]	
A (2)_93										0.400*** [–0.136]
Constant_93	0.469*** [–0.0671]	0.568*** [–0.0894]	0.406*** [–0.0592]	0.535*** [–0.144]	0.339*** [–0.0866]	0.461** [–0.227]	3,9 [–9.344]	0.167*** [–0.0464]	0.274*** [–0.0622]	0.426*** [–0.0941]
R-squared	0,154	0,284	0,096	0,351	0,192	0,03	0,049	0,096	0,19	0,328
No. of States	28	28	28	28	28	28	28	28	28	28
No. of observations	351	351	351	351	351	351	351	351	351	351
AR(1)	(0.788)	(0.487)	(0.944)	(0.393)	(0.944)	(0.534)	(0.5439)	(0.598)	(0.918)	(0.406)
AR(2)	(0.351)	(0.343)	(0.355)	(0.585)	(0.447)	(0.446)	(0.415)	(0.419)	(0.439)	(0.459)
Hansen test	0,061	0,006	0,098	0,251	0,014	0,122	0,007	0,017	0,009	0,184
(p-value)	(0.804)	(0.936)	(0.753)	(0.616)	(0.905)	(0.726)	(0.93)	(0.894)	(0.921)	(0.667)
Diff-in–Sargan	2,914	1,786	3,464	3,871	4,503	5,544	6,173	5,084	4,423	3,549
(p-value)	(0.087)	(0.181)	(0.062)	(0.049)	(0.033)	(0.018)	(0.013)	(0.024)	(0.035)	(0.059)

Source: Our calculations. For a full definition of the variables, see Table A1.1 in the Annex 1.
Notes: lgdppc: Natural logarithm of real GDP per capita.
Inequality measures: Gini index (Gini), Mehran and Piesch measures, Generalised Entropy GE (–1, 0, 1, 2), Atkinson class A (0.5, 1, 2). Endogenous variables: dlpibpc9808 and Inequality measures (1998). Exogenous variables: lpibpc_98, qualif_98, oc_con_98, ltparo_98, lpibpc_93 and Inequality measures (1993). The standard errors were computed using weight matrix, robust. SEs in brackets *** p<0.01, ** p<0.05, * p<0.1.

This pattern of results follows what has previously been found in the literature, i.e., the overall effect of inequality on growth is sensitive to the econometric technique used (see *e. g.,* Panizza, 2002; Banerjee and Duflo, 2003). Methods that rely on time-series variation in the data tend to indicate a positive effect of inequality on growth (*e. g.,* Li and Zou, 1998; Forbes, 2000), whereas methods that rely on cross-sectional information tend to indicate a negative effect (*e. g.,* Persson and Tabellini, 1994). Partridge (1997) argues that the positive effects found in different parts of the distribution could affect economic growth through other channels besides the political process. He considers that, in the context of an ambiguous government policy, this type of economic growth relationship would be consistent with this explanation. He also stresses that the differences found in the middle quintile suggest that a strong middle class could favour economic growth because it may indicate a more stable economic or social environment.

5. Final remarks

In this paper, we have examined the link between different inequality measures and economic growth in Mexican regions using data from 1998 to 2008. Contrary to the findings of several studies in developing countries, we have found evidence of a positive relationship between changes in inequality and changes in growth. We estimated different models, including OLS, FEs, FE-IV and IV-GMM, and obtained mixed evidence on the relationship between inequality and growth. In this sense,

it seems that the combined effect of both income and educational distribution on growth is far from being well understood and is indeed complex. Overall, existing income and human capital inequality are likely to increase growth, but the magnitude of their effect is relatively small.

The differences among the results shown in this paper are in line with those found in Partridge (1997) for the United States. First, the positive or negative effect can be attributed to differences in the estimation techniques, the variables used in the analysis, the source of the data used to measure inequality, the level of regional analysis and the differences within regions. Second, the positive and negative influences of inequality on growth are mostly associated with inequality in different parts of the income distribution. Many of the positive mechanisms can be linked to inequality at the upper end of the income distribution, while many of the negative mechanisms are associated with inequality further down the distribution. Third, the results support that Mexico has experimented with changes in the bottom and the middle part of the distribution of incomes; however, if growth is facilitated by an income distribution that is compressed only in the lower part of the distribution and not in the top end, we must consider reviewing redistributive policies and their relation with mobility incomes. Consequently, future research is required to examine the relationship of the three elements, *inequality, redistribution and growth,* and pro-equality policies.

To generate additional policy implications from the empirical relationship between inequality and income growth, a better understanding of this issue is warranted. It would merit further examination to determine whether advanced post-industrial economies have recently undergone a change in their inequality-economic growth relationship across countries rather than within countries, perhaps by using subnational data from other nations. There should also be further study of whether the relative welfare of the middle class or the median voter plays a special role.

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Annex 1. Description of variables

Table A1.1. List and abbreviation of variables used in Econometric Estimates

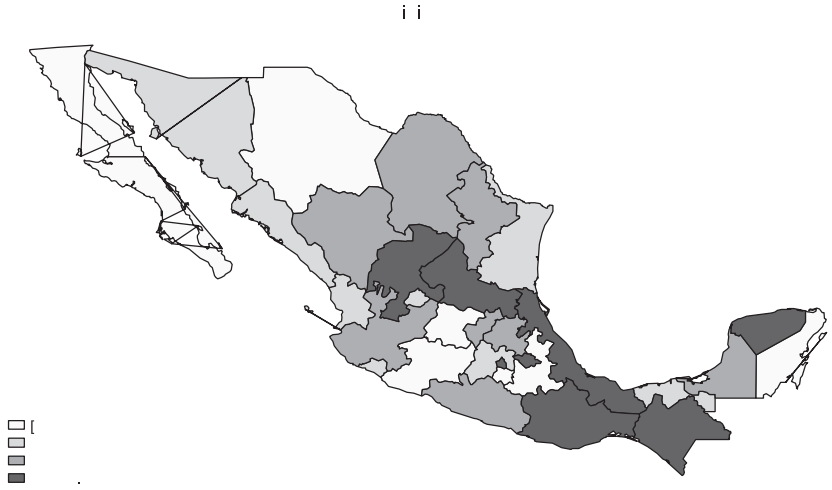
Variables	*Description*	*Source*	*Variable*
Regions	States: Aguascalientes, Baja California, Baja California Sur, Campeche, Coahuila de Zaragoza, Colima, Chiapas, Chihuahua, Distrito Federal, Durango, Guanajuato, Guerrero, Hidalgo, Jalisco, México, Michoacán de Ocampo, Morelos, Nayarit, Nuevo León, Oaxaca, Puebla, Querétaro Arteaga, Quintana Roo, San Luis Potosí, Sinaloa, Sonora, Tabasco Tamaulipas, Tlaxcala, Veracruz, Yucatán, Zacatecas.		reg
GDP	GDP per capita by region data are in 2002 Mexican pesos	System of National Accounts (SCN-INEGI).	
Logarithm of GDP per capita	Represents the natural logarithm of real regional GDP per capita		lgdppc
Consumer Price Index (CPI)	CPI by region Base year 2002. Campeche, Durango, Morelos, Oaxaca, Querétaro and Tlaxcala information are available since 1995. National average values of the corresponding group were assigned to these states.	Bank of Mexico	
Population	Population density	Conteo de Población y Vivienda, INEGI. Estimaciones de CONAPO. Encuesta Nacional de Dinámica Demográfica.	
Educational attainment	No qualified (No schooling or primary incomplete, primary and secondary levels) Qualified (Upper secondary and higher or tertiary levels)	Microdatos ENEU-ENOE	qualif No qualified
Educational inequality	Inequality in education (Theil index)	Microdatos ENEU-ENOE	
Labour force participation rate	Average rate by region	ENEU-ENOE	ltpart
Unemployment rate	Open unemployment (average rate) by region	ENEU-ENOE	ltparo
Informal labour rate	Average rate by region	ENEU-ENOE	ltoc_informal

Table A1.1. *(cont.)*

Variables	*Description*	*Source*	*Variable*
Coastal localisation of the region	Dummy variable that takes the value of 1 when a region has a coastal strip and value 0 if not. Regions with coastal strip: Baja California, Baja California Sur, Campeche, Colima, Chiapas, Guerrero, Jalisco, Michoacán, Nayarit, Quintana Roo, Oaxaca, Sinaloa, Sonora, Tabasco, Tamaulipas, Veracruz. Yucatán.	Marco Geoestadístico INEGI	coast
Distance to DF	The distance in kilometers (Km) by road from the capital of each region to Mexico City.	Seccretaría de Comunicaciones y Tranasporte	Dist_DF
Employment by economic sector	Employment in: (1) Agriculture, Forestry, Fishing and Mining Sector, (2) Industry and Manufacturing (including Electricity, Gas, Steam, Air conditioning and Water supply), (3) Construction, (4) Trade, (5) Transport, Storage and Communication Sector, (6) Services Sector (including Financial Services)	Microdatos ENEU-ENOE	OC_AGR OC_IND OC_CON OC_COM OC_TRA OC_SER
Inequality measures	Own calculations using real hourly wage. Inequality measures: Gini index, Mehran and Piesch measures, Entropy Generalized GE (-1, 0, 1, 2), Atkinson class A (0.5, 1, 2)	Microdatos ENEU-ENOE	Gini, Mehran, Piesch, GE(-1), GE(0), GE(1), GE(2), A(0.5), A(1), A(2)

Annex 2. Maps of inequality measures

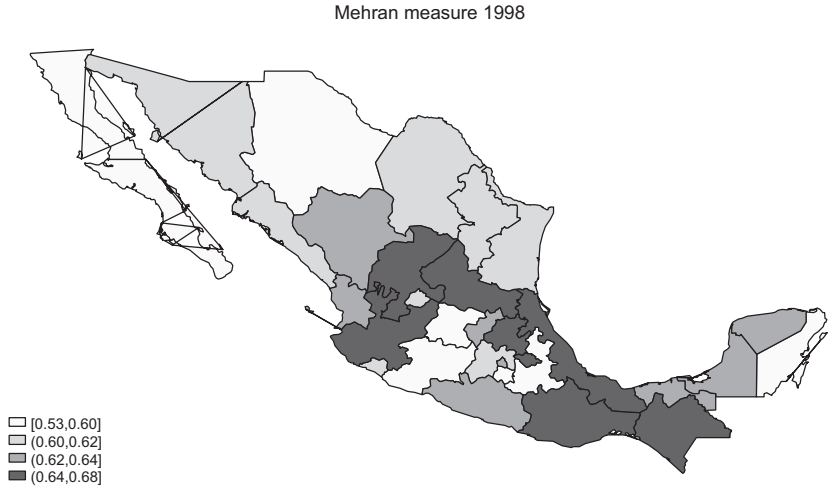
Map 1a. Mexican states Gini index: 1998



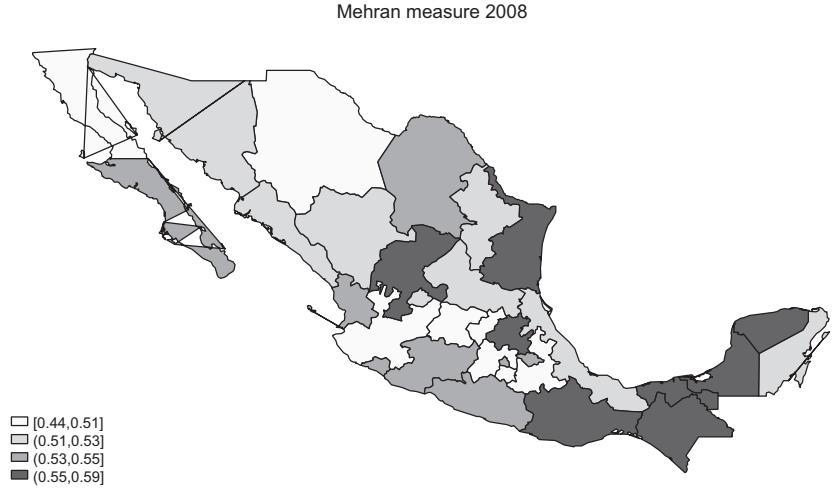
Map 1b. Mexican states Gini index: 2008

Source: Own elaboration from ENEU-ENOE 1998-2008.

Map 2a. Mexican states Mehran measure: 1998

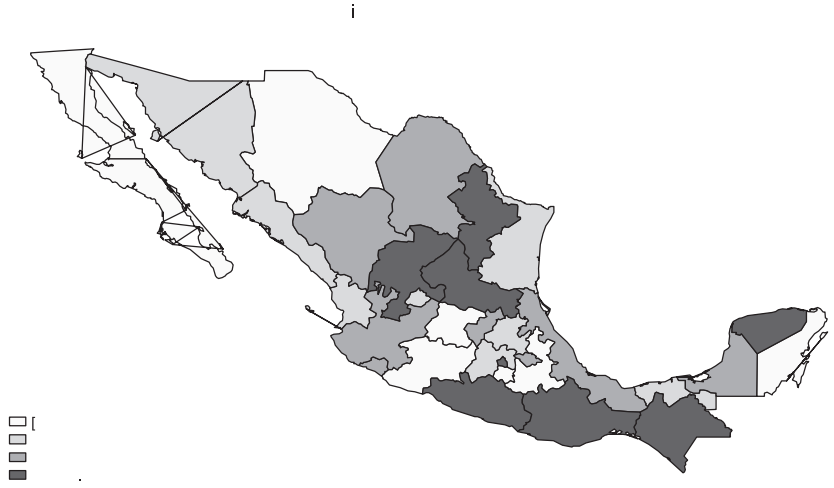


Map 2b. Mexican states Mehran measure: 2008

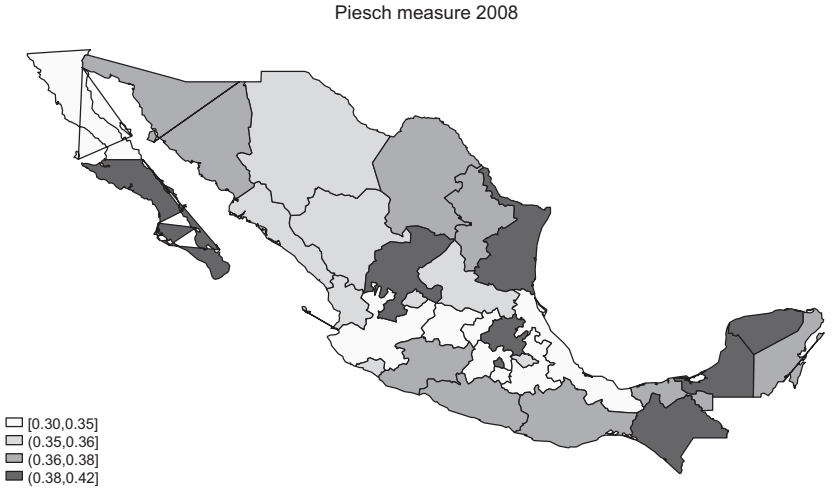


Source: Own elaboration from ENEU-ENOE 1998-2008.

Map 3a. Mexican states Piesch measure: 1998

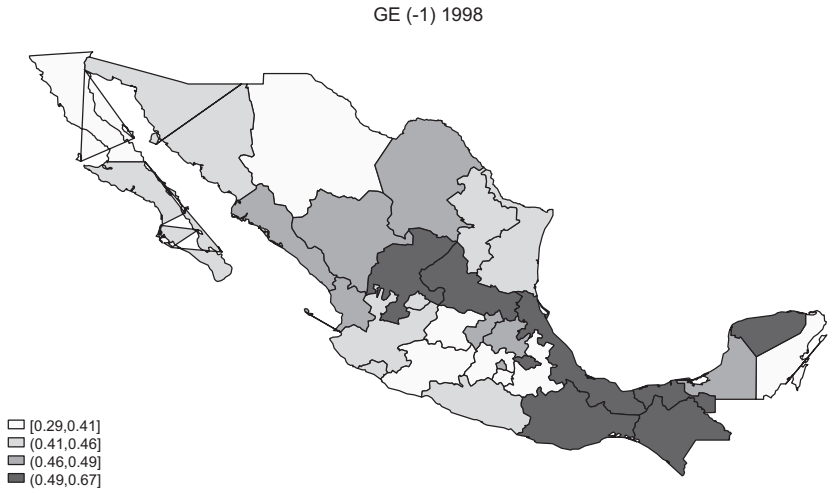


Map 3b. Mexican states Piesch measure: 2008

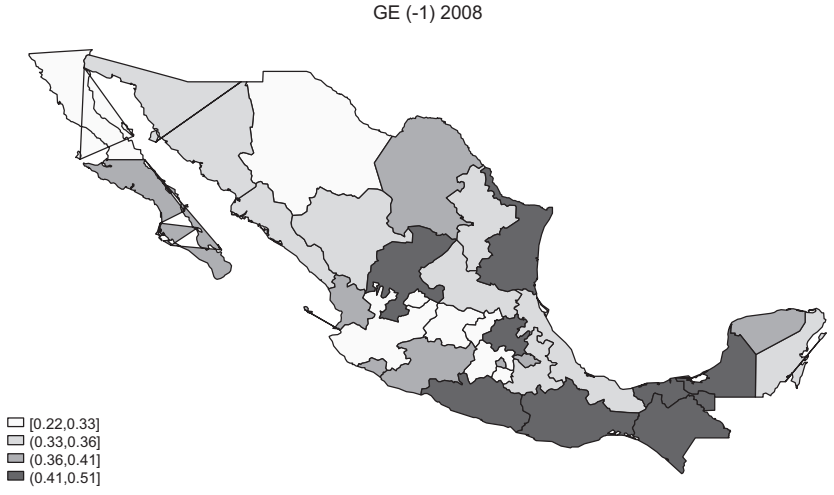


Source: Own elaboration from ENEU-ENOE 1998-2008.

Map 4a. Mexican states Generalized entropy GE (–1): 1998

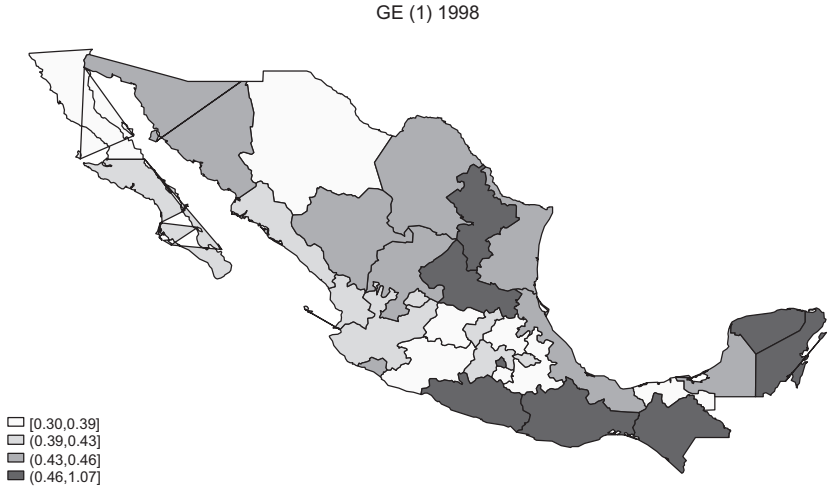


Map 4b. Mexican states Generalized entropy GE (–1): 2008

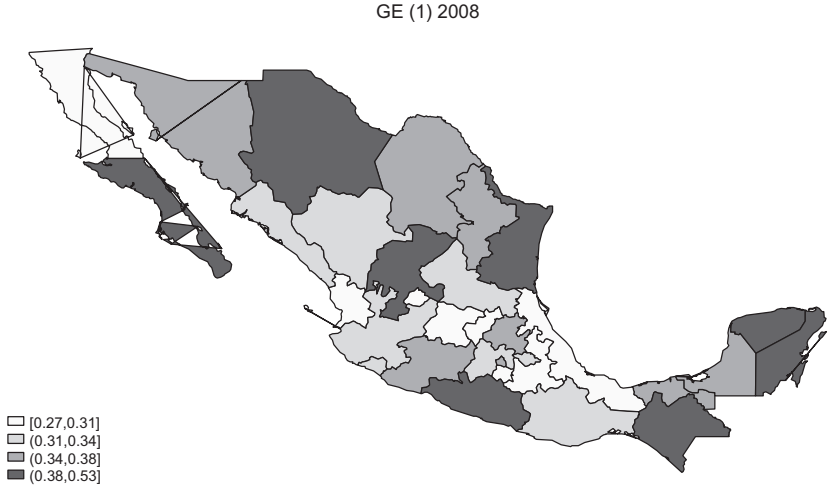


Source: Own elaboration from ENEU-ENOE 1998-2008.

Map 5a. Mexican states Generalized entropy GE (1): 1998

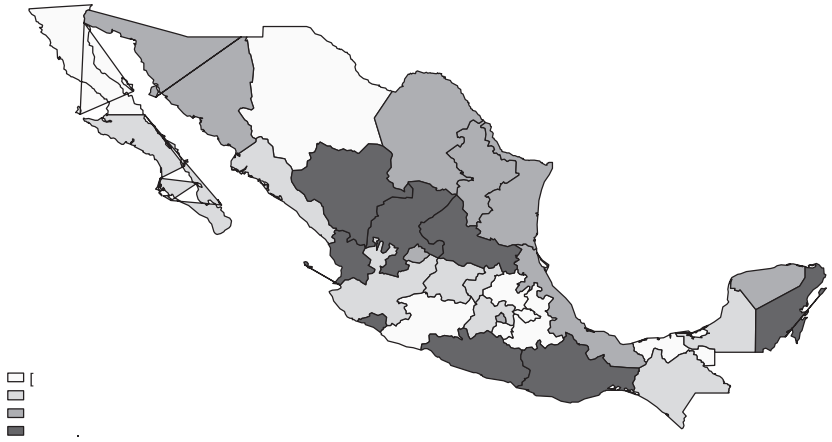


Map 5b. Mexican states Generalized entropy GE (1): 2008

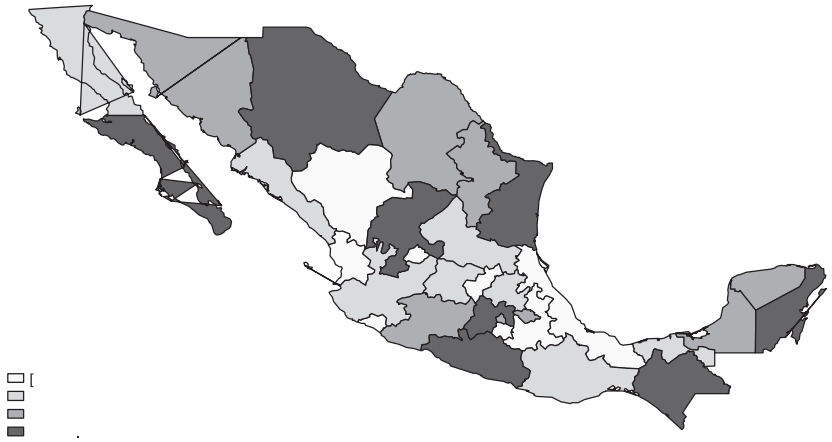


Source: Own elaboration from ENEU-ENOE 1998-2008.

Map 6a. Mexican states Generalized entropy GE (2): 1998

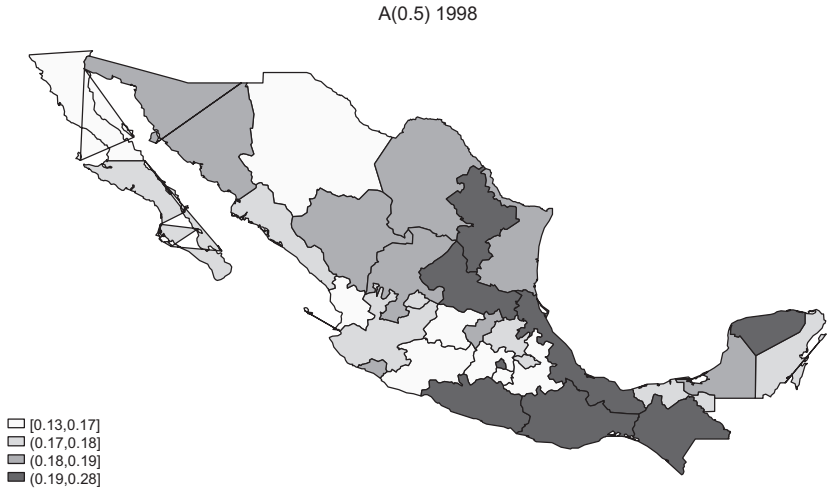


Map 6b. Mexican states Generalized entropy GE (2): 2008

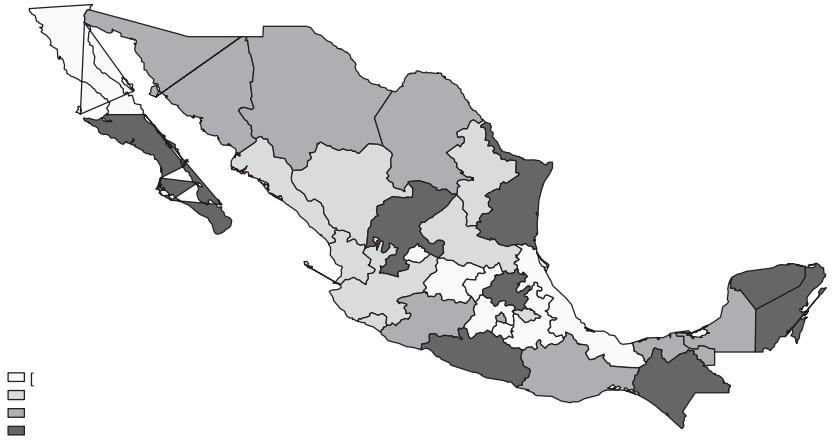


Source: Own elaboration from ENEU-ENOE 1998-2008.

Map 7a. Mexican states Atkinson class A(0.5): 1998

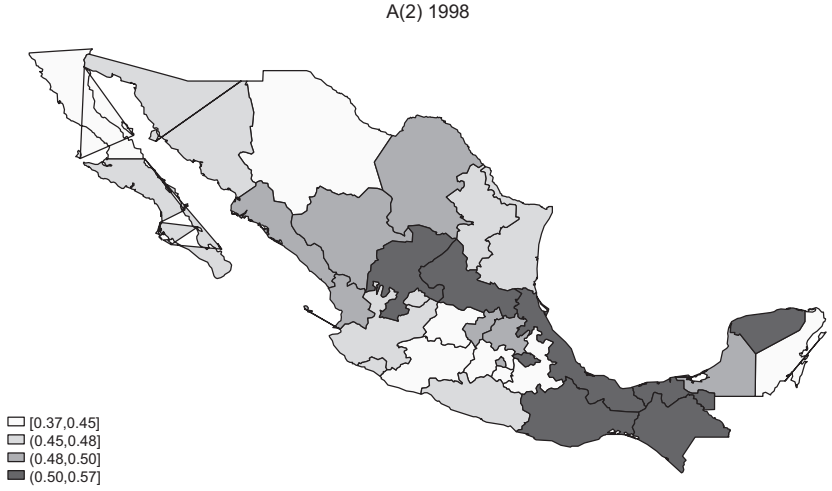


Map 7b. Mexican states Atkinson class A(0.5): 2008

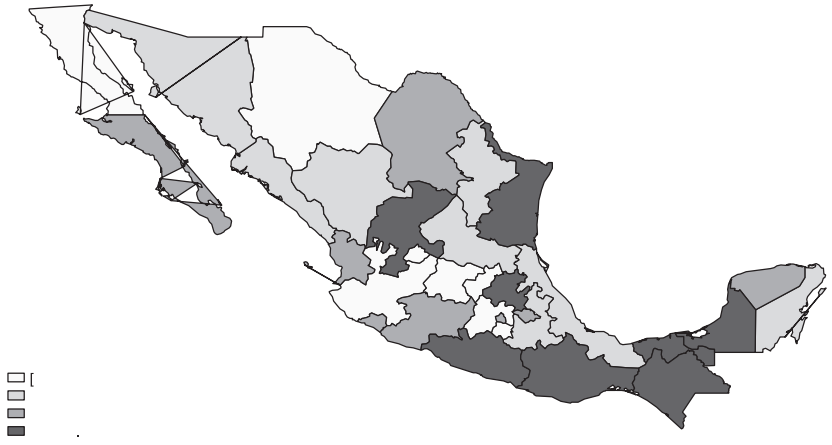


Source: Own elaboration from ENEU-ENOE 1998-2008.

Map 8a. Mexican states Atkinson class A(2): 1998



Map 8b. Mexican states Atkinson class A(2): 2008



Source: Own elaboration from ENEU-ENOE 1998-2008.

Comment on «Wage Inequality and Economic Growth in Mexican regions», by Claudia Tello and Raúl Ramos

Antonio Di Paolo *

The paper «Wage Inequality and Economic Growth in Mexican Regions» investigates the effects of wage inequality on economic growth from a regional perspective, focusing on Mexico over the period from 1998 to 2008.

The relationship between economic growth and inequality has captured the attention of many economists during the past decades. The seminal papers by Lewis (1954), Kuznets (1955) and Kaldor (1956) analysed how economic development affects long-run income distribution, suggesting an inverted U-shaped relationship between growth and inequality. However, many subsequent studies from the economic growth and development literature were concerned with the investigation of the opposite causation between inequality and growth (*i. e.,* whether and how changes in income inequality affect economic growth). In general, it is of key importance to analyse this issue because of the need for a better understanding of whether pursuing more economic growth and a more equal distribution of economic resources are compatible goals.

From a theoretical perspective, arguments for the positive or negative impact of inequality on growth have been provided. For example, the traditional equity/efficiency trade-off hypothesis, which argues that a more redistributive policy that reduces inequality is detrimental to national income, predicts a positive relationship (see Okun, 1975). In contrast, the incomplete markets and credit constraint argument suggests that the presence of market failures increases income inequality and reduces economic growth, thus predicting a negative relationship (see Stiglitz, 1969). A negative impact of income inequality on growth also emerges from political economy theories, which claim that higher inequality leads to more electoral and political pressure for higher tax rates that end up cutting after-tax returns on capital, thereby reducing investment and causing less economic growth (Alesina and Rodrik, 1994; Persson and Tabellini, 1992 and 1994).

The extensive empirical evidence (well reviewed in the paper) concerning the impact of inequality on economic growth is far from conclusive. On the one hand, studies based on OLS cross-country regressions focusing on long-run relationships have often suggested a negative effect of income inequality on economic growth. On the other hand, panel data research aimed at capturing this relationship in the medium/short term and solving the typical omitted variable problems in this type of regression estimated by OLS has provided mixed evidence (usually positive or null relationships). It has also been argued (see Banerjee and Duflo, 2003) that the strong

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sensitivity of the results to the adopted econometric strategy is merely due to the implicit assumption of linearity in the relationship between income inequality and economic growth.

The main contribution of the discusses paper consists of providing additional evidence on wage inequality and economic growth from a regional perspective. Indeed, the author focuses on a single country —Mexico— and analyses the relationship between wage inequality and the economic growth generated by regional variations over the period from 1998 to 2008. This strategy, increasingly adopted in regional economics, helps to reduce the potential biases provoked by unobserved institutional characteristics in cross-country regressions and by measurement error issues. The use of homogeneous microdata for the construction of wage inequality measures represents another appealing feature of the paper, given that it also contributes to ensuring the internal validity of the information collected over several years. Moreover, the variety of considered inequality measures and the multiple econometric techniques employed to estimate long- and short-term relationships between inequality and growth constitute the additional richness of the paper, which is undoubtedly a valuable contribution to the literature of this field. In a nutshell, the paper confirms the sensitivity of the results to the adopted econometric techniques, given that OLS, Fixed Effects and IV-GMM provide a positive relationship, whereas the IV-Fixed Effect model yields negative coefficients.

In my opinion, the main weakness of the paper is the linear specification adopted in all the estimations, which constrains the impact of wage inequality on economic growth to a constant, although, as suggested above, other authors have found that the linear specification is rejected by the data (see Banerjee and Duflo, 2003; among others). Moreover, several variables that may confound the relationship between wage inequality and growth and may be especially relevant in the Mexican context are not considered in the estimations; these include the quality of the regional/local labour market and social institutions, political stability, corruption and criminality, among others, which are variables that are also likely to vary over time and across regions.

This paper can also be extended in at least two directions. First, the availability of a large and micro-dataset for such long time period (1998-2008) might be exploited to further disentangle the observed relationships between wage inequality and economic growth. For example, drawing on the idea developed by Bourguignon et al (2007), the inequality measure could be disaggregated in order to compute the share of inequality that is caused by inequality of opportunity, i.e., disparities related to factors that are beyond the control of the individual. This would enable to understand whether and how effort-related and circumstance-related inequalities are related to economic growth, which could also offer some additional insight into the role of institutions in mediating the relationship between inequality and growth. Second, the multiple inequality indexes considered in the paper provide only a partial picture of income distribution, which could be enhanced by considering the concept of polarisation introduced and formalised by Esteban and Ray (1994). This concept could be especially relevant in the case of Mexico. Indeed, both the deviation from the equal distribution of income (wage) and how distant the pools of income distribution are,

as considered by Ezcurra (2009) for the case of European regions, could be important for growth.

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© *Investigaciones Regionales, 24 – Pages 153 to 173*
Section ARTICLES

Investigaciones Regionales

Unemployment and long-run economic growth: The role of income inequality and urbanisation

David Castells-Quintana *, Vicente Royuela **

ABSTRACT: Two of the most dramatic aspects of the current economic crisis are with no doubt the experience of high and persistent rates of unemployment and the accelerated pace at which inequalities increase. But high and persistent levels of unemployment and increasing inequality are more than a consequence of scarcer opportunities related to the crisis; they can also be negative determinants for subsequent long-run economic growth. In this work, we consider unemployment and income inequality, and interactions between both, as possible determinants of long-run growth by using cross-sectional international data. Our results suggest that: 1) while initial high unemployment rates do not seem to be statistically significant to explain long-run growth, they do have a negative and significant effect when interacting with increases in inequality. 2) When we differentiate based on levels of urbanization, increasing inequality harms growth in countries with high levels of urbanization, as well as in countries with low levels of urbanization in which there is high and persistent unemployment.

JEL Classification: J6, O1.

Keywords*:* Unemployment, urbanization, inequality, economic growth.

Desempleo y crecimiento económico a largo plazo: el papel de la desigualdad de ingresos y la urbanización

RESUMEN: Dos de los aspectos más dramáticos de la crisis económica actual son sin duda la experiencia de elevadas y persistentes tasas de desempleo y el ritmo acelerado al que las desigualdades aumentan. Sin embargo, niveles elevados y persistentes de desempleo y aumentos de la desigualdad son más que una consecuencia de oportunidades escasas relacionadas con la crisis; también pueden ser determinantes negativos para un crecimiento económico posterior a largo plazo.

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En este trabajo, utilizando datos internacionales de corte transversal, consideramos el desempleo y la desigualdad de ingresos, y las interacciones entre los dos, como posibles factores determinantes del crecimiento a largo plazo. Nuestros resultados sugieren que: 1) mientras altas tasas iniciales de desempleo no aparecen como estadísticamente significativas, sí tienen un efecto negativo y significativo cuando interactúan con aumentos en la desigualdad. 2) Cuando diferenciamos basándonos en niveles de urbanización, la desigualdad creciente perjudica el crecimiento tanto en países con altos niveles de urbanización, como en países con bajos niveles de urbanización donde hay desempleo alto y persistente.

Clasificación JEL: J6, O1.

Palabras clave: Desempleo, urbanización, desigualdad, crecimiento económico.

1. Introduction

Two of the most dramatic aspects of the current economic crisis are, with no doubt, the high and persistent rates of unemployment and the accelerated pace at which inequalities are increasing. According to International Labour Organization estimates, global unemployment reached 210 million people in 2010. The World of Work report 2011 (ILO, 2011), under the title «Making markets work for jobs», stressed that the current crisis has resulted in a global need of 80 million net new jobs over the next two years to restore pre-crisis employment rates. There is a vast literature on the causes and consequences of unemployment. However, little of this literature specifically provides scarce empirical evidence of the impact of unemployment on long-run economic growth [1]. Sala-i-Martin *et al.* (2004) list up to 67 variables potentially influencing long-run growth, but none of them is directly related to the labour market. In the present paper we examine whether high and persistent levels of unemployment can be considered a determinant of long-run economic growth.

The sign of the relationship between unemployment and long-run growth is unclear. Several works, such as Zagler (2009), assume that economic growth is driven by structural change, which usually has a cost associated with it in terms of unemployment because labour markets may not be flexible enough, leading to delays in the adjustment to such changes. Similarly, several works, *e.g.* Bassanini *et al.* (2009), report improvements in productivity associated to changes in the employment protection legislation. These changes promote higher labour market flexibility, which eventually encourage countries with initial high levels of unemployment to promote reforms, which, in turn, will promote higher economic growth. Conversely, today we see that a key consequence of high and persistent unemployment is increasing social discontent and the risk of social unrest, which is largely motivated by ensuing inequality (World of Work report, ILO, 2011). In fact, it is clear that high and persist-

[1] Nickell (1990) surveys microeconomic and macroeconomic theories on unemployment.

ent unemployment is associated not only with higher poverty rates [2], but also with higher inequality, since the unemployed lose proportionally more than the employed (Nickell, 1990). Furthermore, many economists now underline the importance of increasing inequality over the past decades as a root cause of the current economic crisis (Stiglitz, 2009; Brescia, 2010; Rajan, 2010, among others). Countries that have seen soaring unemployment rates and levels of inequality during the current crisis could also be facing the prospects of slower recovery and lower long-run growth. In fact, the same ILO, 2011 Report highlights that «there is a vicious cycle of a weaker economy affecting job and society, in turn depressing real investment and consumption, thus the economy and so on». Yet, the Report also states «not enough attention has been paid to jobs as a key driver of recovery».

The final piece of the puzzle is increasing inequality as a possible symptom of economic growth. The classical theory of inequality and economic growth stresses the differences in the interaction between both variables during the different stages of economic development, differences being driven by the process of urbanization (Lewis, 1954; Kuznets, 1955; Harris and Todaro, 1976; Rauch, 1993). Inequality is expected to rise with early urbanization, to then fall back. Moreover, the process of urbanization may be related to increasing unemployment if the inflow of workers in the urban sector exceeds urban labour demand (Harris and Todaro, 1976). Thus, for low-urbanized countries, where there is still high rural-to-urban migration, increasing inequality is associated to rural-urban differentials. However, increasing inequality is also associated to the increasing urban unemployment rates, even when accompanied by growth of the urban employment, which is the so-called Todaro paradox (see Lall *et al.,* 2006 for a survey on the rural-urban migration models). The final relationship between unemployment and inequality will very possibly depend, therefore, on stage of economic development (associated to level of urbanization).

In this work, we consider the impact on economic growth of unemployment levels and increasing income inequality, and their interaction, at different levels of economic development as summarised by urbanisation levels. The paper is organized as follows: first, we revise theoretical links between unemployment and growth (section 1.1) and the theory and empirical evidence on the effects of inequality on growth (1.2). Section 2 presents the data and the empirical approach followed, while section 3 presents our results. Section 4 extends the analysis to focus on the role of urbanization. Finally, a conclusion is given in section 5.

1.1. Unemployment and long-run growth

Unemployment may be associated with structural change and subsequent economic growth. Here, we focus on the mechanisms through which high and persistent unemployment may directly hinder economic growth. In the short run, economic

[2] A recent IBRD report (IBRD, 2005) identifies unemployment as the first characteristics that account for much of the variation in poverty rates among individuals at the Eastern Europe and Central Asia region.

growth and unemployment are inversely related along the business cycle. However, *structural* unemployment mainly depends on factors related to the characteristics of the labour market. Moreover, when unemployment becomes high and persistent there are economic costs that can become detrimental to long-run growth. Unemployment not only represents a high social cost for the individual, it also represents a high economic cost for the society (Sanchis-i-Marco, 2011).

In the first place, high unemployment implies an inefficient use of resources and wasted work, not performed by the unemployed, which can never be recovered. Secondly, high unemployment also implies a lower aggregate demand; not only is consumption lower, harming current growth, but private investment in physical and human capital is also reduced, harming future production capacities. In this line, Bean and Pissarides (1993) analyse how unemployment may have an adverse effect on growth through lower savings available for investment. On the other hand, Chaterjee and Corbae (2007) report welfare costs of the Great Depression unemployment through lower consumption in the long-run. In parallel to this, high unemployment increases fiscal burden, through lower income revenues and higher welfare spending. A higher fiscal burden is likely to reduce public investment and to increase public debt, which handicaps future growth capacities [3]. In the third place, unemployment can lead to an erosion of human capital; people unemployed for long periods may become de-skilled, as their professional skills become obsolete in an era of rapid technological change and associated rapidly changing job market (Pissarides, 1992). Martin and Rogers (2000) suggest that when growth is generated by learning-by-doing, short-term macroeconomic instability reduces human capital accumulation and therefore growth. Moreover, as unemployed workers become de-skilled, their chances of finding a new job in the future decrease, initiating a vicious cycle. The time dimension is present in the «unemployment hysteresis hypothesis», according to which small increases in unemployment may result in pockets of long-term unemployment, as long-term unemployed do not perform a hard search for jobs and therefore do not exercise sufficient downward pressure on wages (Layard, Nickell and Jackman, 1991). Relatedly, Andrienko and Guriev (2004) found that high unemployment results in liquidity constraints, restricting labour migration and resulting in persistent unemployment and lower economic growth. Finally, high and persistent unemployment erodes individual self-esteem and life satisfaction, and confidence in the society as a whole (Ochsen and Welsch, 2011). Lower confidence and socio-economic deprivation, exclusion and marginalisation from unemployment increase social dislocation, leading to unrest and conflict (ILO, 2011) and decreasing labour market performance (Mares and Sirovátka, 2005), thus harming long-run growth.

From an empirical point of view, and despite well-grounded theoretical reasons to do so, unemployment is seldom considered as a variable to enter in the classical

[3] European countries like Spain, Greece and Portugal today are a clear example of this mechanism, by which higher unemployment has increased fiscal burden, public debt and, therefore, forcing contractive austerity policies harmful for subsequent growth.

long-run growth regressions a-lá Barro and Sala-i-Martin. Still, some evidence can be found; for instance, the already mentioned work by Martin and Rogers (2000) reports a negative and significant impact of average unemployment rate on subsequent economic growth for industrialized countries and also for European regions. Yet, they consider that the impact goes via learning-by-doing and capital accumulation. For developing countries they do not find a significant impact and argue that this is explained by the fact that growth is driven by learning-by-doing only at late stages of development. However, we have seen that the negative impact can be brought about through other mechanisms aside from simply human capital accumulation and that they may also be at work in developing countries. In particular, we focus on the possibility that high and persistent unemployment may be associated to higher inequality and social unrest that are likely to harm long-run economic growth.

1.2. The effects of income inequality on economic growth

By contrast to the scarce literature on unemployment and long-run growth, there is a wealth of studies, both theoretical and empirical, on the relationship between inequality and economic growth. Several works demonstrate a significant negative relationship between inequality and long-run economic growth (Alesina and Rodrik, 1994; Persson and Tabellini, 1994; Clarke, 1995; Perotti, 1996; Temple, 1999; and Easterly, 2007; among others) based on cross-section analyses of international data [4]. Other authors have argued that it is important to look not only at levels of inequality across countries, but at how inequality evolves over time within countries (Forbes, 2000; Banerjee and Duflo, 2003; Castells-Quintana and Royuela, 2011). The negative effects of high and increasing inequality on long-run growth are thought to work through several transmission channels [5]. Moreover, many of these transmission channels linking inequality and growth discussed in the literature refer precisely to the arguments supporting a negative influence of unemployment on long-run growth. First, one channel connects high inequality to reduced productivity of certain assets and implies that many individuals do not have the opportunity to be more productive, which represents an inefficient use of resources. Second, high inequality also implies a higher share of population with low purchasing power, which, given that the poor tend to demand local products, reduces aggregate demand (Todaro, 1997). Third, inequality generates redistributive pressure, which may lead to economic distortions and disincentives that harm growth, such as social security programs that prevent labour migration from lagged regions to more prosperous ones, making unemployment and stagnation more persistent. Finally, higher inequality increases the risk of socio-political instability and conflict, which translates into uncertainty in property rights and reducing investment (Alesina and Perotti, 1996).

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[4] Benabou (1996) reviews some of the pre-1996 literature in depth.

[5] Both Barro (2000) and Ehrhart (2009) provide theoretical reviews on the various transmission channels through which inequality may influence long-run growth.

Therefore, since the factors that provide the theoretical base to expect that high and persistent unemployment will reduce growth seem to be closely associated to inequality, and since unemployment is likely to lead to increasing inequality, we should expect that the negative impact of high unemployment rates on long-run growth will be more relevant when high and persistent unemployment is linked to increasing inequality. These issues are clearly associated with institutional quality in all countries, both affecting the labour market (as stressed by Feldman, 2004) and the society as a whole, with ensuing effects on economic growth (as stressed by Knack and Keefer, 1995; Mauro, 1995; and Acemoglu, Johnson and Robinson, 2001; 2002). In this paper we assume that these institutions have a substantial effect on unemployment and inequality [6]. However, we have focused on the latter by considering a reduced form of a wider model in which institutions would have effects on unemployment and inequality, and all three would impinge on economic growth. In this way we concentrate our analysis on those channels through which institutions may affect economic growth. Our analysis was performed considering the different stages of development described in the Kuznets inverted-U hypothesis of inequality, from rural to urbanised societies once a structural change from agriculture to industry is accomplished.

2. Data and empirical approach

The experience and evolution of a previous recent major world crisis, that of the end of 1970s and beginning of the 1980s —without entering in a deep comparative analysis of both crises, which would be beyond the scope of this paper— give us a good opportunity to study empirically whether high and persistent unemployment rates combined with increasing inequality did indeed reduce long-run growth. As with today's crisis, unemployment rates soared in the early1980s. Along with increasing unemployment, there was also a significant increase in income inequality (as data from our sample shows: see section 2.1). We used cross-sectional international data from 1980 onwards to estimate a growth equation in which we analyse long-run effects of initial levels of unemployment and income inequality. We also chose the 1980s as our starting point because of availability of unemployment data.

Our empirical approach was based on a neo-classical model of economic growth. The empirical literature on economic growth has identified a substantial number of variables that are partially correlated with the long-term rate of economic growth. Sala-i-Martin *et al.* (2004), using Bayesian Averaging of Classical Estimates, found that of 67 explanatory variables tested, 18 were significantly and robustly partially correlated with long-term growth. Among those with the strongest evidence they found initial level of real GDP per capita and two variables associated with labour and capital endowments: primary school enrolment and the relative price of investment. In the

[6] Inequality levels have a very high correlation with institutional quality; for our sample (excluding Mauritania because of lack of data) we found a correlation of –0.65 between inequality levels in 1980 and the «Quality of Government Index» in 1984/1985, the first years for which data are available. (The Quality of Government Index is taken from ICRG indicators of the PRS Group).

short list of important variables they also included regional dummies and a few other measures of human capital and health, such as life expectancy at birth [7]. In order to avoid running several million regressions, we followed a parsimonious strategy, and focus on the above-mentioned concepts, plus those specific to this paper: inequality and unemployment.

2.1. Data

We used GROWTH as our dependent variable, which reflects accumulated annual average per capita GDP growth rate between 1990 and 2007. A table with the definition and sources of all the variables considered is displayed in Annex 1 [8]. We controlled for the initial level of per capita GDP in logs (LOG_PCGDP), the initial level of years of schooling (SCHOOLING), the initial price of investment (PI), the initial life expectancy at birth (LIFE_EXP) and the initial level of Gini coefficient (INEQUALITY). For unemployment we considered the average annual rate of unemployment during the period covering 1980 to 1989 (UE_MEAN) and the maximum annual rate of unemployment during the same period (UE_MAX). In this way we expected to capture long-run structural unemployment and control for the business cycle. For increasing inequality we considered the change in the Gini coefficient between 1980 and 1990 (ΔINEQUALITY). Data for inequality and for unemployment are very scarce. For unemployment we found very few countries with data on a year-to-year basis during the 1980s. The average and the maximum values were therefore computed only considering the years for which there were data for each country. For inequality we relied on Gruen and Klasen's (2008) adjusted Gini coefficients. These coefficients are from the World Income Inequality Database (WIID-WIDER), are adjusted to match the object under measurement, measuring households or families in the entire population, and have been previously used by us (Castells-Quintana and Royuela, 2011) and others, like Atkinson and Brandolini (2010). Finally, we also considered the ratio of urban population as percentage of the total population (URBAN), to classify countries at different stages of development. Considering data available our sample includes 48 countries (39 when we further consider ΔINEQUALITY). A list of the countries considered is in annex 2 [9].

Table 1 shows descriptive statistics for our variables. Mean value and variance across countries in our sample were both high for any of the unemployment measu-

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[7] Given the short list of countries in our database we do not include regional dummies in our model. Nevertheless we will consider two different regressions depending on the degree of urbanisation, acting as control in this regard.

[8] In order to test the robustness of our results, we considered other variables related with labour (primary and secondary enrolment rates) and capital (the share of investment over total GDP, plus a measurement of the foreign direct investment, as a proxy for capital markets), both for 1980 and 1990. The final results, not reported here, basically confirmed what is here displayed and even though reported statistically more significant outcomes. Thus, we followed the parsimonious strategy of considering the Sala-i-Martín *et al.* (2004) preferred variables, as the main conclusions hold.

[9] Our 39 countries sample includes: 14 countries from Europe, 10 countries from Latin America and the Caribbean, 10 from Asia, 2 from North America, 2 from Africa, and 1 from Oceania (Australia).

Table 1. Descriptive statistics

	Mean	*Std. Dev.*	*Maximum*	*Minimum*	*Obs.*
GROWTH (1990-2007)	2.2341	1.4763	–0.4081	8.6207	48
LOG_PCGDP (1990)	9.0914	0.9220	7.3878	10.6841	48
LIFE_EXP (1990)	70.1710	6.2409	54.0570	77.5368	48
SCHOOLING (1980)	5.5152	2.7163	1.2000	11.9070	48
PI (1990)	70.9618	34.4676	23.0961	187.9749	48
UE_MEAN (1980-1990)	8.4596	5.2133	1.5333	25.8000	48
UE_MAX (1980-1990)	10.5479	5.8848	1.8000	27.3000	48
INEQUALITY (1990)	43.8042	9.8870	27.6000	62.1000	48
URBAN (1990)	61.2125	18.7873	19.8000	96.4000	48
INEQUALITY (1980)	43.4313	9.1575	27.3000	62.4000	48
Δ INEQUALITY (1980-1990)	0.4590	5.0367	–11.5000	10.9000	39

res. A high variance of inequality levels across countries was also found. Moreover, despite a sample mean increase of 0.46, increases in inequality from 1980 to 1990 showed even higher variance (ranging from a maximum decrease of 11.5 to a maximum increase of 10.9). The mean level of urbanisation was close to 60% and variance among countries for this variable was even higher than for inequality.

Table 2 presents the correlation values among the variables. Unemployment in the 1980s was negatively correlated to subsequent growth; the correlation was –0.32 using UE_MEAN and –0.28 using UE_MAX. In fact, among the considered explanatory variables —standard in the literature—, these two were the ones with higher correlation with economic growth. Similarly, inequality was negatively correlated with subsequent growth (–0.21). Additionally, there was a high and negative correlation of inequality levels with income levels (–0.54). Unemployment in the 1980s and inequality in the year 1990 were positively correlated (0.26 using UE_MEAN and 0.32 using UE_MAX). Regarding urbanisation levels, they were negatively correlated with growth (–0.22), but were also negatively correlated with inequality levels (–0.34) and with change in inequality (–0.11).

When we classify countries (high, low) according to level of urbanisation as compared to the sample median (60%), countries with high initial urbanization levels had on average an initial Gini coefficient of 40, while those with low initial urbanization had on average a coefficient of 48. Moreover, for the latter countries, inequality increased between 1980 and 1989 (a mean increase of 1.65 of the Gini coefficient), while it decreased for countries with high initial levels of urbanisation (a mean decrease of 0.79). For both types of countries, however, the levels of unemployment were similar; the mean was 7.94 for countries with low urbanisation and 8.98 for countries with high urbanisation (although there was higher variance among the former). The negative correlations between unemployment in the 1980s and growth were stronger for countries with low urbanization levels. Change in inequality between 1980 and

Table 2. Correlations

	GROWTH	*LOG_PCGDP*	*LIFE_EXP*	*SCHOOLING*	*PI*	*UE_MEAN*	*UE_MAX*	*INEQ.*	*Δ INEQ.*
GROWTH (1990–2007)	1								
LOG_PCGDP (1990)	–0.11	1							
LIFE_EXP (1990)	0.04	0.9	1						
SCHOOLING (1980)	0.05	0.82	0.77	1					
PI (1990)	–0.09	0.57	0.42	0.47	1				
UE_MEAN (1980-1990)	–0.32	0.06	0.12	–0.08	–0.14	1			
UE_MAX (1980-1990)	–0.28	0.04	0.12	–0.06	–0.17	0.98	1		
INEQUALITY (1990)	–0.21	–0.54	–0.42	–0.48	–0.56	0.26	0.32	1	
ΔINEQUALITY (1980-1990)	0.01	–0.10	–0.01	–0.09	–0.33	0.09	0.15	0.46	1
URBAN (1990)	–0.22	0.8	0.7	0.76	0.53	0.11	0.12	–0.34	–0.11

Included observations: 39

1990, by contrast, was negatively correlated (–0.23) with growth in countries with high urbanisation, while a weakly positive correlation (0.06) was found for countries with low urbanisation. Additionally, the correlation between unemployment (using UE_MAX) and change in inequality, although low, was higher (0.18) for countries with low than for countries with high levels of urbanisation (0.04).

2.2. Empirical approach

Our basic model can then be expressed as follows:

$$\Delta y_0^1 = c + \alpha_0(y_{i0}) + \alpha_1(ue_{i0}) + \alpha_2(i_{i0}) + (\boldsymbol{X}'_{i0})\boldsymbol{B} + u_i \tag{1}$$

Where Δy_{i0}^1 is the growth rate of per capita GDP (y_{i0}), is initial per capita GDP i_{i0}, is inequality (ue_{i0}), is one of our two variables for unemployment and (X) the considered control variables (price of investment, life expectancy and average years of

schooling). We used initial values of all our independent variables, as we wanted to estimate long-run effects and minimise endogeneity concerns.

From equation 1 we set different specifications. For inequality levels we started with 1980s values. We considered separately our 2 measures of unemployment during the 1980s: UE_MEAN (specification 1) and UE_MAX (specification 2). We then dropped the unemployment measures and considered change in inequality between 1980 and 1990 (specification 3). We finally considered the interactions between change in inequality during the 1980s and unemployment during the same period (specifications 4 and 5). All specifications were made by OLS estimation with robust standard errors.

3. Results

Table 3 presents the results for all our specifications. All controls have the expected sign. Results are consistent with conditional convergence; initial per capita GDP had a negative and significant coefficient on growth. Higher human capital levels (higher average years of schooling and higher life expectancy at birth) and the initial price of investment display non-significant parameters, although with the expected signs. Inequality had a significant negative effect on subsequent long-run economic growth. Regarding unemployment, none of the two measures considered seem to have a significant effect on growth. Changes in inequality were not significant. However, when we let unemployment interact with changes in inequality (specifications 4 and 5) the interaction term is negatively significant for any of the two variables for unemployment.

Results suggest, therefore, that higher unemployment, when associated to increasing inequality, has a negative effect on subsequent long-run economic growth [10]. Employment is at the core of recovery and long-run growth. And it is so in particular because high and persistent unemployment most probably leads to increasing inequalities that erode growth capacities. On the contrary, when inequality decreases and this decrease is coupled with large unemployment levels, we understand that this relationship could be associated to the early stages of development, when urbanisation is still taking place and high unemployment levels are due to a strong inflow of workers to the cities (as in Harris and Todaro, 1976, and Rauch, 1993). In any case, in our sample we did not find any country with the concurring circumstances of strong inequality decreases and high unemployment levels. However, we did find the opposite situation, i.e. increases in inequality linked to increases in unemployment. Overall, our results point to a strong negative impact of increasing inequality in association with high levels of unemployment: the third quartile of this interaction

[10] 10 out of 10 of the worst performing countries in our 39 countries sample experienced high initial unemployment, increasing inequality or both (5 out of 10). By contrast, none of the 10 best performing countries experienced high initial unemployment and increasing inequality, while 8 experienced low initial unemployment and even 3 of them also experienced decreasing inequality (Malaysia, Norway and Indonesia).

Table 3. OLS estimations

Dependent Variable: GROWTH (1990–2007)					
Variable	*1*	*2*	*3*	*4*	*5*
	Coeff.	*Coeff.*	*Coeff.*	*Coeff.*	*Coeff.*
LOG_PCGDP (1990)	–1.5367 * (0.838)	–1.6015 * (0.869)	–1.8267 (1.087)	–1.8659 * (1.045)	–1.8801 * (1.062)
LIFE_EXP (1990)	0.1657 ** (0.078)	0.1724 ** (0.081)	0.1676 (0.103)	0.1641 (0.100)	0.1661 (0.101)
SCHOOLING (1990)	0.0903 (0.093)	0.1044 (0.093)	0.1250 (0.092)	0.1436 (0.089)	0.1415 (0.089)
PI (1990)	–0.0028 (0.006)	–0.0028 (0.006)	–0.0034 (0.006)	–0.0039 (0.005)	–0.0036 (0.006)
INEQUALITY (1980)	–0.0712 * (0.038)	–0.0699 * (0.039)	–0.0807 * (0.042)	–0.0822 * (0.042)	–0.0804 * (0.042)
UE_MEAN (1980–1990)	–0.0515 (0.035)				
UE_MAX (1980–1990)		–0.0342 (0.033)			
ΔINEQUALITY			–0.0404 (0.031)		
ΔINEQUALITY*UE_MEAN				–0.0077 * (0.004)	
ΔINEQUALITY*UE_MAX					–0.0056 * (0.003)
CONSTANT	7.8041 * (4.342)	7.7162 * (4.345)	10.2659 ** (4.927)	10.8906 ** (4.821)	10.7991 ** (4.858)
Obs.	48	48	39	39	39
R-sqd.	0.302	0.288	0.298	0.328	0.320

Estimation by OLS.
Robust standard errors in brackets. Asterisks indicate significance: *** 1%, ** 5% and * 10%

between the two variables (UE_MEAN equal to 11.065 and ΔINEQUALITY equal to 4) implies a decrease in GDP per capita of 3.8% over the 17 years considered.

4. The role of urbanisation

We considered URBAN, the ratio of urban population as percentage of the total population, and classified countries in low and high in a comparison to the sample median (60%). We have seen that countries with low levels of urbanisation are in general terms less developed countries —likely to have a poorer institutional environment—. Additionally, we found that high inequality had worse effects in less, rather than in more, developed countries (Partrigde, 1997; Barro, 2000; Easterly, 2007). More developed countries tended to have lower levels of inequality very likely linked to the better institutional envi-

ronments and social welfare systems allowing them to tolerate, at least temporarily, high levels of unemployment without any significant increase of inequality. When inequality does increase it is less expected to be associated with economic development in these developed countries, as it might be the case in countries at earlier stages of development.

Thus, our previous results suggest that high and persistent unemployment has a negative effect on growth, but that this effect seems to be evident only when associated to increasing inequality. On the other hand, there are sound reasons to expect urbanisation to play a role in the effects of both inequality and unemployment on long-run growth. It seems reasonable, therefore, to wonder whether these links differ depending on the countries' level of urbanisation —as a component of the process of development but also as an indicator of it—. Thus, we extended our previous empirical analysis by differentiating countries according to their level of urbanization. Table 4

Table 4. OLS estimations for highly urbanised countries

Dependent Variable: GROWTH (1990-2007)					
Variable	*1*	*2*	*3*	*4*	*5*
	Coeff.	*Coeff.*	*Coeff.*	*Coeff.*	*Coeff.*
LOG_PCGDP (1990)	–0.6528 (0.808)	–0.7022 (0.910)	0.2869 (0.762)	0.0803 (0.846)	0.112 (0.826)
LIFE_EXP (1990)	0.2145 * (0.115)	0.2259 * (0.127)	–0.1247 (0.086)	–0.1084 (0.094)	–0.113 (0.091)
SCHOOLING (1990)	0.0628 (0.130)	0.0829 (0.136)	0.0807 (0.112)	0.1153 (0.108)	0.1117 (0.106)
PI (1990)	–0.0175 (0.012)	–0.0173 (0.013)	–0.0154 * (0.008)	–0.0137 (0.009)	–0.0139 (0.009)
INEQUALITY (1980)	0.0097 (0.049)	0.0188 (0.051)	–0.0561 (0.052)	–0.0542 (0.053)	–0.055 (0.053)
UE_MEAN (1980-1990)	–0.1036 (0.065)				
UE_MAX (1980-1990)		–0.0684 (0.063)			
ΔINEQUALITY			–0.0632 * (0.029)		
ΔINEQUALITY*UE_MEAN				–0.0066 (0.004)	
ΔINEQUALITY*UE_MAX					–0.0058 * (0.003)
CONSTANT	–5.8074 (10.200)	–6.8226 (10.510)	11.6794 (10.021)	12.0149 (10.072)	12.1221 (9.988)
Obs.	24	24	19	19	19
R-sqd.	0.297	0.244	0.381	0.338	0.355

Estimation by OLS.
Robust standard errors in brackets. Asterisks indicate significance: *** 1%, ** 5% and * 10%.

presents the results for countries with low levels of urbanisation, while table 5 presents results for countries with high levels of urbanisation.

Results are similar to those in Table 3. However, comparing table 4 and 5, levels of inequality had a significant effect on growth only in countries with relatively low levels of urbanisation (Table 5), while the variable change in inequality was significantly negative for countries with relatively high levels of urbanization (specification 3 in Table 4). Regarding the interaction between unemployment and increasing inequality, the effect on growth was negative in both types of countries. But for countries with high levels of urbanisation the effect on growth was significant only when UE_MAX was used as the measure for initial unemployment. Moreover, the effect on growth was weaker than in low-urbanised countries; the coefficients in highly urbanised countries were about half those in low-urbanised countries.

Table 5. OLS estimations for low-urbanised countries

Dependent Variable: GROWTH (1990-2007)					
Variable	*1*	*2*	*3*	*4*	*5*
	Coeff.	*Coeff.*	*Coeff.*	*Coeff.*	*Coeff.*
LOG_PCGDP (1990)	–1.1444 (1.404)	–1.2104 (1.406)	–2.3751 * (1.311)	–2.1847 * (1.217)	–2.2839 * (1.261)
LIFE_EXP (1990)	0.1258 (0.136)	0.1324 (0.137)	0.2397 (0.143)	0.2056 (0.128)	0.2146 (0.131)
SCHOOLING (1990)	0.2523 (0.257)	0.2643 (0.256)	0.4166 * (0.230)	0.4519 * (0.233)	0.4355 (0.248)
PI (1990)	0.0056 (0.006)	0.0054 (0.006)	0.0051 (0.007)	0.0056 (0.007)	0.0065 (0.007)
INEQUALITY (1980)	–0.116 ** (0.051)	–0.1146 ** (0.051)	–0.129 ** (0.052)	–0.1256 ** (0.051)	–0.118 ** (0.051)
UE_MEAN (1980-1990)	–0.0506 (0.034)				
UE_MAX (1980-1990)		–0.0426 (0.033)			
ΔINEQUALITY			–0.1195 (0.080)		
ΔINEQUALITY*UE_MEAN				–0.0152 * (0.007)	
ΔINEQUALITY*UE_MAX					–0.0106 * (0.005)
CONSTANT	8.2486 (5.874)	8.2742 (5.891)	10.853 * (5.897)	11.2624 * (5.561)	11.1711 * (5.724)
Obs.	24	24	20	20	20
R-sqd.	0.498	0.493	0.535	0.577	0.552

Estimation by OLS.
Robust standard errors in brackets. Asterisks indicate significance: *** 1%, ** 5% and * 10%

These results suggest, as expected, that the negative impact of inequality is highly dependent on the country's stage of economic development, and consequently on the institutional environment. In countries with lower levels of urbanisation —which we know tend to have lower levels of economic development— the negative effects of high levels of inequality on subsequent growth become significant. However, in these countries, and controlling for levels of inequality, the process of urbanisation and development is likely to be associated to *increasing* inequality (in line with Lewis, 1954; and Kuznets, 1955) [11]. Yet, increasing inequality in poor institutional environments —where inequality is already high— combined with high and persistent unemployment (our interaction term) leads to a significantly negative impact on long-run economic growth, this impact being double that in the more urbanised countries and that estimated for the full sample. In the more urbanised countries, increasing inequality is less likely to be linked to the process of economic development. Our results suggest that in these countries, although the levels of inequality have not significant impact on growth, increasing inequality will likely harm long-run growth.

5. Summary and Conclusions

High and persistent unemployment is likely associated to increasing inequalities. Furthermore, there are sensible reasons to expect that this process of high and persistent unemployment, in which inequality increases, has a negative effect on subsequent long-run economic growth. In this paper we have studied the combined effects of unemployment and increasing inequality on economic growth. We have also extended our analysis to differentiating countries based on their levels of urbanisation. Our results suggest that: 1) while initial high unemployment rates do not seem to be significant for subsequent long-run growth, they do have a significantly negative effect when interacting with increases in income inequality. 2) When we differentiate based on levels of urbanisation, increasing inequality harms growth in countries with both high and low levels of urbanisation, although the effect is much stronger in the latter than in the former. In sum, unemployment may seriously harm growth not only because it is a waste of resources, but also because it has serious distributional effects: it generates redistributive pressures and subsequent distortions; it depreciates existing human capital and deters its accumulation; it drives people to poverty; it results in liquidity constraints that limit labour mobility; and finally it erodes individual self-esteem and promotes social dislocation, unrest and conflict. We have not been able to identify these channels, but we believe that our «reduced form» empirical model captures the main ideas of our discourse. Likewise, we highlight that our findings relate to the important and integral role of institutional quality on the process of development.

[11] China and Thailand are examples of countries with initial levels of urbanisation and low unemployment and that have experienced increasing inequalities associated to high and sustained economic growth.

Hence, the experience of the 1980s, and the subsequent cycle of low long-run economic growth is a cautionary tale about the future risks for growth of high unemployment and increasing inequality in our current times. «The economic slowdown may entail a double-dip in employment... exacerbating inequalities and social discontent... and further delaying economic recovery» (ILO, 2011). Policies aiming at controlling the dramatic rise in unemployment associated to the current crisis, and in particular at reducing its inequality-associated effects, are not just pressing for the obvious current difficulties that they represent for society today, but also because of the handicap that they represent for future long-run growth. The analysis at the regional level both in developed and developing countries deserves future research, as institutional aspects would be better controlled for, and the distributional aspects related with unemployment could be better analysed.

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Annex 1. Variables used

Variable	*Description*	*Source*
GROWTH	Accumulated annual average per capita GDP growth rate. (1990-2007).	Constructed with data from Summers and Heston, using real GDP chain data (rgdpch).
LOG_PCGDP	Per capita GDP (in log). 1990.	Constructed with data from Summers and Heston, using real GDP chain data (rgdpch).
LIFE_EXP	Life expectancy at birth in 1990.	World Bank.
SCHOOLING	Mean years of schooling, age 25+, total.	World Bank.
PI	Price of investment in 1990.	Summers and Heston.
INEQUALITY	Gini coefficient.	Gruen and Klasen 2008*.
UE_MEAN	Unemployment rate. Average annual rate between 1980 and 1990.	World Bank.
UE_MAX	Unemployment rate. Maximum annual rate between 1980 and 1990.	World Bank.
URBAN	Urban population as percentage of total population. 1990.	World Bank.

* For the following countries missing values for 1980 were filled with the closest available value: Austria, Bahamas, Chile, Guatemala, Jordan, Mauritania, Nicaragua, Paraguay and Venezuela.

Annex 2. List of countries

Country	*Country*	*Country*
Australia	Finland	Netherlands
Austria*	France	Nicaragua*
Bahamas*	Greece	Norway
Bangladesh	Guatemala*	Pakistan
Belgium	Honduras	Panama
Bolivia	Indonesia	Paraguay*
Brazil	Ireland	Peru
Canada	Israel	Philippines
Chile*	Italy	Portugal
China	Jamaica	Spain
Colombia	Jordan*	Sweden
Costa Rica	Korea, Republic of	Thailand
Denmark	Luxembourg	Turkey
Ecuador	Malaysia	United Kingdom
Egypt	Mauritania*	United States
El Salvador	Morocco	Venezuela*

* Only included in the 48-countries sample because of lack of data to calculate change in INEQUALITY.

Comment on «Unemployment and Long-run Economic Growth: The Role of Income Inequality and Urbanisation», by David Castells-Quintana and Vicente Royuela

Roberto Ezcurra *

This article by David Castells-Quintana and Vicente Royuela investigates the effects of unemployment and income inequality on economic growth in 48 countries with different levels of economic development over the period from 1990 to 2007. The article is well motivated and written. The research questions are articulated clearly, and the discussion of the literature shows that the authors are familiar with the subject under consideration. In my opinion, the main contribution of the article is the attention paid by Castells-Quintana and Royuela to the role of the interaction between unemployment and income inequality in explaining variations in economic growth rates across the sample countries. This issue is nowadays of particular relevance because the current economic crisis is characterised by a considerable destruction of employment and a probable increase in the level of income inequality.

From a methodological perspective, Castells-Quintana and Royuela estimate different «Barro-type» cross-section growth regressions using ordinary least squares (OLS). Their results reveal that income inequality is harmful for economic growth, particularly in those countries with relatively low levels of urbanisation. In principle, this finding is in contrast to the traditional equity-growth trade-off, which postulates that income inequality produces incentives for resources to be channelled into more efficient use, thus increasing capital accumulation and savings rates (Kaldor, 1956). Nevertheless, the negative association between income inequality and economic growth observed in the present article is consistent with more recent theories that argue that greater inequality can lead to distorting redistribution policies, inefficient credit constraints, social unrest and political conflicts (Partridge, 2005). In fact, studies using OLS cross-section growth regressions generally find that income inequality is negatively correlated with economic growth (Alesina and Rodrik, 1994; Persson and Tabellini, 1994), a similar result to that obtained by Castells-Quintana and Royuela. However, other studies based on panel data techniques tend to reveal a positive link between income inequality and economic growth (Li and Zou, 1998; Forbes, 2000). Thus, it would be interesting to find out whether the results of the present article still hold when panel data techniques are employed. Although it is likely that this is not an easy task in this context due to the lack of data on income inequality, panel estimation would make it possible to control for time-invariant country-specific effects, thereby eliminating a potential source of omitted-variable bias. Castells-Quintana and Royuela also find that, although unemployment initially does not exert a significant effect, its interaction with the variation in income inequality during the study

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period is negatively associated with economic growth. This seems to suggest that the combination of high unemployment rates with increases in the degree of income distribution dispersion are related to significantly lower growth rates throughout the ensuing years. It is important to note that this finding is particularly relevant in the context of the current economic crisis because there are numerous countries across the world with high unemployment rates and increasing levels of income inequality. Nevertheless, this result should be interpreted with some caution because the relevant coefficient estimates are only statistically significant at the 10% level.

It is not difficult to conceive additional extensions work of Castells-Quintana and Royuela. One relates directly to the enlargement of the number of countries included in the sample. It is likely that the lack of adequate income inequality data has prevented the authors from pursuing this issue, but addressing it may provide a more complete picture about the nature of the complex links between unemployment, inequality and economic growth. Furthermore, as is common in the literature, the authors exclusively use the Gini index to measure the degree of income distribution dispersion in the sample countries. Nevertheless, the results of the article may be sensitive to the choice of the measure used to quantify the relevance of income inequality. In this respect, various inequality measures may actually yield different orderings of the distributions one wishes to compare because each index has a different way of aggregating the information contained in the distribution under study (Cowell, 1995). Future research will also have to pay special attention to the need to identify and study the various theoretical mechanisms that explain the potential impact of unemployment and income inequality on economic performance.

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Section ARTICLES

Investigaciones Regionales

Wage flexibility and local labour markets: a test on the homogeneity of the wage curve in Spain *

Roberto Bande **, Melchor Fernández *** and Víctor Montuenga ****

ABSTRACT: In this paper we analyse wage flexibility in Spain and its regional differences, departing from the estimation of wage curves. Using data from the Structure of Earnings Survey for 1995, 2002 and 2006, we estimate regional wage equations, relating the observed wage received by workers to a group of personal and job characteristics, as well as to the regional unemployment rate. This analysis allows us to test for the existence of regional differences in the degree of wage flexibility, which may have an important influence on the evolution of regional unemployment, given its impact on the ability of the local labour market to absorb negative shocks. Estimated results indicate that regions suffering from higher unemployment rates exhibit lower wage flexibility. Collective bargaining reforms should pursue greater wage flexibility, especially in regions with high rates of joblessness.

JEL Classification: J31, J64, R15, R23.

Keywords: Wage flexibility, wage curve, Structure of Earnings Survey, regional unemployment.

Flexibilidad salarial y mercados de trabajo locales: un contraste sobre la homogeneidad de la curva de salarios en España

RESUMEN: En este trabajo analizamos la flexibilidad salarial en España y sus diferencias regionales a partir de la estimación de curvas de salarios. Empleando datos procedentes de la Encuesta de Estructura Salarial para los años 1995, 2002 y 2006 procedemos a estimar curvas de salarios por grupos de regiones, vinculando

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el salario percibido por los trabajadores a un grupo de variables que miden las características personales y del puesto de trabajo, así como a la tasa de paro regional. Nuestro análisis nos permite contrastar la existencia de diferencias regionales en el grado de flexibilidad salarial, que pueden haber ejercido una importante influencia en la evolución del desempleo, dado su impacto sobre la capacidad de absorción de perturbaciones por los mercados de trabajo locales. Los resultados de las estimaciones indican que las regiones que muestran mayores tasas de desempleo también presentan un menor grado de flexibilidad salarial. Las potenciales reformas del sistema de negociación colectiva deberían perseguir una mayor flexibilidad salarial, especialmente en aquellas regiones con mayores tasas de paro.

Clasificación JEL: J31, J64, R15, R23.

Palabras clave: Flexibilidad salarial, curva de salarios, Encuesta de Estructura Salarial, desempleo regional.

1. Introduction

Three major features have characterised the Spanish labour market during recent decades. First, and most evident, the unemployment rate in Spain is considerably higher than in other EU countries. Between 1980 and 2000, and again since 2008, the unemployment rate in Spain has been the highest among EU and OECD countries. There is a consensus in the literature (see the review by Blanchard, 2006) that differences in current unemployment rates in Europe can be explained by the different responses in each country to external shocks and the reactions to those shocks by individual national labour market institutions. In this context, Spain is a good candidate for analysis (Bentolila and Jimeno, 2006).

A second feature is the very high volatility of employment. Data from the Spanish Labour Force Survey shows that, between 1994 and 2007, more than 7 million jobs were created in Spain (more than half of the growth in employment in the EU) whereas, since the onset of the Great Recession at the end of 2007, the number of unemployed has surged from 1.7 million to 5.6 million, much more than any other country in the Euro zone [1]. During the last two decades, employment in Spain has been highly procyclical with respect to its neighbours: during upturns, more jobs have been created than in the rest of the EU, but during recessions, more jobs have been lost. Again, labour market institutions are shown to play an important role (Bentolila and Jimeno, 2006). In particular, the (external) flexibility at the margin introduced by the extension of temporary contracts (the temporary employment rate has stood at well above 30% since the mid-1980s) has been regarded as key to this severe volatility in employment growth and decline (Dolado *et al.,* 2008, Sala and Silva, 2009). In this

[1] In fact, during this period, more than 50% of the newly unemployed in the Euro area are native Spanish. This sharp decrease in employment reflects the fact that in Spain the labor market has mainly adjusted to the decline in output via a reduction of employment, rather than via a combination of wage and hours reductions.

respect, the labour institutional structure in Spain has left little room for internal and wage flexibility, whereas inter-regional migration is still scarce, so that the use (and abuse) of temporary contracts has been the main way to provide flexibility in labour relationships [2]. Moreover, the integration of almost 500,000 immigrants per year during the period 2000-2006 has encouraged this external flexibility, since most of these workers have been given temporary employment, and were willing to accept lower wages (Bentolila *et al.*, 2008) [3].

The third major feature of the Spanish labour market is the existence of large and persistent regional disparities in the unemployment rate. Employment growth has not been homogeneously distributed across the Spanish regions, basically due to the existence of important regional differences in wage setting, as a consequence of significant imitation effects in wage bargaining (Bande *et al.,* 2007, 2008) [4]. These authors show that, in general, the less productive sectors in the less productive regions link their wage growth to the conditions prevailing in the most productive sectors of the most productive regions. This process increases unit labour costs, especially in less productive regions, and thus limits their ability to create employment, even during economic upturns. As a consequence, regional unemployment disparities expressed in relative terms exhibit a marked countercyclical behaviour.

This paper aims to analyse jointly the two latter features: increased flexibility and persistent regional disparities. High rates of temporary employment, and a large immigrant influx, may have endowed the Spanish labour market with a way to increase flexibility, which has had some impact on wages. We add new empirical evidence to the existing literature by identifying the degree of pay flexibility in the Spanish labour market during the last two decades, estimating regional wage curves. The contribution of our work is twofold. First, we provide measures of wage flexibility at the regional level, within a country in which regional differences are marked and persistent. Second, we use the most extensive data set, providing information at the individual level for workers and firms, the Structure of Earnings Survey (SES), covering a period of several years.

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[2] Internal flexibility refers to mechanisms within the firm to adjust the employment level (adjustment in hours worked, temporary reduction in wages, occupation mobility within the firm, etc.). External flexibility refers to mechanisms for adjusting the number of workers, such as, for example, the procedures for hiring and firing (for more on this, see Eichhorst *et al.,* 2008). The generalization of fixed-term contracts has facilitated changes in the number of workers, since firing costs are substantially lower for temporary workers, at most 8 days per year worked, as against 33 or 45 days per year worked, typical in the case of permanent contracts.

[3] During the downturn, workers holding temporary contracts have borne the brunt of job losses, as firms have adjusted to the sudden decline in demand by simply not renewing these contracts. Between the last quarter of 2007 and the first quarter of 2012, almost 2 million temporary jobs have been lost in the Spanish economy.

[4] This is a well-known problem in Spain. The International Monetary Fund and the Bank of Spain have both commented that the collective bargaining system, dominated by industry-wide agreements that cannot be modified, is too rigid. In fact, the reforms of collective bargaining undertaken between 2010 and 2012 have pursued giving more prevalence to firm agreements and making it easier for companies to opt out of collective bargaining agreements in order to enhance both internal and wage flexibility. See Simón (2010) for a discussion.

The paper is organised as follows. Section 2 summarises our theoretical framework for the existence of regional unemployment disparities, and describes the most recent evolution of employment and unemployment in the Spanish labour market. Section 3 summarises the existing estimates of wage flexibility in Spain and Europe, in the context of our framework. Section 4 presents evidence of differences in regional labour market flexibility, using data from the SES. Our conclusions are presented in Section 5.

2. Wage flexibility in Spain and Europe: review of the empirical evidence

2.1. Theoretical underpinnings

Labour market flexibility is a key assumption under the standard neoclassical models, and refers to a situation where wages are flexible and the labour force is geographically and occupationally mobile. This implies that, under the standard assumptions made in this type of model, if we add perfect competition in the product market, full employment is guaranteed.

However, at least in European countries, full employment has been the exception rather than the norm since the early 1980s. The high and persistent unemployment rates registered in the European economies during the 1980s and 1990s generated a significant body of literature that, fundamentally, concluded that the phenomenon can be better explained by interactions between labour market institutions and responses to external shocks (Blanchard and Wolfers, 2000; Bertola *et al.,* 2001; Blanchard, 2006), shaping the configuration of unemployment rates. Rigidity imposed by labour market institutions prevents labour markets from rapidly responding to external shocks, avoiding functional adjustment processes, with important differences across countries. Consequently, the economic policy recommendation was clear: the labour market should be more flexible to absorb possibly asymmetric adverse shocks. In empirical work, labour market flexibility is usually proxied by pay or wage flexibility [5]; that is, the response of wages to the general conditions of the labour market, which are often measured by the unemployment rate.

Marston (1985) shows that regional differences in unemployment may reflect either equilibrium or disequilibrium. If regions differ in amenities, each would tend towards its own natural rate. Given that amenities change slowly over time, the existence of disparities in unemployment becomes an equilibrium result. In a disequilibrium framework, NAIRUs can be similar across regions, but adjustment processes may evolve differently because of different degrees of flexibility [6].

While differences across regions in demand-side, supply-side and institutional factors have been extensively considered in the empirical literature (see Elhorst,

[5] See Monastiriotis (2006) for an in-depth discussion of the issue of labour market flexibility.

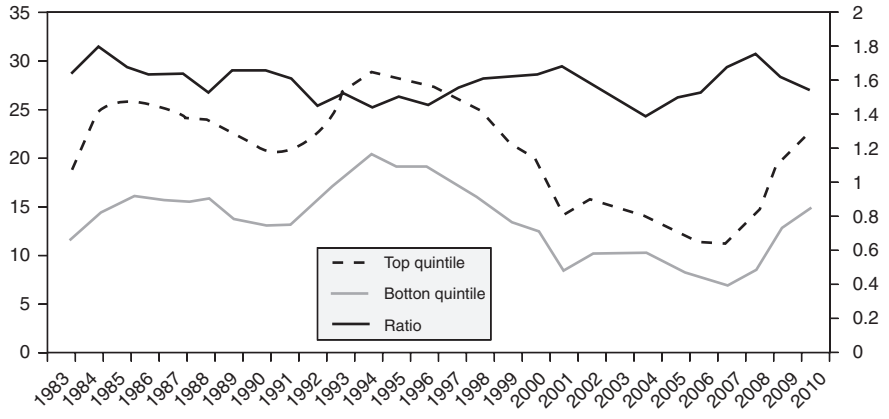
[6] For a critique of this view, see Bande and Karanassou (2011).

2003), in recent years, the institutional settings focused on wage schemes have been increasingly considered in studies on regional unemployment disparities (see Brunello *et al*., 2001; Bande *et al.,* 2008; Basile and De Benedictis, 2008). Since most of the institutions are common between regions, the focus has been on the wage-setting mechanism, specifically on how wages respond to regional factors such as labour productivity and unemployment (Jimeno and Bentolila, 1998). This will be analysed in Section 3. Before that, we present evidence on the evolution of regional differences in unemployment rates for the Spanish economy.

2.2. Regional unemployment rate differences in Spain

In Spain, a cursory glance at unemployment rates allows us to appreciate large differences between regions [7]. Figure 1 reveals the wide differences in unemployment rates across Spanish regions, showing the average unemployment rate in the three high-unemployment regions (top quintile of the distribution), in the three low-unemployment regions (bottom quintile) and the ratio between the rates in the high-unemployment and the low-unemployment regions over time. This figure follows closely the evolution of the national unemployment rate throughout the business cycle: an increase until the mid-1980s; a marked decrease during the expansionary phase between 1986 and 1991; a sharp rise until 1994 (when the national unemployment rate attained a peak of 24.1%); a steady reduction between 1994 and 2007, and then an abrupt surge back to 1994 levels.

Figure 1. Averaged top and bottom quintiles of unemployment rates distribution and their ratio



[7] All the information used here comes from the Eurostat Region dataset and from the Spanish Labour Force Survey, elaborated by the Spanish National Statistics Institute (*INE* in Spanish), according to the European standard issued by Eurostat. The thorough reform of the survey undertaken in 2002, consisting of the change of the elevation factors and of the adaptation of the definition of unemployed to that proposed by Eurostat, implied a clear break in the sample that must be borne in mind.

The average difference between the top and the bottom quintiles has been about 7.5 percentage points, with the recession periods showing higher values (almost 10) and the expansionary phases showing lower (the minimum was less than 4, in 2004). This is preliminary evidence that absolute differences, computed as the difference between the regional and the national unemployment rates, are marked and procyclical [8]. However, when differences are computed in relative terms, as the ratio between the regional and the national unemployment rates, a countercyclical behaviour is observed, increasing during expansionary phases and declining in periods of recession [9].

In the series included in table 1, we show regional unemployment rates at different moments in time from 1983 to 2010, as well as some illustrative indicators. It can be observed that regional differences in the unemployment rate are persistent across Spain. During the last 30 years, Andalusia, the Canary Islands and Extremadura have been at the bottom of the regional rankings, with unemployment rates much higher than the average. At the other extreme, the Balearic Islands, La Rioja, Aragon and Navarre have always been in the group of regions with the lowest unemployment rates. This indicates that regional differences in Spanish unemployment rates exist and persist, similar to other EU countries (European Commission, 2000, Baddeley *et al.,* 1998).

Table 1 also suggests that, during the most recent decades, Spanish regions have formed groups as regards their unemployment rates. Prior evidence (López-Bazo *et al.,* 2002) has shown that a polarization process was under way at the provincial level during the 1980s and early 1990s. However, Bande *et al.* (2009), for the period between 1980 and 2001, found a weak convergence process in the regional unemployment rates, along with a stronger polarization effect, that did not affect the whole set of Spanish regions. On the one hand, two clusters of regions were identified by these authors, with opposite unemployment behaviors: those regions in the Ebro axis and Balearic Islands showed unemployment rates below the national average, while the other cluster (Andalusia, Extremadura and the Canary Islands) showed values 1.5 times greater than the average [10]. On the other hand, a large third group formed by the rest of the regions was converging towards the national average. Bande *et al.* (2010) confirm that this pattern continued in the second half of the first decade of the 21st century, and that the Great Recession was inverting the process, with an ongoing process of overall relative unemployment convergence. Figure 2 clarifies this issue, presenting the estimated kernel density functions for the relative unemployment rates at selected moments of time [11].

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[8] Both the difference between the maximum value and the minimum value (figure A1 in the Appendix) and the absolute dispersion (figure A2 in the Appendix) move parallel to the evolution of the national unemployment rate.

[9] See also the ratio between the maximum and the minimum value in figure A1 and the relative dispersion in figure A2, both in the Appendix.

[10] For a similar result, see López-Bazo and Motellón (2011).

[11] We use the expression «relative unemployment rates» to refer to the regional differences in unemployment rates expressed in relative terms.

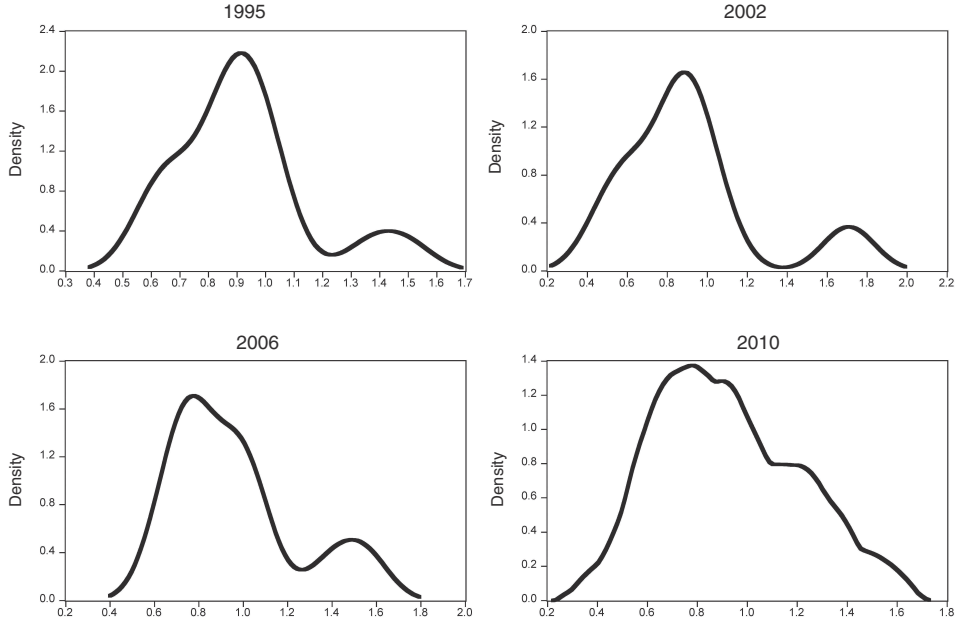
Table 1. Relative regional unemployment rates

	1983	*1986*	*1988*	*1990*	*1992*	*1994*	*1996*	*1998*	*2000*	*2002*	*2004*	*2007*	*2008*	*2009*	*2010*
Andalusia (AND)	22.41	30.09	28.68	25.53	28.18	34.59	32.35	29.13	24.13	19.68	17.07	12.76	17.83	25.35	27.97
Aragón (ARA)	13.68	16.00	13.94	9.54	12.31	18.30	15.28	11.37	7.20	5.80	5.62	5.24	7.15	12.82	14.77
Asturias (AST)	13.90	18.58	19.45	17.49	16.82	21.95	20.93	18.84	16.98	9.73	10.36	8.48	8.45	13.42	15.97
Balearic Isl (BAL)	13.93	14.19	10.92	10.54	11.55	17.80	13.41	11.29	6.53	7.61	9.16	6.98	10.18	18.02	20.37
Canary Isl. (CAN)	19.11	25.72	22.01	22.98	24.82	26.47	21.94	18.47	13.42	11.13	11.96	10.44	17.36	26.19	28.70
Cantabria (CANT)	12.61	17.71	20.64	16.77	16.65	23.36	23.87	17.79	13.36	10.05	10.54	5.90	7.17	11.99	13.87
Castilla-León (C-L)	13.56	18.04	17.36	15.39	17.70	21.43	19.90	18.00	13.75	10.48	10.69	7.18	9.51	13.78	15.78
Castilla-Mancha (C-M)	14.08	15.17	15.11	13.09	15.66	19.70	19.43	16.79	12.50	9.52	9.52	7.61	11.59	18.81	20.99
Catalonia (CAT)	21.08	21.16	18.55	12.54	13.54	21.17	18.83	14.42	8.88	10.11	9.70	6.55	9.00	16.25	17.75
Com Valencia (VAL)	17.27	19.54	17.14	14.26	19.10	24.59	21.62	16.47	11.60	10.77	10.40	8.76	12.13	21.24	23.30
Extremadura (EXT)	16.35	27.42	26.22	24.84	25.89	31.64	30.21	28.90	23.63	19.22	17.20	13.06	15.20	20.55	23.04
Galicia (GAL)	9.89	13.46	12.43	12.29	16.24	19.93	18.65	17.35	14.88	12.17	13.61	7.64	8.73	12.59	15.40
Madrid (MAD)	16.70	19.35	16.14	12.23	12.96	20.57	20.18	16.79	11.56	7.27	6.71	6.30	8.69	14.03	16.08
Murcia (MUR)	16.62	19.64	17.49	15.95	20.97	25.52	23.56	17.28	12.73	11.38	10.67	7.56	12.63	20.73	23.35
Navarre (NAV)	15.52	18.10	14.41	11.66	11.47	14.62	11.70	10.09	5.65	5.71	5.54	4.76	6.72	10.89	11.85
Basque Country (PV)	19.62	23.18	21.22	18.64	19.56	24.39	20.62	16.91	12.08	9.59	9.71	6.12	6.45	11.04	10.55
La Rioja (RIO)	11.26	15.94	13.37	8.33	13.53	16.97	14.10	11.25	8.03	7.02	5.58	5.66	7.79	12.75	14.27
National (SPA)	17.33	20.98	19.24	16.24	18.35	24.12	22.08	18.61	13.87	11.48	10.97	8.26	11.34	18.01	20.06
Max-min	12.52	16.63	17.76	17.20	16.71	19.97	20.65	19.05	18.48	13.97	11.66	8.30	11.38	15.30	18.15
Max/min	2.27	2.24	2.63	3.06	2.46	2.37	2.76	2.89	4.27	3.44	3.10	2.74	2.76	2.40	2.72
Dispersion	3.41	4.65	4.76	5.14	5.09	5.11	5.38	5.29	5.20	3.90	3.44	2.40	3.58	4.90	5.37
Relative dispersion	0.20	0.22	0.25	0.32	0.28	0.21	0.24	0.28	0.37	0.34	0.31	0.29	0.32	0.27	0.27
Q4	18.49	25.62	23.68	20.87	22.34	28.93	27.58	24.94	19.77	15.39	13.66	10.71	13.91	19.98	22.36
Q1	11.25	15.70	15.48	12.46	15.47	20.09	18.87	15.46	12.09	9.74	9.91	6.40	7.90	12.44	14.51
Q4/Q1	1.64	1.63	1.53	1.67	1.44	1.44	1.46	1.61	1.64	1.58	1.38	1.67	1.76	1.61	1.54

Notes: Q4/Q1 stands for the ratio of the average regional unemployment rate in the top quartile over that in the bottom quartile.
Source: Own elaboration from the Labour Force Survey.

These snapshots confirm prior results. During the economic boom that began in the second half of the 1990s, until the upheaval of the Great Recession, relative regional unemployment disparities were exacerbated, since the two-mode distribution in 1995 was progressively sharpened, with a low unemployment mode around 0.9 in 2002 and 0.8 in 2006. The high unemployment mode, on the contrary, moved from 1.4 in 1995 to 1.7 in 2002 and back to 1.5 in 2006. However, within the low unemployment group of regions, a different behaviour can be found, and an additional mode could be identified at 0.6 in 2002 and 1.0 in 2006 (see Bande *et al.*, 2010 for a detailed account of changes in the distribution of regional unemployment rates throughout the first decade of the century). If the hypothesis of an imitation effect on wage bargains during expansions were true, we should observe a reversal of the described pattern through the Great Recession, and this is precisely what seems to be happening in Spain. The last panel of figure 2 shows the kernel density function for the distribution of relative unemployment rates in 2010, pointing to an ongoing process of convergence towards the national average. This result provides support for the hypothesis that the process of wage formation is a fundamental element in the explanation of unemployment disparities in the Spanish economy.

Figure 2. Estimated kernel density functions for the relative regional unemployment rates



Notes: a Gaussian kernel function is used to estimate the kernel density, while the bandwidth has been selected using the Silverman option. The relative unemployment rate is defined as the regional unemployment rate over the national unemployment rate.

We explore this in the empirical section, where wage flexibility is measured for the three different groups of regions identified: those with high relative unemployment rates, those with low relative unemployment rates, and those with relative unemployment rates close to 1. To carry out this task, we make use of the wage curve as an appropriate measure of wage flexibility.

3. Wage curves in Spain: regional differences

The wage curve is the term used to describe the negative relationship between the levels of unemployment and wages that arises when these variables are expressed in local terms, reflecting that, for two identical individuals, one working in an area of high unemployment and the other working in a region with low joblessness, the former has lower earnings. Since the initial work by Blanchflower and Oswald (1994), many studies have found that this relationship is quite similar across countries, and it can be represented by [12]:

$$w_{ir} = -0.1\ u_r + other\ terms \tag{1}$$

where w_{ir} is the log of the wage of an individual living in region r; u_r is the log of the regional unemployment rate, and the *other terms* are control variables for worker and job characteristics. Here, the coefficient –0.1 is the elasticity of wages with respect to unemployment, indicating that, for a given region and a given point in time, doubling the unemployment rate implies a decrease of one tenth in wages, *ceteris paribus*.

Empirically, the wage curve can be estimated by adding the regional unemployment rate to the typical wage equation

$$w_{irt} = a + f_r + d_t + b\ \boldsymbol{X}_{irt} + \beta\ u_{rt} + \varepsilon_{irt} \tag{2}$$

where the subindex i denotes the individual, r the region and t the year. $\boldsymbol{X}_{irt}$ is a vector of workers' personal aspects including, among others, race, marital status, gender, level of education, and other variables related to the specific workplace, such as experience, type of contract, occupation, activity, etc. Thus, w_{irt} and u_{rt} stand, respectively, for the hourly earnings and the regional unemployment rate (both in logs). Finally, f_r and d_t are, respectively, the fixed regional and time effects. Fixed time effects in (2) take into account the influence of variables that are supposed to be time-variant but constant across states. Fixed regional effects are included to capture each region's structural features, such as local amenities. These fixed regional effects constitute the key element of the wage curve, since they capture the permanent features of the environment, so that the unemployment rate is basically affected by the transitory aspects of the relationship between wages and unemployment. When regional fixed effects are not included, the unemployment elasticity captures both

[12] See Nijkamp and Poot (2005), Montuenga and Ramos (2005) and Blanchflower and Oswald (2005) for lists of countries in which wage curves have been found.

the permanent and transitory components of the relationship between wages and unemployment rates, allowing for a positive long-term relationship, as forecast by the theory of compensating differentials**.**

Our focus is on the coefficient β. A wage curve exists when the estimate of β is negative and statistically significant. The log specification of the unemployment rate is common in the literature. The value of the coefficient β is then interpreted as a measure of the degree of wage flexibility. The greater the value of β, the greater the response of wages to unemployment rate fluctuations, and hence, a higher wage flexibility (or lower wage rigidity). Attaching regional unemployment rates to each individual makes it possible to associate each worker with the relevant local labour market.

Most of the literature has found an estimate of the unemployment elasticity for Spain close to the «empirical law of economics» of –0.1. The papers surveyed below have faced different problems, depending on the data base employed. Canziani (1997) used the *Encuesta de Estructura, Conciencia y Biografía de Clase* of 1991, where the unemployment rate was not disaggregated at the territorial level. Unemployment rates were computed by sector and by gender, obtaining a wage-elasticity to unemployment of –0.13, when gender and age dummies are not included in the estimation. García and Montuenga (2003) and Montuenga *et al*. (2003) used the European Community Household Panel (ECHP) to estimate a wage curve for Spain, which provided individual information on workers and firms in panel data form, but the limited territorial detail of the data (seven NUTS I regions) forced them to use unemployment data disaggregated by region, by age, and by gender. Using a random effect specification, these authors obtain a value for the unemployment rate of about –0.13. Sanroma and Ramos (2005) employed individual data from the Spanish Family Budget Survey (*Encuesta de Presupuestos Familiares* EPF) for 1990/91, which includes information at the provincial level (50 local labour markets, NUTS III level) only for workers. Their results also show a wage curve for all employees with an elasticity of –0.13.

In this paper, we use the Structure of Earnings Survey (SES), *Encuesta de Estructura Salarial*, which has the great advantage of providing detailed information at the individual level about wage-earners, and about the establishments where they work, i.e. each observation is a matched employer-employee, for a great number of employees. Since this information is offered for three different years, we can pool the information to construct a pseudo-panel. Despite that the regional dimension of the survey is at the NUTS II level, unemployment rates are disaggregated by categories in order to gain variability and robustness in the estimation. Extending this previous work, we are not interested in estimating the Spanish wage curve, but in studying its performance across the Spanish regions. In this sense, our approach is closer to that of Ammermuller *et al.* (2010), Livanos (2010) and Deller (2011).

In estimating specification (2)**,** some econometric issues should be considered. First, as regards the plausible endogeneity of unemployment, prior research (García and Montuenga, 2003) has shown that this is not the case in Spain, since unemployment rates are shown to be predetermined. Second, since wages may respond to un-

employment through: i) changes in standard rates; ii) overtime rates, and iii) the proportion of overtime to total hours, and given that overtime is typically remunerated at a premium rate, the marginal cost of labour that is independent of hours worked is the standard hourly wage paid for the working period (see Hart, 2003). Third, regional prices must be used to compute real wages in order to control for differences in regional life costs. Fourth, whereas the dependent variable is expressed in individual terms, unemployment rates are expressed in aggregate terms, leading to a bias known as the «common group effect», which must be controlled for (Moulton, 1986). Finally, and related to the previous issue, given that the unemployment rate does not change across individuals, the true number of degrees of freedom of the estimation is not the number of individual observations, but rather the product of the number of regional markets times the number of time periods. Since this dimension may be small in datasets (as it is in our own case), measures of the unemployment rates disaggregated by the characteristics of the workers (gender, age, education level) should be used (see also Kennedy and Borland, 2000, and Montuenga *et al.*, 2003).

4. Empirical results

In this section, we present our empirical approach and the main econometric results of the estimation of a wage curve at the regional level for Spain. We begin by describing our dataset. Obviously, in order to estimate wage equations, we need individual data on wages and on personal and job characteristics. At the same time, the regional dimension of our approach requires a sufficient number of observations in order to achieve robust econometric results, as many of the properties of the estimators hold only under the assumption of large samples. Our main database is the SES, conducted by the Spanish Statistics Institute (*INE* in Spanish) in 1995, 2002 and 2006, comprising a large number of observations, with regional disaggregation at the NUTS II level. It does not represent the whole set of employed workers, since only wage earners are included in the sample.

The reference population in the survey was originally formed by employees working in establishments with at least 10 workers, involved in any activity except agriculture, farming, fisheries, public administration, defence, social security, private households, and extra-territorial organisations and bodies. This initial design has been modified in the subsequent waves. For instance, the 2002 survey included additional economic activities, as education, health and social work or other community, and social and personal service activities. In the 2006 survey, firms of between 1 and 9 workers were also included. The main advantage of this statistical source is its large size, providing detailed information about wage-earners and about the establishments where they work. Each observation is a matched employer-employee data, providing a set of information related to the characteristics of the individual as well as job and workplace information.

The estimation of the wage curve (2) involves relating the individual wage to the closest available unemployment rate, controlling for as many personal and job

characteristics as possible. In principle, the more precisely the unemployment rate is defined, the more robust will be the computation of the wage elasticity to local unemployment. Ideally, an individual unemployment rate would proxy the risk of joblessness for a particular worker. In practice, there are many difficulties in achieving highly disaggregated unemployment rates. In our case**,** the most reliable statistical source for the unemployment rate, i.e., the Spanish Labour Force Survey, has the disadvantage of providing non-significant figures of active and unemployed population when the level of disaggregation is high. Thus, initially, we attempted to calculate unemployment rates at the regional level by gender, age (4 groups) and education (4 levels) but found ourselves with many empty or unreliable figures. Consequently, we reduced the level of disaggregation, and computed unemployment rates at the regional level by gender and educational groups alone. However, as indicated above, this introduced another problem, since the estimation of an equation such as (2) involves variables with different levels of aggregation, which may lead to biased estimates if all of the workers in a group share the same unemployment rate. More precisely, estimates of the more aggregated variable (the unemployment rate) tend to exhibit lower standard errors. We also explored the possibility of estimating the wage curve for each year and region, and compared the slope coefficients for the unemployment rate, but found non-significant coefficients, with incorrect signs in many cases.

We then adopted a different approach, pooling the information gathered in the three waves of the survey into a unique dataset [13]. This necessitated homogenising the variables, in order to make them comparable. Specifically, we restricted our analysis to those sectors reported in the 1995 survey, and dropped from the sample variables with different levels of information that were not reconcilable (for instance, type of property, or type of market towards which production is directed). Moreover, we dropped from the 2006 survey those observations corresponding to firms of between 1 and 9 workers, in order to have homogenous individuals across samples. Thus, we ended with a sample of 777,789 observations. Unemployment rates are disaggregated by region NUTS II level, gender, and education (four levels). Additionally, in order to make the computed wages comparable, we deflated them with the regional consumer price index provided by the INE [14]. Finally, the hourly wage was computed without taking into account extraordinary payments (as discussed in the previous section). The Appendix (table A1) provides the definitions of the variables included in the estimated wage equation.

Given the results presented in Section 2, we concluded that Spanish regions form groups (or clusters) as regards the behaviour of their unemployment rates, and we hypothesised that this different behaviour could be explained by different degrees of sensitivity of wages to the unemployment rate, *i. e.,* different levels of wage flexibility.

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[13] Note that, despite the fact that the SES provides data for three waves, it is not a panel, since the surveyed firms are not necessarily the same, neither are the workers included in the sample.

[14] Given the change in the base year of the CPI in 2002, we used the regional CPI increase since 1995 provided by the INE. Therefore, the 1995 deflator takes value 1, and the values for 2002 and 2006 are calculated accordingly, and thus nominal wages are deflated. The implied assumption is that the price level is the same across regions at the base year; but this a problem common with any regional price deflator.

Since the estimation of the wage curve allows for the identification of such elasticity, we explore this line next, by considering different sets of regions. This approach follows Livanos (2010), who estimates a wage curve for the set of Greek regions with unemployment rates above the national average, and another wage curve for the set of regions with unemployment rates below that average. Similarly, Ammermüller et al (2010) compute wage curves for West Germany against East Germany, as well as for the North of Italy against the South [15].

In our case, and according to results in Section 2, we split our sample into three groups of NUTS II regions, as indicated above. First, those with high unemployment rates (Group H), formed by Andalusia, Extremadura and the Canary Islands; second, a group formed by Aragon, the Balearic Islands, Navarre, the Basque Country and La Rioja, which exhibit low unemployment rates (Group L) [16]. The remaining 9 Spanish regions are regarded as regions with medium unemployment rates (Group M).

Equation (2) was therefore estimated by OLS for the whole sample and for each group, including regional and time fixed effects, as well as all of the variables described in the Appendix, which account for the main personal and job characteristics. For brevity, we only report the results obtained for the unemployment rate coefficient. Table 2 summarises the main results [17].

Table 2. OLS estimation of the wage equation

	All Regions	*Group H*	*Group M*	*Group L*
β	–0.082*	–0.0602*	–0.0992*	–0.1134*
t-statistic	–5.42	–2.56	–4.81	–3.29
Nº of observations	777,789	126,729	486,851	164,209
Nº of clusters	408	72	216	120

Notes: t-statistic based on robust standard errors. Nº of clusters refers to the number of different unemployment rates within each group. See text for definition of Groups, and Appendix for other variables included in the estimated model. * indicates 95% significance.

From table 2, it can be seen that wage elasticity to unemployment at the aggregate level is –0.08, not statistically different from either the standard value of -0.1 found in the literature (Blanchflower and Oswald, 1994, 2005) or the «modal» value of -0.07 reported by Nijkamp and Poot (2005) in their meta-analytic study. When

[15] A somewhat different approach is applied by Deller (2011), who computes wage curves for the US at the county level, using techniques that are specific for spatial analysis.

[16] We also attempted to perform individual wage curve estimations for each region, once the three waves of the SES were pooled. However, even though correctly signed, the unemployment elasticity of wages was never significant for each region, due to the insufficient level of disaggregation of the unemployment rate. Results are available upon request.

[17] Table A2 in the appendix provides the whole set of estimates. In general, the estimated coefficients are in line with theoretical predictions and previous findings in the literature as regards the determinants of the individual wage.

disaggregating into the three sets of regions, to take into account that unemployment rates are quite different across those regions, we obtain very interesting results, summarised in the last three columns of table 2. Differences in the estimated coefficients are not very large, but statistically significant between the three groups [18]. Specifically, in regions with unemployment rates close to the national average (Group M), the unemployment elasticity is almost the «typical» –0.10 (estimated coefficient of –0.0992, not statistically different from –0.1). However the estimates for the other two groups are dramatically different. The group of high unemployment (Group H) exhibits a much lower degree of wage elasticity (–0.0602) while the group of low unemployment (Group L) almost doubles this figure, with an estimated elasticity of –0.1134. These results indicate that high unemployment is related to low wage elasticity, while low unemployment is related to higher sensitivity of wages to local labour market conditions. Consequently, if wage flexibility is a mechanism that allows for absorbing external shocks without largely affecting employment, our results seem to indicate that regions that suffer from higher unemployment rates exhibit lower wage flexibility [19].

5. Conclusions

Most of the theoretical and empirical economic literature agrees that labour market rigidity should be addressed in order to better adjust against negative shocks impacting an economy. At the regional level, and given that institutions are usually common within a country, one possible way of providing flexibility to a regional labour market is through wage flexibility, so that wages may respond to external shocks by adapting to new circumstances as, for example, an increase in unemployment rates. Wage flexibility can be measured through the wage curve, which (inversely) relates the local unemployment rate to individual wages.

We have focused on the Spanish case, a country characterised by large and persistent regional differences in the unemployment rate. We explore whether such differences may be related (or not) with different behaviour across regions in wage flexibility. Specifically, we have proceeded to estimate a national wage curve, along with regional wage curves, to assess whether wage flexibility differs across regions or sets of regions. Using data for three moments in time, 1995, 2002 and 2006, to make use of the most extensive data base for wages and individual and job characteristics, the Structure of Earnings Survey, we have estimated wage curves considering three sets of regions: those with persistently higher unemployment rates than the national average; those with persistently lower rates, and those with figures close to the national rate.

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[18] Standard Wald tests strongly reject the null that the slope coefficient for the unemployment rate is similar across the three models at the 1% confidence level. The F(2, 777719) statistic is 1127,72, with a *p*-value of 0.000. We therefore conclude that the estimated slope coefficients for the three models are statistically different.

[19] We also attempted alternative specifications of the wage curve, adding the squared unemployment rate or the log unemployment to the third power. The general results are not changed, we do not report these estimates to preserve space, but they are available from the authors upon request.

Our hypothesis was very simple: if wage flexibility is a mechanism to absorb external shocks in order to accommodate employment variations, those regions with low wage flexibility should exhibit, *ceteris paribus*, higher unemployment rates. The estimated results appear to confirm this hypothesis. In this context, spurring flexibility in regional labour markets, especially those with severe rigidities, would be crucial and unavoidable for absorbing negative supply shocks. The availability of longer and more comprehensive data sets will, this hypothesis to be more robustly tested.

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Appendix

Figure A1. National unemployment rate and regional differences in unemployment rates

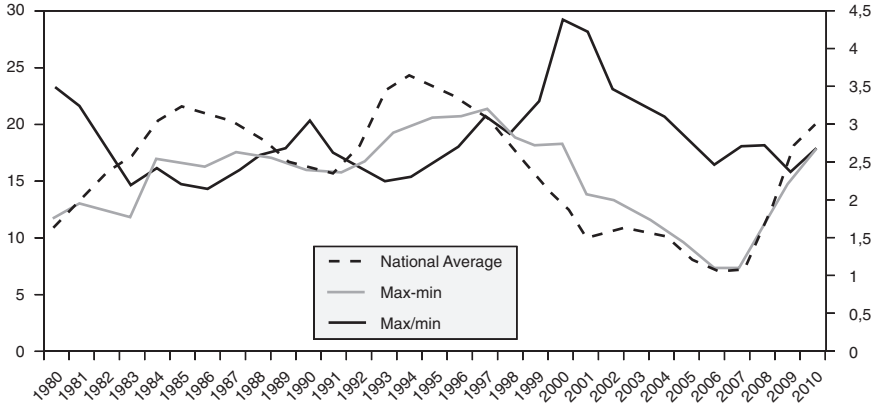

Figure A2. National unemployment rate and absolute and relative regional disparities in unemployment

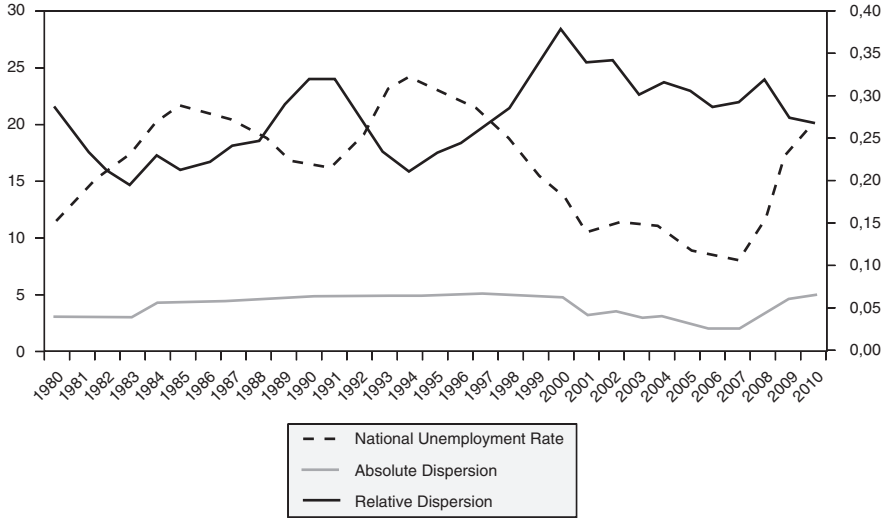

Table A1. List of included variables in the wage equation regression. Definitions

Variable	*Definition*
Lu	Log of the Unemployment rate
Female	=1 if observation is female
Ed1-Ed4	Education level • Ed1: primary • Ed2: secondary I • Ed3: secondary II • Ed4: Higher
Exp1-Exp5	Experience: Age-education-6-years of tenure • Exp1: 4 years or less • Exp2: 5 to 9 years • Exp3: 10 to 15 years • Exp4: 15 to 20 years • Exp 5: more than 20 years
Expsqr	Experience squared
Tenure1-Tenure4	Tenure: • Tenure 1: less than a year • Tenure 2: 1 to 4 years • Tenure 3: 5 to 9 years • Tenure 4: more than 10 years
Ocup1-Ocup9	Occupation level: • Ocup1: Legislators, senior officials and managers • Ocup2: Professionals • Ocup3: Technicians and associate professionals • Ocup4: Clerks • Ocup5: Service workers and shop and market sales workers • Ocup6: Skilled workers • Ocup7: Plant and machine operators and assemblers • Ocup8: Elementary occupations (services) • Ocup9: Elementary occupations (other activities)
Age1-Age3	Age group • Age1: 25 to 54 • Age2: less than 25 • Age3: more than 54
Contract1-Contract2	Type of contract • Contract1: permanent • Contract2: fixed-term
Wktime-Wktime2	Working time status • Wktime1: full time job • Wktime2: part-time job
Size1-Size3	Size of the firm (number of workers) • Size 1: 10 to 49 workers • Size 2: 50 to 99 workers • Size 3: more than 100 workers
Wagr1-Wagr3	Type of wage agreement: • Wagr1: national agreement • Wagr2: regional agreement • Wagr3: firm-level agreement

Table A1. *(cont.)*

Variable	*Definition*
Sector1-Sector22	Sector of economic activity • Sector1: Mining and quarrying • Sector2: Manufacture of food products, beverages and tobacco • Sector3: Manufacture of textiles and textile products • Sector4: Manufacture of leather and leather products • Sector5: Manufacture of wood and wood products • Sector6: Manufacture of pulp, paper and paper products; publishing and printing • Sector7: Manufacture of coke, refined petroleum products and nuclear fuel • Sector8: Manufacture of chemicals, chemical products and man-made fibres • Sector 9: Manufacture of rubber and plastic products • Sector10: Manufacture of other non-metallic mineral products • Sector11: Manufacture of basic metals and fabricated metal products • Sector12: Manufacture of machinery and equipment n.e.c. • Sector13: Manufacture of electrical and optical equipment • Sector14: Manufacture of transport equipment • Sector15: Manufacturing n.e.c. • Sector16: Electricity, gas and water supply • Sector17: Construction • Sector18: Wholesale and retail trade; repair of motor vehicles. motorcycles and personal and household goods • Sector 19: Hotels and restaurants • Sector20: Transport, storage and communication • Sector21: Financial intermediation • Sector22: Real estate, renting and business activities

Table A2. Estimated coefficients

	All Regions		*Group H*		*Group M*		*Group L*	
	Coefficient	*t-ratio*	*Coefficient*	*t-ratio*	*Coefficient*	*t-ratio*	*Coefficient*	*t-ratio*
Lu	–0.082	–5.42	–0.0602	–2.56	–0.0992	–4.81	–0.1134	–3.29
Female	–0.0807873	–12.88	–0.0897228	–4,84	–0.0814814	–9.03	–0.0869769	–10.25
Ed1	–0.128365	–19.09	–0.142904	–7,83	–0.1389034	–15.38	–0.1078033	–13.63
Ed2	–0.1141137	–17.98	–0.1358443	–7,60	–0.117943	–13.78	–0.1067386	–13.09
Ed3	–0.0610751	–9.09	–0.0624237	–4,63	–0.0627676	–7.04	–0.0644377	–7.45
Exp1	–0.0547459	–13.64	–0.0400626	–3,34	–0.0553885	–11.54	–0.0621278	–6.56
Exp2	–0.0282149	–8.87	–0.0122843	–1.61	–0.0293153	–7.24	–0.0394991	–5.70
Exp3	–0.0135848	–5.21	–0.0078726	–1.28	–0.0125973	–3.92	–0.0243776	–3.91
Exp4	–0.00098	–0.49	–0.0014782	–0.33	0.0008185	0.34	–0.0068858	–1.40
Expspr	0.0000258	8.21	0.0000169	2.02	0.0000282	7.49	0.0000256	3.61
Tenuresq	0.0001181	24.24	0.0001312	10.10	0.0001233	20.17	0.0000981	9.69
Tenure1	–0.1014803	–24.30	–0.0984612	–7.90	–0.0999819	–19.94	–0.106007	–11.81
Tenure2	–0.0730701	–20.72	–0.0811217	–7.83	–0.0713482	–16.22	–0.0685662	–9.65
Tenure3	–0.0405958	–12.97	–0.0500494	–5.11	–0.0376749	–9.96	–0.0406004	–6.46
Ocup1	0.5427991	25.80	0.4952819	26.33	0.5507799	18.87	0.5456798	22.72
Ocup2	0.4263341	26.51	0.4209608	24.55	0.4265917	19.34	0.4204418	20.62
Ocup3	0.2173186	35.86	0.2336207	16.92	0.209851	27.15	0.2279728	18.01
Ocup4	0.072642	13.28	0.079363	6.33	0.0639724	9.46	0.0920804	8.37
Ocup5	0.0357889	5.97	0.0672232	5.13	0.0226114	3.16	0.0484415	3.98
Ocup6	0.0661487	15.25	0.0524762	6.16	0.0653204	11.31	0.0801124	9.60
Ocup7	0.0406955	9.39	0.022216	2.24	0.0399395	7.52	0.0569278	5.48
Ocup8	–0.0282488	–3.79	–0.0067757	–0.45	–0.0449574	–5.27	–0.0106861	–0.68
Age1	0.0265087	6.57	0.0298903	3.23	0.0278705	5.65	0.0236372	2.52
Age2	0.0158629	3.66	0.0092057	1.03	0.0183636	3.57	0.0147814	1.34
Contract1	0.0173162	6.42	0.0021972	0.36	0.0226384	6.78	0.0088408	1.45
Wktime1	–0.019823	–3.90	–0.0027493	–0.20	–0.0253628	–4.04	–0.0206552	–2.44
Size1	–0.1051517	–28.78	–0.1319687	–17.16	–0.0933251	–21.23	–0.1176613	–15.66
Size2	–0.0682937	–19.70	–0.0926546	–12.29	–0.0644222	–14.62	–0.0646122	–9.61
Wagr1	–0.004686	–0.31	0.0507346	1.56	–0.0242045	–1.21	–0.0085144	–0.31
Wagr2	0.06006	3.77	0.0867808	2.70	0.0544379	2.48	0.0537022	1.95
Sector1	0.0024479	0.13	0.0003455	0.01	–0.0063153	–0.26	0.0463601	1.94
Sector2	–0.017037	–2.55	0.0015627	0.11	–0.0084899	–0.99	–0.0639824	–4.64
Sector3	–0.054651	–8.44	–0.0336798	–2.68	–0.0531503	–6.53	–0.0771791	–5.98
Sector4	0.1250883	13.37	.12025530	4.85	0.1293942	11.00	0.1023396	6.06
Sector5	0.0177997	2.68	0.058662	3.95	0.0172824	2.10	–0.0146747	–1.00
Sector6	–0.0690518	–8.83	–0.0277117	–1.44	–0.0872372	–10.96	–0.0439372	–1.91
Sector7	0.3780734	14.14	0.3871489	6.77	0.3890055	11.29	0.2908678	5.59

Table A2. *(cont.)*

	All Regions		*Group H*		*Group M*		*Group L*	
	Coefficient	*t-ratio*	*Coefficient*	*t-ratio*	*Coefficient*	*t-ratio*	*Coefficient*	*t-ratio*
Sector8	0.1785761	18.28	0.1897076	4.60	0.2023733	22.04	0.0688294	3.37
Sector9	0.0830924	8.36	0.1139358	6.36	0.1051103	8.49	0.0104588	0.69
Sector10	0.0198082	2.68	0.0569783	2.85	–0.0013998	–0.18	0.059841	3.65
Sector11	0.0515172	7.07	0.0349469	2.97	0.0601308	6.32	0.025928	1.94
Sector12	0.061215	6.76	0.0353728	1.75	0.0689106	6.05	0.0386831	2.26
Sector13	0.0566835	5.71	0.0866646	4.68	0.0706053	5.59	–0.0058063	–0.36
Sector14	0.1104888	13.01	0.129007	5.08	0.1061808	9.98	0.0950183	6.54
Sector15	0.0251227	3.34	0.0647673	3.04	0.035271	4.22	–0.0321207	–2.19
Sector16	0.2936199	19.62	0.2811808	12.40	0.3139815	14.69	0.2437218	8.08
Sector17	0.0065349	0.77	–0.0095702	–0.57	–0.022823	–2.46	0.1022398	8.25
Sector18	0.0102186	1.77	0.0228663	1.72	0.0165177	2.27	–0.0305813	–3.23
Sector19	0.0868793	8.94	0.1444273	8.51	0.0777567	6.92	0.0403822	1.60
Sector20	0.0520054	7.67	0.04548	2.53	0.0585694	7.27	0.032914	2.13
Sector21	0.2100134	20.90	0.2783394	14.17	0.1977158	15.12	0.1720809	12.08
Dum1995	4,968201	1.83	5.123839	62.00	4,964896	10.95	4,960049	203.35
Dum2002	–0.0828217	–2.68	0.0890119	0.94	–0.078717	–1.51	–0.1067079	–3.74
Reg1	–0.0592412	–5.07	0.084074	8.49				
Reg2	–0.0741609	–6.91					–0.0718408	–9.92
Reg3	–0.034225	–2.95						
Reg4	0.013175	1.05					0.0117567	1.39
Reg5	–0.1526836	–10.26						
Reg6	–0.0339952	–3.16			0.0000522	0.00		
Reg7	–0.0823115	–6.83			–0.0490364	–4.11		
Reg8	–0.0775169	–7.81			–0.0440814	–4.55		
Reg9	–0.0328207	–3.22			–0.0000444	–0.00		
Reg10	–0.0565365	–5.75			–0.0217388	–2.24		
Reg11	–0.1183619	–9.53	.03410870	3.10				
Reg12	–0.0943835	–9.34			–0.0595519	–5.80		
Reg13	–0.0436151	–2.66			–0.0081167	–0.56		
Reg14	–0.1005037	–7.95			–0.0670256	–5.21		
Reg15	0.0368974	3.08					0.037773	3.88
Reg16	–0.0017287	–0.17					0.0080651	1.04
Reg17	—	—						
Constant	1.461543	64.64	1.175759	20.40	1.44463	44.30	1.493618	41.73
N. Obs	777,789		1,216,729		486,851		164,209	
Clusters	408		72		216		120	

Comment on «Wage Flexibility And Local Labour Markets: A Test On The Homogeneity Of the Wage Curve in Spain», by Roberto Bande, Melchor Fernández and Víctor Montuenga

Esteve Sanromà *

The extensive literature based on the seminal works by Blanchflower and Oswald (1990, 1994) on the wage curve includes estimated wage curves for many countries (Nijkamp and Poot, 2005). In addition, the research on this topic has advanced along three parallel lines: consolidating the theoretical basis of the wage curve, improving the estimation methodology and estimating wage curves for different groups of workers.

Regarding the theoretical basis of the wage curve, earlier works have offered a wide variety of explanatory models, including implicit contracts, union bargaining, efficiency wages, and labour turnover costs (Blanchflower and Oswald, 1994; Campbell and Orszag, 1998). However, there is currently a wide consensus that the most plausible explanations are related to efficiency wages and/or labour turnover costs. From a methodological perspective, recent studies are increasingly using panel data, applying instrumental variables estimation techniques to account for unemployment endogeneity and using different methods to control for composition effects. The wage curve has also been estimated for different groups of workers based on age, gender, race, education, occupation, industry and nationality, as well as for different regions or territories.

The article by Bande, Fernández and Montuenga is part of this third line of research, estimating wage curves for groups of Spanish regions. The objective is to test the existence of regional differences in wage elasticity to unemployment. The authors find a lower effect in the group of regions with higher unemployment rates. This evidence is consistent with the model of collective bargaining in Spain because it reflects the important imitation effects that generate a weak sensitivity of individual wages to local labour market conditions.

The analysis has several interesting aspects. Estimating regional differences in the wage curve is not a totally new topic, but it is not usually mentioned in the literature. The reason for this scarcity of studies is the difficulty of estimating wage curves for individual regions due to strong data requirements. The authors partially overcome this problem by working with groups of regions. Second, the authors use the Spanish Wage Structure Survey, a matched employer-employee data set. This permits the inclusion of a set of controls related to firm tenure and type of labour contract that are not common in the literature. Third, analysing wage flexibility in Spain is especially interesting because labour market reforms have recently been approved to

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introduce more flexibility in the wage-setting model. Furthermore, the paper is well written and very transparent in presenting its methodology and the problems that it has overcome. For these reasons, the work by Bande, Fernández and Montuenga is an important step forward in the literature on wage curves and regional wage flexibility in Spain.

Nevertheless, the paper has some limitations. For example, the authors have encountered the difficulty —common in most studies that estimate disaggregated wage curves— of defining the specific (or closest) labour market for each individual in the sample. The usual solution consists of using unemployment rates by region, gender and educational level. However, this requires the assumption that these specific labour markets are independent of one another (i.e., competition for jobs only takes place within each labour market) and, most likely, this is not the case in many occupations (*i. e.,* women and men can compete for similar jobs if they are equally qualified). Furthermore, the high incidence of over-education among Spanish workers implies that workers with higher educational levels are also competing for jobs that require less education. Thus, the independence of the considered regional labour markets is not fully guaranteed. Additionally, the pseudo-panel created pooling of the three waves of the survey is estimated by imposing the restriction that the coefficients associated with the controls are constant over time, which, again, is a risky assumption. For instance, Felgueroso *et al.* (2010) found that the skill-wage premium has clearly declined during the period of analysis.

In any case, the article represents clear progress in the analysis of Spanish regional labour markets, although the authors are cautious about their conclusions. They conclude that «high unemployment is related to low wage elasticity, while low unemployment is related to higher sensitivity of wages to local labour market conditions» and that the «results seem to indicate that regions which suffer from larger unemployment rates exhibit lower wage flexibility». Despite the progress that the paper represents, the authors recognise that it lacks a deeper analysis of the factors causing these results. There are three potential areas for future research on this topic. First, it is necessary to consider recent advances in the analysis of the spatial heterogeneity of wage curves for different countries, such as Japan, the United States or Germany. Second, the size of the considered geographical units is a key issue when estimating regional wage curves. The authors use information on *Comunidades Autónomas* (NUTS-II regions), but more geographical detail is needed to avoid problems related to aggregation bias. The challenge here is to find an appropriate database to carry out this type of analysis for the Spanish regions. Finally, as previously mentioned, further evidence on the causes of the regional differences of the estimated elasticities is needed. Although academic research on this topic is still scarce, some potential explanatory factors have been suggested. For instance, the role of the interregional migration that affects competition for available jobs or regional differences in the monopsonistic power of firms due to unequal agglomeration of firms could play a role.

Overall, the article represents clear progress in the analysis of regional wage flexibility and opens new avenues for future research.

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Section ARTICLES

Investigaciones Regionales

Wage Curve Evidence From Turkey's 2007-2009 Income and Living Conditions Survey

Gonca Konyalı *

ABSTRACT: The aim of this paper is to investigate the labour market conditions of Turkey via disaggregated wage curves following the argument that group specific regional unemployment rates might better describe wage curves than aggregate ones. Using 2007-2009 panel survey of Income and Living Conditions, I found that there is weak evidence in favour of the existence of a wage curve for Turkey. Different categories of unemployment rate give different results on the unemployment elasticity of pay. For male workers, wage curve relationship seems to exist only when male unemployment rates are used and for female workers, there is no evidence in favor of a wage curve. When the data are split into two age groups, and age specific unemployment rates are used, there appears a wage curve for women of age twenty-five to sixty-four and a positive unemployment elasticity of pay for the women of age fifteen to twenty-four. These results might be explained by İlkkaracan and Selim (2003)'s argument focusing on the labour force participation dynamics of women in Turkey.

JEL Classification: J30, J60.

Keywords: Wage curve, group-specific regional unemployment rates.

Evidencia sobre la curva de salarios en Turquía a partir de la encuesta de ingresos y condiciones de vida 2007-2009

RESUMEN: El objetivo de este trabajo es investigar las condiciones laborales de Turquía a través de curvas salariales desagregadas siguiendo el argumento de que las tasas regionales de desempleo por grupos podría describir mejor las curvas salariales que las agregadas. Usando datos del Panel de Ingresos y Condiciones de Vida 2007-2009, encuentro que no hay pruebas sólidas a favor de la existencia de una curva de salarios para Turquía. Diferentes categorías para la tasa de desempleo ofrecen distintos resultados en la elasticidad de los salarios al desempleo regional. Para los trabajadores masculinos, la relación salarial curva parece existir sólo cuando se utilizan tasas de desempleo específicas de este colectivo, mientras

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que para las trabajadoras no hay evidencia a favor de una curva de salarios. Cuando los datos se dividen en dos grupos de edad, y se usan las tasas de desempleo específicas por edad, aparece una curva de salarios para las mujeres de veinticinco a sesenta y cuatro años y una elasticidad positiva para las mujeres de edad de quince a veinticuatro. Estos resultados podrían explicarse por el argumento de İlkkaracan y Selim (2003) que se centra en la dinámica de la participación laboral de las mujeres en Turquía.

Clasificación JEL: J30, J60.

Palabras clave: Curva de salarios, tasas de paro por región y grupo.

1. Introduction

This study tests the wage curve hypothesis for Turkey using individual level data of 2007-2009 Income and Living Conditions Surveys. The wage curve is an empirical relationship that can be described by Mincerian wage equation (Mincer, 1974) augmented by region -specific unemployment rate. According to the wage curve hypothesis, workers that are employed in high unemployment regions have lower wages than the workers that are employed in low unemployment regions (Blanchflower and Oswald, 1994 and 2005). This negative relationship between regional unemployment rate and wage level is introduced by Blanchflower and Oswald as an empirical law, such that the unemployment elasticity of pay; that is, the estimated coefficient on regional unemployment rate in a wage curve equation is –0.10. As suggested in the literature, bargaining and efficiency wage theories may explain the wage curve, where unemployment is considered as a disciplining device on labor force.

The Turkish economy has witnessed historic changes in the last two decades. Real wages have contracted since the early 1990s and entered a new phase of contraction after 1999 (Yeldan, 2004). The decline in the private sector real wage was almost 20% in 2001 and there was a very moderate increase afterwards: the average increase in real wages was 3.2% from 2001 to 2005 (Voyvoda and Yeldan, 2006). Over the post-2001 crisis period, unemployment has also become a major problem in the economy. Unemployment rate has increased from 7% in 2000 to 10.6% in 2005 and to 12% in 2010. These adverse conditions in the economy have not been shared equally. Different worker groups have been affected at different rates from the negative conditions in the labour market. For example, the youth unemployment rates have soared, especially in the second half of 2000s.

The aim of this paper is to investigate further the post 2000 conditions of the labour market of Turkey via disaggregated wage curves within the argument that group specific regional unemployment rates might better describe wage curves. Wage curve literature show that different labour market groups have different unemployment elasticities of pay. For Turkey, İlkkaracan and Selim (2003) and Baltagi, Başkaya and Hülagü (2012) provide evidence on the disaggregated wage curves (using official unemployment rates). While the first study has used data of 1994 Employment

and Wage Structure Survey and defined 7 regions, the second study has analysed the 2005-2008 period using Household Labour Force Surveys and defined 26 regions. The limitation of the first study is that it has used two alternative unemployment rate data which are both not much satisfactory. The first series is a proxy based on 1990 rates and although the second series is 1994 rates (which were the only available data provided by TURKSTAT at that time), it was not comparable with international standards [1]. İlkkaracan and Selim (2003) have found unemployment elasticity of pay for male workers as –0.10, and higher elasticity for male workers in private sectors, but found no evidence for a female wage curve. They have also found lower elasticity of pay for the youngest worker groups and no wage curve evidence for highly educated workers. On the contrary, Baltagi, Başkaya and Hülagü (2012) have shown that there exists a wage curve for females; and the younger, less educated and less experienced female workers have the highest unemployment elasticities of wage among all workers. These results are in line with the international evidence showing vulnerable groups have more sensitive wages with respect to regional unemployment rates (see for example, Baltagi and Blien, 1998; Berg and Contreras, 2004; Sanroma and Ramos, 2005).

This study differs from these earlier studies of the Turkish literature in two respects. First, the study utilizes individual level data from Income and Living Conditions Surveys (ILCS) in which the *panel* survey method is applied. Although Turkish Statistical Institute (TURKSTAT) carries out this panel since 2006, only 2007-2009 period is covered. The crisis year 2008, and the preceding and the consequent years have been chosen to examine a relatively more homogeneous period.

Secondly, this study reports disaggregated wage curve estimates based on group specific (official) regional unemployment rates. The regional unemployment rates of different labor market groups have different dynamics and their relationship with wages might be different also (Aixala and Pelet, 2010; Boushey, 2002; Card, 1995; García-Mainar and Montuenga-Gómez, 2003, Sanroma and Ramos, 2005). Disaggregated analysis which regresses wage on overall regional unemployment rate may produce different elasticities of pay for different groups of the labor market, but this may not necessarily mean that different groups have different sensitivities to the same overall unemployment rate. Instead this result may arise because different groups have different elasticities with respect to overall unemployment rate (Card, 1995). İlkkaracan, Levent and Polat (2012)'s recent paper for Turkey presents a very interesting analysis by disregarding the official definitions of unemployment rate. They conclude that unemployment elasticity of pay of different groups is sensitive to different categories of unemployment rate. The unemployment rates they calculate and use in their analysis take into consideration discouraged workers (ILO based measure), marginally attached workers (BLS based measure) and long-term unemployed. These different definitions of unemployment rate they use are also disaggregated by

[1] İlkkaracan and Selim (2003) assumed that the same percent change in country wide unemployment rate from 1990 to 1994 applies to the regional unemployment rates of the same period, and upscaled the 1990 regional unemployment rates using this change rate. On the other hand, 1994 SIS data on regional unemployment rates do not meet the ILO standards and, in fact, is nowadays unpublished.

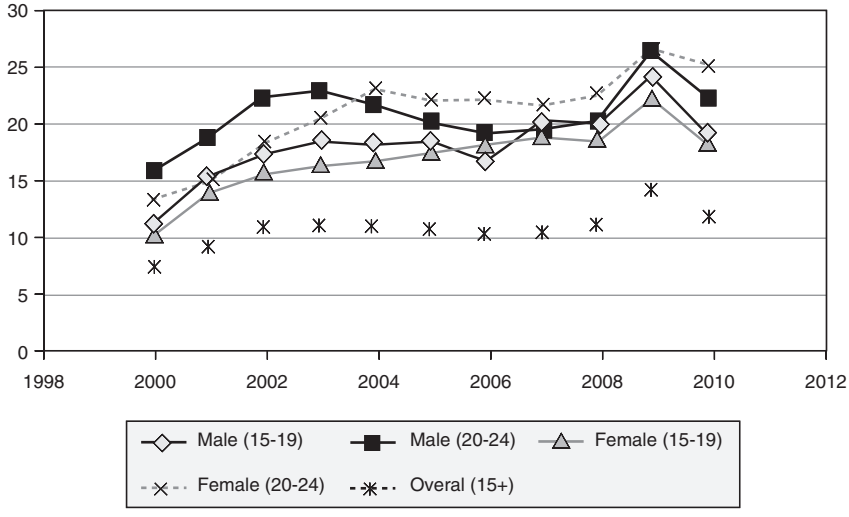
skill level. They have used the pooled cross section individual level data of Household Labour Force Surveys and analyzed the period 2005-2010.

In this study, the wage curve relationship has been investigated for male and female workers and for the aged between fifteen to twenty-four and twenty-five to sixty-four using group-specific (official) regional unemployment rates [2]. The outline of the paper is as follows: In the next part, the trends in the unemployment rates in Turkey after 2000 is summarized. In the third part, the model and the data are introduced. In the fourth part, the findings are discussed and the last part provides concluding remarks.

2. Some Trends in Unemployment Rates in Turkey

Figure 1 shows male and female unemployment rates for fifty to nineteen and twenty to twenty-four age groups and compares them with the overall unemployment rates for the aged fifty and above. The purpose in presenting figure 1 is to demonstrate how the unemployment rates of different labor market groups may have different dynamics. For this reason, the groups that have the *highest* unemployment rates have been chosen to be displayed in Figure 1 while the unemployment rates of the other groups are not presented but are available from the author on request.

Figure 1. Some Trends in Unemployment Rates in Turkey, 2000-2010



Source: Household Labor Force Statistics, TURKSTAT.

[2] The information provided by ILCS makes possible the distinction between formal and informal workers. My analysis has also taken into consideration this information.

As it can be seen from figure 1, the gap between the youth unemployment rates and overall unemployment rates increases during the 2000s. For the period after 2004, females aged twenty to twenty-four years have the highest unemployment rates. In the twenty to twenty-four age group until 2004, the male unemployment rates exceed the female unemployment rates. After that year, the trend reverses: male unemployment rates enter into a declining trend and female unemployment rates consistently exceed male unemployment rates. Figure 1 proves that different labor market groups have very distinct trends and levels in their unemployment rates. Although figures with respect to regions are not presented here, diversifying trends and levels for different labor market groups can also be expected at regional level. This heterogeneity in the unemployment rates of different labor market groups suggests using disaggregated unemployment rates might produce more accurate results than in the case of using overall unemployment rates in wage curve estimates.

3. Model and Data

To test the wage curve hypothesis, the following model is estimated using ordinary least squares method. Both wage and unemployment rate in Eq. (1) are in log form. The model is estimated using unemployment rates of different labor market groups. Eq. (1) shows the wage curve equation

$$W_{irt} = \beta_o + \beta_1 X_{irt} + \beta_2 U_{rt} + d_r + f_t + e_{irt} \quad (1)$$

where i, r, and t stands for individual, region and year respectively. W, is annual main job (after tax) income and it is the sum of wage (or salary) paid in cash and in-kind. The incomes reported in ILCS are in nominal terms, so they were deflated by yearly consumer price indices to reach real incomes. X stands for the control variables that may have influence on wage determination. The control variables include a gender dummy, 4 marital status categories, 7 education dummies, 9 occupational categories, 14 industry dummies, 10 age categories, logarithm of the number of months worked, logarithm of the weekly hours worked and the logarithm of the number of months worked full-time. U stands for group-specific regional unemployment rate. d and f stands for region and year dummies respectively and e is the error term [3].

[3] The female dummy takes the value of 1 for female workers and zero otherwise. *Age* group includes 10 categories: 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64. *Marital status* includes 4 categories: single, married, widowed, divorced. *Employment status* includes 5 categories: regular employee, casual employee, employer, self employed, unpaid family worker. *Educational status* includes 8 categories: illiterate, literate but without any diploma, primary school, primary education, junior school, high school, vocational school, higher education. *Industry classification* includes 14 categories: agriculture; mining; manufacturing; electricity, gas and water supply; construction; wholesale and retail trade; hotels and restaurants; transport, communication; financial intermediation; real estate; public administration and defense; education; health and social work; other social, community and personel services. *Occupational group* includes 9 categories: legislators, senior officials and managers; professionals; technicians; clerks; service workers; skilled agricultural and fishery workers; crafts and related trade workers; plant and machine operators; elementary occupations. *Regional unemployment rate* includes 12 categories: Istanbul

All the data except unemployment rates and yearly consumer price indices (CPI) come from Income and Living Conditions Surveys (ILCS). TURKSTAT applies this panel survey to the random sample of households, with the coverage of all settlements in Turkey. Although the survey gives information on all age groups and defines five employment status categories (see appendix for detail); only regular and casual employeesaged between fifteen to twenty-four and are kept in the sample.

ILCS provides information on household's region with a region identifier classifed in NUTS1 level, which makes 12 regions for Turkey. The source for the unemployment rate data is the Household Labour Force Statistics (HLFS) which covers all settlements in Turkey. HLFS provides regional data in NUTS1 (12) and NUTS2 level (26 regions) and by region/age, region/gender and region/age/gender. The region identifier provided in ILCS makes possible to combine the regional unemployment rate data with individual level data. The unemployment data used in this study is in NUTS1 level and disaggregated by region/age and region/gender.

The CPI used in this study are the 1994 based consumer price indices and they are on yearly basis. The source of CPI is TURKSTAT [4].

Table 1 below presents descriptive statistics. As expected, average annual real income of women is less than the average annual real income of men. Average real income of the workers aged between fifteen to twenty-four is less than the average real income of workers aged between twenty-five to sixty-four. The mean unemploy-

Table 1. Descriptive statistics

	Mean	*Standard deviation*	*Minimum*	*Maximum*
Average annual real income				
Men	.7403615	.6253568	.0039388	10.73607
Women	.7162626	.6522132	.0042944	17.07277
Aged between 15-24	.6317428	.578082	.0071574	7.089919
Aged between 25-64	.759035	.6496261	.0039388	17.07277
Unemployment rate				
Men	11.38103	3.388482	5.5	18.4
Women	12.05095	4.379164	1.9	19.9
Aged between 15-24	22.13796	4.607534	11.3	30.2
Aged between 25-64	9.308191	3.085263	3.8	15.1

Source: Own elaboration from ILCS 2007-2009.

(TR1), West Marmara (TR2), Aegean (TR3), East Marmara (TR4), West Anatolia (TR5), Mediterranean (TR6), Central West Anatolia (TR7), West Black Sea (TR8), East Black Sea (TR9), North East Anatolia (TRA), Central East Anatolia (TRB), South East Anatolia (TRC).

[4] TURKSTAT provides regional consumer price indices on yearly basis in the NUTS 2 level. Since price indices are not available at NUTS 1 level, nominal wages are deflated only by using yearly price indices.

ment rate across regions for men and women are 11.3% and 12.0% respectively. The lowest and highest unemployment rate is for women and fifteen to twenty-four age group, respectively.

The following section summarizes the findings of the wage curve estimations.

4. Findings

The results presented in table 2 are based on OLS estimations. Estimations are conducted for these groups: All workers, male workers, female workers, workers aged between fifteen to twenty-four and workers aged between twenty-five to sixty-four. Wage curves for these groups are first estimated by using overall regional unemployment rates and then by using group specific regional unemployment rates. The results are compared in the second and third columns in part *(A)* of table 2. ILCS gives information on the workers' status of social security system coverage. If a worker is in social security system he or she may be treated as formal worker, and if not, as informal worker (Ramos, Duque and Suriñach, 2010). The above groups further disaggregated as formal and informal, and the results presented in the fourth and fifth columns in part *A* of table 2.

All the entries except the ones in the second column in table 2 show estimation results that use group specific unemployment rates. The results of estimation for the aged between fifteen to twenty-four and twenty-five to sixty-four disaggregated by gender are displayed in the part *(B)* of table 2. In part *(B)* the age group unemployment rate (not the gender/age specific unemployment rate) is used in the estimations.

In table 2, only the estimated coefficient on unemployment rate is reported in order to save space but full results are available from the authors on request. All regressions include region and time dummies. For all workers, the unemployment elasticity of pay is found –0.074 and it is statistically significant at the 10% level. After the separation of all workers as informal and formal, the wage curve relationship disappears; although the estimated coefficients still carry negative sign, they become statistically insignificant.

For the female workers, the unemployment elasticity of pay is negative in all specifications (except for the informal female workers) but none of the estimated coefficients are statistically significant. For male workers, the wage curve relationship does not exist when overall unemployment rates are used. When male regional unemployment rates are used, the coefficient is estimated –0.097 and it is statistically significant at the 10% level.

Gender wage curve results presented here are in line with evidence provided by İlkkaracan and Selim (2003) for Turkey, Sanroma and Ramos (2005) for Spain and Janssens and Konings (1998) for Belgium. Janssens and Konings explain their result by the female labor market being more competitive than the male labour market. İlkkaracan and Selim explain their finding by the labor force participation dynamics of women: In tight labor markets, low- skill women withdraw from the work-force and the composition changes in favor of high- skill, high-pay women groups.

Table 2. Wage curve estimates based on 2007-2009 panel surveys of Income and Living Conditions

(A)

	Overall U rate	*Group specific U Rate*	*Formal workers*	*Informal workers*
All workers	–.074 (.042)*		–.060 (.044)	–.042 (.086)
N.O.	17940		13108	4832
Gender				
Female	–.049 (.061)	–.014 (.049)	–.035 (.050)	.139 (.101)
N.O.	7206	7206	5268	1938
Male	–.069 (.059)	–.097 (.058)*	–.056 (.060)	–.179 (.124)
N.O.	10734	10734	7840	2894
Age				
15–24	–.009 (.087)	.019 (.077)	.020 (.084)	.018 (.143)
N.O.	3986	3986	2741	1245
25–64	–.087 (.048)*	–.088 (.051)	–.076 (.053)	–.040 (.104)
N.O.	13954	13954	10367	3587

(B)

		Age specific U rate		
Age by gender				
15-24 (Female)		.186 (.104)*		
N.O.		1910		
15-24 (Male)		–.161 (.114)		
N.O.		2076		
25-64 (Female)		–.124 (.077)*		
N.O.		5296		
25-64 (Male)		–.024 (.069)		
N.O.		8658		

Robust standard errors in parantheses. * significant at the 10% level. N.O.: Number of observations

For the aged between twenty-five to sixty-four, a wage curve relationship seems to exist when the overall unemployment rates are used and it disappears when the group specific unemployment rates are used. When the age groups are disaggregated by gender, evidence in favor of a wage curve relationship appears only for the women of age twenty-five to sixty-four. The estimated coefficient is –0.124 and it is statistically significant at the 10% level. For the women of age fifteen to twenty-four, the estimated unemployment elasticity of pay has a positive sign and statistically significant coefficient (at the 10% level). These age group results presented here for female

workers (the positive unemployment elasticity of pay for the fifteen to twenty-four aged and the negative unemployment elasticity of pay for the aged twenty-five to sixty-four) might be explained by İlkkaracan and Selim's argument stating that in the case of Turkey, women having low skill background participate in the work-force until marriage or childbirth and they withdraw from work-force in the labor markets with high unemployment rates [5].

5. Conclusion

For Turkey, there is weak evidence in favor of wage curve in the period 2007-2009 period. For male workers, wage curve relationship exists only when male unemployment rates are used and for female workers, there is no evidence in favor of a wage curve. However when the data are split into two age groups, and age specific unemployment rates are used, there appears a wage curve for women of age twenty-five to sixty-four. For the women of age fifteen to twenty-four, unemployment elasticity of pay is found positive. These results are in line with İlkkaracan and Selim (2003)'s argument focusing on the labor force participation dynamics of female workers. According to this argument, female workers with low-skill and low- pay participate in the work-force until marriage or childbirth and withdraws from work-force in tight labour markets so the composition of female work-force changes in favour of high-pay, high-skill female workers in the tight labour markets.

The disaggregation of male workers by age groups does not produce any sign for the existence of a wage curve relationship, and also the formal/informal disaggregation of data does not produce any results in favour of existence of a wage curve.

Different categories of unemployment rate give different results on the unemployment elasticity of pay; therefore, disaggregation of the unemployment rate is important in wage curve analysis.

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[5] All the estimation results presented in table 2 are based on heteroscedasticity consistent standard error estimators. When cluster standard errors are used in the wage curve estimations, the estimated unemployment elasticity of pay in all regressions becomes statistically insignificant. The results are available from the authors upon request.

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Comments on «Wage Curve Evidence From Turkey's 2007-2009 Income and Living Conditions Survey», by Gonca Konyalı

Anna Sanz-de-Galdeano *

This paper provides wage curve estimates based on regional data in Turkey during the period from 2004 to 2008. In their pioneering work, Blanchflower and Oswald (1990, 1994) used individual-level data to investigate the relationship between a worker's pay and the unemployment rate in the local labour market, a relationship they called «the wage curve» [6]. They concluded that wages are negatively correlated with the local unemployment rate, a finding that has been referred to as an empirical «law» of economics. Moreover, the majority of the wage curve elasticities in Blanchflower and Oswald's work are remarkably consistent across countries and estimated at approximately –0.1 [7].

There are three main methodological issues that researchers must face when estimating wage curve elasticities. First, it is crucial to control for the characteristics of individuals who work at different phases of the business cycle. There is evidence that composition biases due to changes in such characteristics obscure the true degree of real-wage procyclicality (Solon *et al.,* 1994) because the variability in working hours is higher for those workers who earn lower wages. To account for composition biases, some studies have included individual specific fixed effects in their estimations (see, for instance, Bratsberg and Turunen, 1996, for the US and Turunen and Sanz-de-Galdeano, 2006, for the Euro area). Previous findings also suggest that it is of paramount importance that the composition of the workforce is well captured by the observed characteristics used as control variables in wage curve regressions. Second, when wage curves are estimated using individual-level wage information, which is drawn from a population and grouped by year and region cells, the error term is likely to be correlated within groups (Moulton, 1990). As a result, the standard errors of the regional unemployment elasticities will be biased downwards. Blanchflower and Oswald (1994) avoid this issue by presenting estimates based on region-by-year «cell means», which is precisely what this paper does. As Card (1995) notes, the standard errors obtained when using this simple aggregation procedure are valid as long as there is no correlation in the unobserved determinants of wages across markets. Finally, various authors (Baltagi and Blien, 1998) have argued that one may underestimate the absolute values of unemployment elasticities when regional unemployment rates are not predetermined. If wages and unemployment rates are simultaneously determined, standard wage curve estimates will be biased and inconsistent. Baltagi

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[6] See Card (1995) for an excellent review of Blanchflower and Oswald (1994) and an insightful discussion of the potential theoretical interpretations of the wage curve relationship.

[7] See also Nijkamp and Poot (2002) for a meta-analysis and references.

et al. (2012), for example, in a recent study that also focuses on the Turkish context, address this problem by using a FE-2SLS estimator. While one may argue that simultaneity is less likely to be an issue when individual-level data are employed, this paper relies on regional-level data and its conclusions would therefore be more solid if they were qualitatively unchanged by using an FE-2SLS estimator.

Aside from methodological considerations, there is still room for interesting extensions in the wage curve literature, despite its extensiveness. In particular, contributions based on low- and middle-income economies where the informal sector plays an important role, such as this paper or Baltagi *et al.* (2012), are especially welcome.

Assessing whether the cyclical behaviour of wages differs between the formal and informal sectors is crucial to understand whether informality is a consequence of labour market segmentation (following the classical reasoning of Harris and Todaro, which has been formalised by Rauch, 1991) or if it instead responds to workers' choices given that the benefits associated with formal sector jobs (*e. g.,* health insurance) may not compensate for their costs (*e. g.,* payroll taxes). If informality reflects a segmented labour market, one would expect wages to exhibit less cyclical behaviour in the formal sector, in which nominal rigidities would prevent wages from adjusting to supply and demand fluctuations. Similar patterns of cyclical behaviour in the two sectors would instead contrast with the segmented view of the labour market. While there are various studies analysing the cyclicality of wages in Europe and in the US, previous work on middle-income countries is scarce and generally fails to account for heterogeneous responses to the cycle across different segments of the labour market.

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Section ARTICLES

Investigaciones Regionales

The impact of minimum wage on employment in Poland

Aleksandra Majchrowska *, Zbigniew Żółkiewski **

ABSTRACT: The purpose of this paper is to verify the hypothesis that minimum wage might have negative impact on employment in Poland, at least for some workers groups and regions. After having reviewed theoretical literature on minimum wage and having discussed stylized facts on labour market in Poland, the authors define econometric model to check the impact of minimum wage on employment in Poland and then discuss the results. The main conclusions of the study may be summarized as follows: i) minimum wage has had an adverse impact on employment in 1999-2010; ii) the adverse effect of minimum wage on employment has been pronounced for the young workers during the period of substantial increase of the minimum wage (2005-2010), and iii) there is some evidence that a uniform national minimum wage may be particularly harmful to employment in poorest regions.

JEL Classification: E24, J38, R23.

Keywords: Minimum wage, employment.

El impacto del salario mínimo sobre la ocupación en Polonia

RESUMEN: El objetivo de este trabajo es verificar la hipótesis de que el salario mínimo puede tener un impacto negativo sobre el empleo en Polonia, por lo menos para algunos grupos de trabajadores y las regiones. Después de haber revisado la literatura teórica sobre el salario mínimo y de haber discutido los hechos estilizados del mercado de trabajo en Polonia, se especifica y estima un modelo econométrico para cuantificar el impacto del salario mínimo sobre el empleo en Polonia y, a continuación, discutir los resultados. Las principales conclusiones del estudio se pueden resumir de la siguiente manera: i) el salario mínimo ha tenido un impacto negativo sobre el empleo en 1999-2010; ii) el efecto negativo del salario mínimo

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sobre el empleo ha sido pronunciado para los trabajadores más jóvenes durante el período de aumento sustancial del salario mínimo (2005-2010), y iii) existe cierta evidencia de que un salario mínimo nacional uniforme puede ser particularmente perjudicial para el empleo en las regiones más pobres.

Clasificación JEL: E24, J38, R23.

Palabras clave: Salario mínimo, empleo.

1. Introduction

Minimum wage in Poland, set uniformly across the regions, has increased substantially over last years and especially after Poland's accession to EU in 2004. At present Poland is one of the countries with the highest minimum wage among New Member States [1] (NMS), despite its relatively low level of economic development. Moreover, following recommendations of the International Labour Organisation [2] (ILO) there are plans, supported particularly by Polish trade unions, to further increase the minimum wage in Poland to 50% of an average wage rate.

While labour organizations and social partners tend to highlight social security and protection impact of minimum wage legislation, economists are quite often sceptical whether this is adequate and effective tool of alleviating poverty and income inequalities. They rather emphasise potential danger of setting minimum wage at the level above the productivity of some groups of workers what has an adverse effect on the demand for these employees. Moreover, while this objection gives an argument for the certain restraint in augmenting minimum wage, even its modest rise may be harmful to employment if there is considerable regional variation in average wage and therefore minimum wage may be binding in some low wage regions. Adjustment of minimum wage to local labour market conditions through its regional differentiation is therefore a way to neutralize to some extent negative effects of minimum wage legislation.

Poland is a country with considerable regional wage inequalities and also with substantial diversification of unemployment rates across regions and employees groups (especially, with respect to age, skills, etc.). These characteristics of labour market provide some rationale for considering setting of minimum wage at regional basis. This opinion was put forward in OECD Economic Survey of Poland 2010 as the following policy recommendation: «The minimum wage should not be increased relative to the average wage but be differentiated across regions, based on local labour market conditions». This recommendation looks plausible against the background of the stylized facts on the labour market in Poland mentioned above. However, OECD documents do not refer to any up-to-date analysis of the impact of minimum wage on labour market performance in Poland, especially in regional dimension. Indeed,

[1] Countries that joined EU in 2004 or later (Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia).

[2] Kłos (2005).

literature on this issue for Poland is not very extensive, leaving the question of assessment of minimum wage policy in fact unfounded on empirical verification.

In this paper we attempt to check if observed minimum wage could have been a factor restraining the employment in Poland, at least for some workers groups and regions.

A structure of this paper is as follows. In section 2 theoretical considerations on potential minimum wage impact on labour market performance and some empirical evidence are presented. Section 3 presents statistical information on minimum wage in Poland. In section 4 the regional employment rates and their potential determinants are analysed. Section 5 presents the econometric analyses and results. Section 6 contains final conclusions.

2. Impact of minimum wage on labour market: theory and empirical results

There is no clear-cut answer to the question of potential impact of an increase in minimum wage on labour market performance except for the stylized, textbook-type neoclassical model with homogenous labour and symmetrical information (*e. g.,* Boeri and van Ours, 2008). In this case, rise in the minimum wage above the competitive equilibrium level produces decline in demand for labour and increase in supply, thus leading to the rising (involuntary) unemployment. However, in more «realistic» neoclassical model with heterogeneous labour and products, the result (sign of employment adjustment) depends on the elasticities of substitution across different types of workers and cross-elasticities of demand across different types of goods (*e. g.,* Neumark and Wascher, 2007).

When the models are further complicated and more labour market imperfections are being introduced, the results of minimum wage legislation are *ex ante* ambiguous, both theoretically and empirically. For instance, in the model with monopsony in factor markets, rise in the minimum wage has generally non-monotonic impact on employment. It may lead to increase in employment if the new minimum wage is lower than the competitive level (adjustment along the supply curve) but it may reduce employment if government sets minimum wage higher than competitive equilibrium level (adjustment along the demand curve) as discussed *e. g.* in Rocheteau and Tasci (2007).

Also in a labour market model with search frictions, an impact of minimum wage increase is generally indeterminate. It may lead to higher employment if market is dominated by employers (the market wage is low). But higher market wages reduce firms' incentives to create jobs, thus leading to decrease in number of vacancies, which discourages workers from searching for a job and finally results in reduced employment rates (Rocheteau and Tasci, 2007). Also efficiency wage theory gives an argument that rising minimum wage above competitive equilibrium level does not necessarily create barrier to employment. According to this approach, higher wages

generate incentives for workers to increase their productivity (since wages determine productivity) which finally results in increased employment as potential reaction to minimum wage rise (Manning, 1995).

A general specification of model often used in in the literature is formulated as follows (e.g.: Neumark Wascher, 2007; Neumark, 1999 or Brown *et al*., 1982):

$$ER = f(wmin, X) + e \tag{1}$$

where:

ER	employment variable,
wmin	minimum wage variable,
X	vector of control variables
e	unobserved error term.

Usually both employment and minimum wage are expressed in relative terms, e.g. as employment-population ratio and minimum-to-average wage ratio, respectively. As for the control variables, a measure of business cycle position (*e. g.,* GDP, output gap, unemployment rate, etc.) is used to take into account demand factors behind employment fluctuations. Supply factors like demographic or structural variables (*e. g.* working age population, school enrolment) and institutional variables are also taken into consideration as potential explanatory variables. The latter represent the features of labour market that may potentially affect sensitivity of employees and employers to minimum wage legislation, like the unemployment benefit replacement rate or union density.

As for the other potential effects of minimum wage (*e. g.,* Boeri and van Ours, 2008; Gunderson, 2005; Neumark and Wascher, 2007), impact on labour force participation is ambiguous. The net effect will result from the interplay of two countervailing forces: employees withdrawing from the labour market in a reaction to employment falling because of minimum wage rise («discouraged worker» effect) and workers entering labour market in hope of finding better paid job («added worker» effect).

As for the impact on unemployment, it will again be interplay of «discouraged» versus «added» worker effect, with empirical literature pointing to expected smaller rise in unemployment vis-à-vis drop in employment (Gunderson, 2005). Minimum wage legislation may have also an impact on employment of other workers, especially those earning just above the minimum wage (so called «spillover effect»). This effect will mean increase in demand for workers just above the minimum if they are substitutes for the employees earning minimum wage and decrease if they are complements of workers at minimum wage. Similar mechanism may be expected for the workers earning just below the minimum wage.

The «spillover» (or «ripple») effect may be also defined and observed with respect to wages. Minimum wage legislation will modify not only wage of workers directly affected but the final effect may materialize throughout the wage distribution as firms try to restore at least some of their former wage structure. Impact of the

minimum wage has been also studied in the context of training and human capital formation, on school enrolment, on wage inequality as well as on the labour supply decisions. However in this paper we concentrate only on the impact of minimum wages on the demand side of labour market.

General conclusions from the large body of empirical studies on employment effect of minimum age (mostly on US and Canada) may be formulated as follows (Neumark and Wascher, 2007; Gunderson, 2005):

— the majority of authors find adverse impact of the minimum wage legislation. *E. g.,* according to the Neumark and Wascher (2007), two thirds of 102 studies surveyed resulted in negative employment effects and only 8 positive,
— if significant impact of minimum wage on employment was found, then respective elasticities were dispersed along wide range of estimates [3],
— adverse labour market effects of minimum wage legislation concentrate in particular segments, mostly low-skilled and young workers.

Similarly to the diversity of results for the main world economies, most of the scarce literature on the countries of Central and Eastern Europe reveals negative impact of minimum wage legislation on employment but the results are not unanimous. For instance, for the Czech Republic, Fialova and Mysikova, (2009) found significant adverse consequences of the minimum wage for labour market (unemployment rate) while Gottvald *et al.* (2002) and Eriksson and Pytlikova (2004) claimed that impact of minimum wage on employment is unclear and that the effect on wages turned out to be positive. For Hungary Halpern *et al*. (2004) reported sizeable adverse impact of minimum wage increase on employment and Kertesi and Köllő (2004) confirmed these results in case of employment opportunities in the small enterprise sector.

Research on labour market consequences of minimum wage legislation in Poland has not produced, similarly to other countries, commonly accepted conclusions. Melnyk (1996) found strong negative impact of minimum wage rise on employment and unemployment rates. He also identified a large degree of regional disparity with respect to employment elasticity of minimum wages. Conclusions of the study by Suchecki (1999) were as follows: there is strong adverse employment and unemployment effect of minimum wage increase especially for young workers (fifteen to twenty-four years old) and much weaker for other age groups. Boni (2004) claimed that it is not only level of minimum wage that matters, but also alternative sources of income in case of employees and non-wage labour cost for employers (especially for low educated and young workers). Ruzik (2007) found that minimum wage might constraint employment of unskilled workers. The most extensive study on minimum wage impact on labour market by Jacukowicz (2007), based on survey of companies, concluded that there was no impact of minimum wage on unemployment and no need for regional differentiation of minimum wage. Also Golnau (2007) drew the general

[3] Neumark and Wascher (2007) suggest to take –0.1 to –0.3 range as consensus view on employment elasticity of minimum wage, following Brown *et al*. (1982) survey study.

conclusion that minimum wage has rather insignificant impact on employment and unemployment. According to this author, if the adverse effects of raising minimum wage were to emerge, they would be restricted to low-wage workers (*e. g.* youths) and these effects would be rather small. Since that time no further econometric research in this area has been undertaken for Poland (according to authors' knowledge) while simultaneously the significant increase in the minimum wage level (and its ratio to average wage) was observed in Poland over last years.

3. Minimum wages in Poland

Poland is among 20 of the EU countries with national legislation setting a minimum wage by statute at national level [4]. Minimum monthly wage in Poland is negotiated on an annual basis within the Tripartite Commission for Social and Economic Affairs, composed of representatives of government, employees and employers. Then taking the negotiations' outcome into consideration, government sets legally binding minimum wage level for all the wage contracts in the subsequent year. If there is no consensus within the Tripartite Commission, the minimum wage is set unilaterally by the government.

Looking at the minimum wage level in Poland and other EU countries it can be noted that Poland belongs to the group with the low minimum wages expressed both in euro and in purchasing power standards (figure 1). However in 2011 it had the one of the highest minimum wage among the NMS, following only Malta and Slovenia.

During the last years we have observed a significant growth of minimum wage in Poland. The level of minimum wage more than doubled since 1999 (from 650 PLN in 1999 to 1386 PLN in 2011) and the changes were not uniform over time. The most significant rises were concentrated at the beginning of analysed period (about 8% per year in 2000-2001) and then in 2008 and 2009 (respectively 20.3% and 13.3%; figure 2).

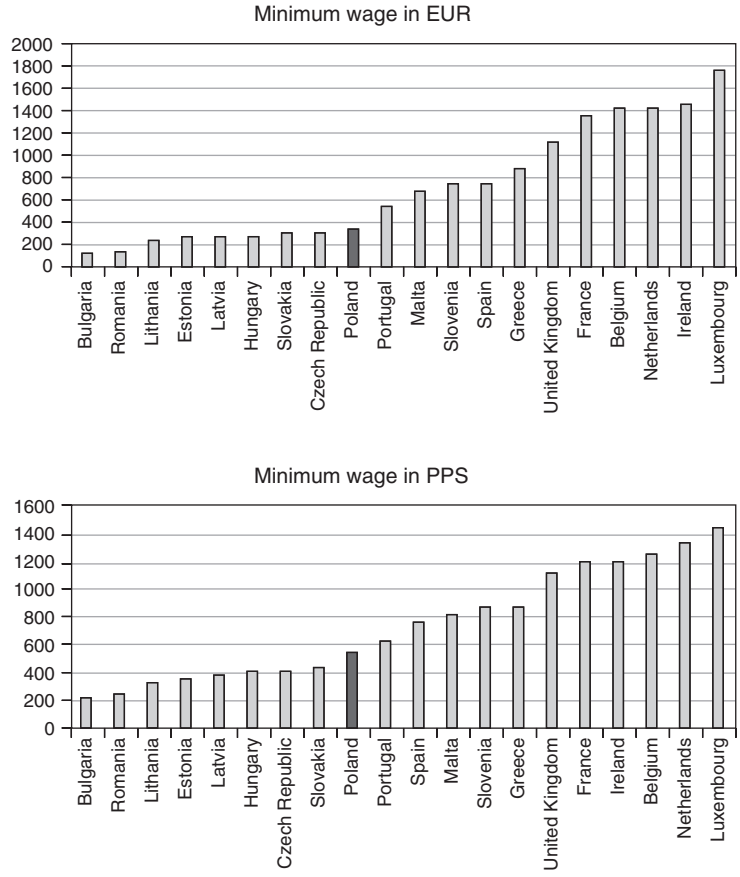
The inflation could only partially explain the growth of minimum wage, especially at the beginning of analysed period [5] (figure 2). The significant growth of minimum wage in 2008-2009 was much higher than the inflation rate. One may rather presume that the main driving force behind fast growth of minimum wage during 2000s was continuous pressure of trade unions exerted on government to raise minimum wage to the level of 50% of average wage [6]. The growth rate of minimum wages was also higher in 1999-2010 than the growth of average wages in Poland (figure 2). These tendencies resulted in changes of its ratio with respect to the average wage in Poland

[4] Czarzasty (2005).

[5] Unfortunately, the data concerning regional inflation rates have been published by Central Statistical Office since 2003 only.

[6] For instance, in July 2011 trade unions delivered a petition with 300,000 signatures to the parliament calling for an increase in the statutory minimum wage and demanding increase of the minimum wage to 50% of the average wage.

Figure 1. Average level of minimum wage in Poland and other EU countries in 2011

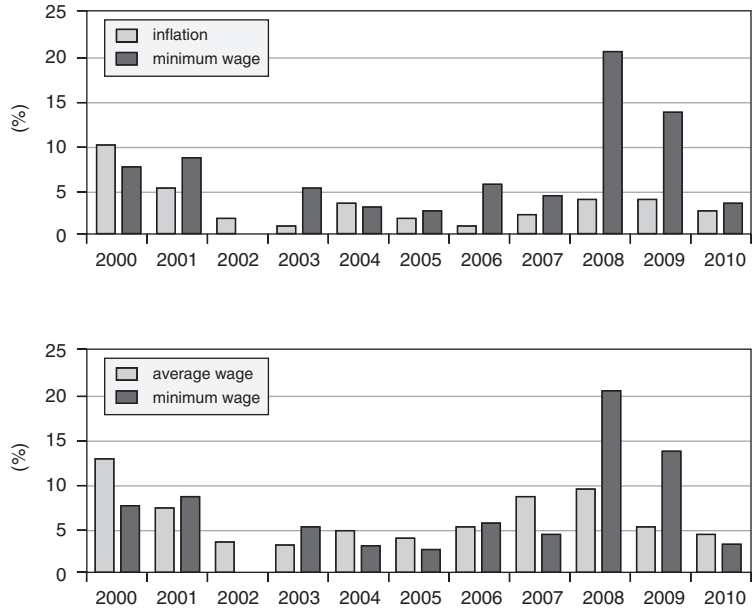


Source: Eurostat.

(figure 3). In 1999 the minimum to average wage ratio in Poland was about 38%. In subsequent years this ratio fluctuated and has decreased to 33% in 2007. The strong increase in minimum wage in Poland that was visible in 2008 and 2009 has led to increase in minimum to average ratio to 40%.

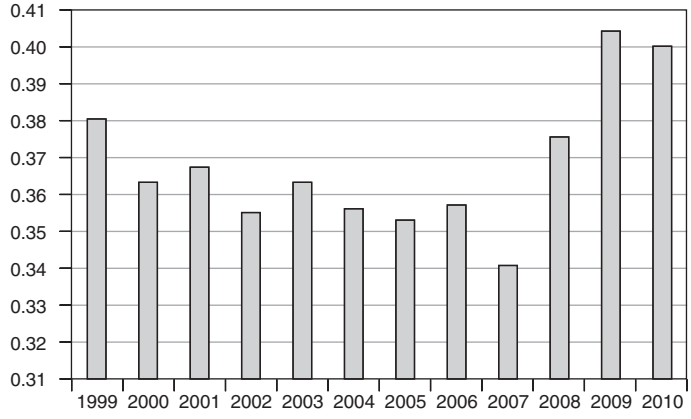
Looking at the development of minimum wages in Poland vis-à-vis NMS we may notice that, due to the relatively high growth rate during the last years, only in Slovenia and Malta minimum wages were in 2010 higher than in Poland. Even bigger differences can be observed while comparing the minimum wages in purchasing power standards, especially taking into account the differences in economic development. Although GDP per capita in Poland is relatively low among the NMS, the minimum wage level is higher than in Czech Republic, Hungary and Slovakia, the countries with higher level of economic development (figure 4).

Figure 2. Minimum wage, inflation and average wage growth in Poland in 1999-2010 (y/y, %)



Source: Ministry of Labour and Social Policy (*www.mpips.gov.pl*) and Eurostat.

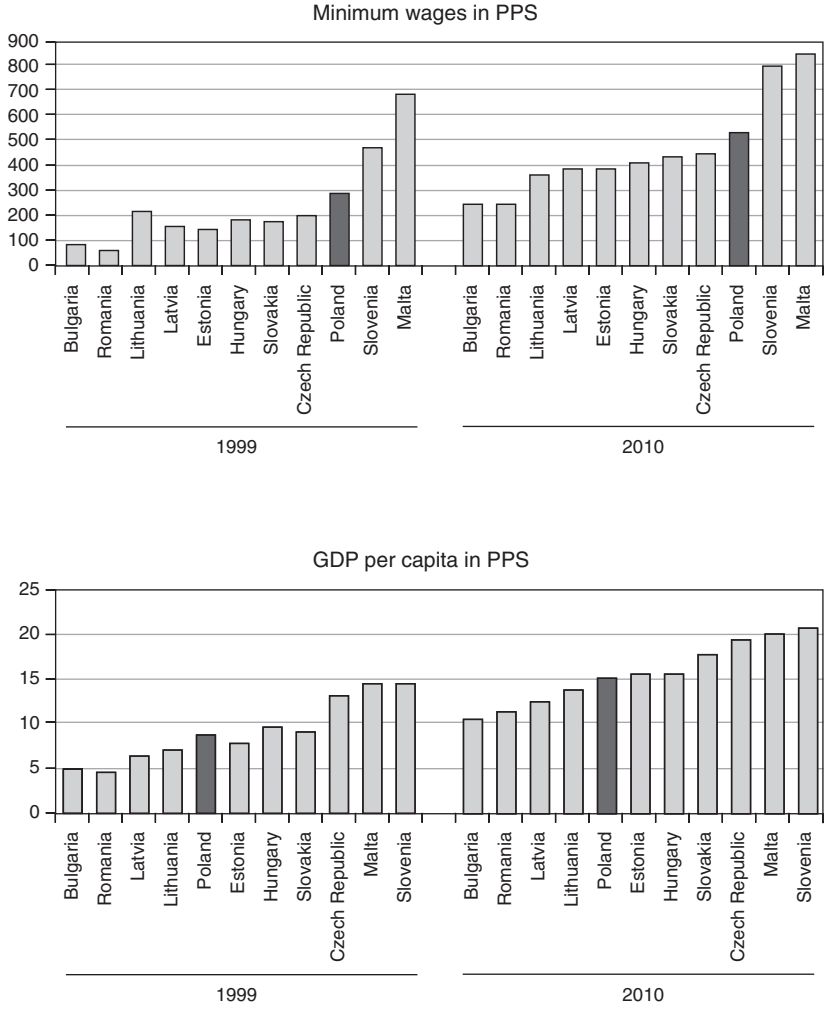
Figure 3. Minimum to average wage ratio in Poland in 1999-2010 (%)



Source: www.stat.gov.pl, own calculations.

Additionally, while analysing the impact of minimum wages on employment one should take into account quite substantial regional diversity of average wages in Poland. Therefore the uniformly set minimum wage can influence the labour demand on

Figure 4. Minimum wage and GDP per capita in PPS in Poland among other New Member States in 1999 and 2010



Source: Eurostat.

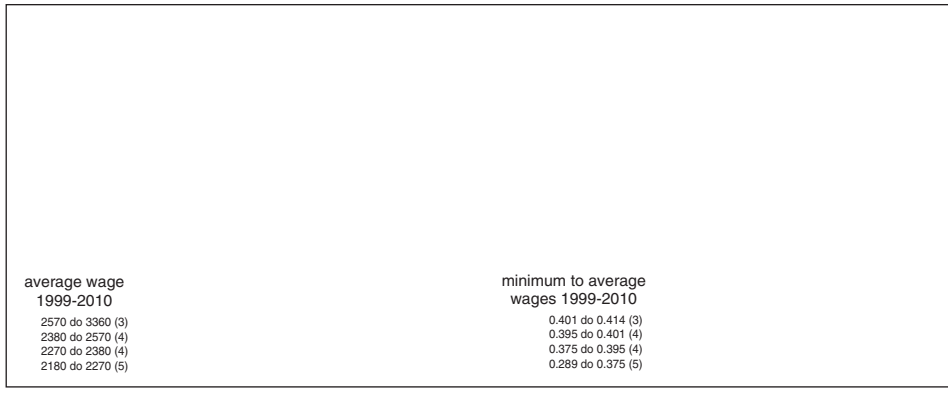
the regional labour markets to a various extent, potentially creating barrier to employment in low productivity (and low wage) regions.

Looking at regional differences in average wage level we may notice that the highest wages in Poland are observed in Mazowieckie (capital)[7] region (map 1). Wages above the average are observed also in Slaskie and Dolnoslaskie, the regions with considerable share of mining industry and Pomorskie (shipyard industry). The lowest wages in

[7] The administrative map of Poland is included in Annex 1.

Poland are observed in rural regions of the eastern part of Poland and also in some of the northern and western regions of Poland with high structural unemployment. The uniform economy-wide minimum wage in Poland on the one hand and regional diversity of average wage by regions on the other result in significant variation of regional minimum to average wage ratio (map 1). In 2010 the ratio of minimum to average wage varied from 0.30 in Mazowieckie (capital) to 0.44 in Podkarpackie region.

Map 1. Average wages in 16 Polish NUTS2 regions (left map, PLN) and minimum to average wage ratio (right map, %) on average in 1999-2010



Source: www.stat.gov.pl and www.mpips.gov.pl, own calculations.

According to other studies, regional variation in wages may be to a large extent explained by differences in labour productivity across the regions due to differences in regional structure of production (*e. g.,* Rogut and Tokarski, 2007; Wyszynski, 2008). Regions with low average wage levels are at the same time characterised by low productivity. And especially in those regions minimum wage, relatively high with respect to the regional average, might be the factor potentially limiting demand for labour since cost of employing low productive worker would in some cases outweigh the product of his work. It means that actual uniform across regions minimum wage may be too high from the point of view of economic conditions of the poorer regions of Poland and may be the reason for lower employment and higher unemployment, especially among young and less educated.

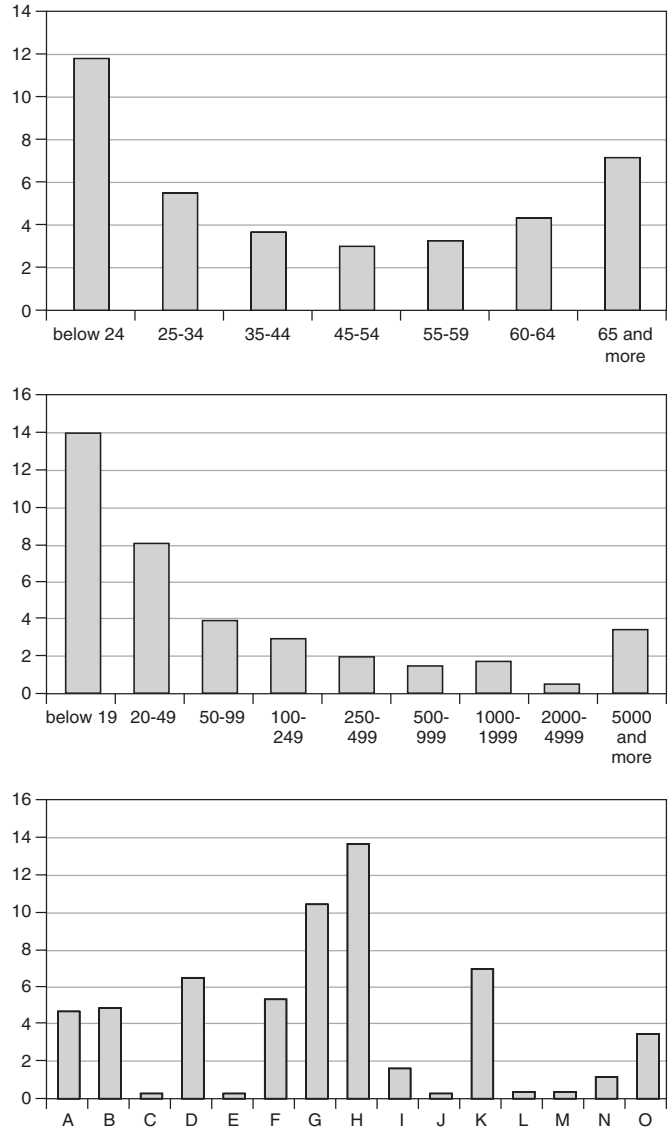
As for the number of workers covered by the minimum wages, the most recent estimate by the Ministry of Labour and Social Affairs is 3.8% of total employment in 2010[8]. Another source of the data about the distribution of wages in Poland is the firm surveys conducted by the Central Statistical Office every second year. According to the last survey (as of 2010) 17.9% of all workers earned the wage below 1772 PLN (the minimum wage in 2010 was 1317 PLN)[9].

[8] MPiPS (2010).

[9] In euro terms these are respectively 444 and 330 EUR.

Looking at the distribution of minimum wage recipients in Poland in [10] 2004 we may notice that it concerned mostly young people (below twenty-five years old, figure 5). Moreover, they were employed mostly in small enterprises (below 9 or

Figure 5. Minimum wage employees by age, firm size and economic sector in 2004 (%)



Source: Jacukowicz (2007).

[10] Unfortunately, no recent data were found.

between 10 and 19 employees) and the firms paying minimum wages were mostly located in services sector, especially in trade (sector G) as well as hotels and restaurants (sector H) [11]. In the next section of the paper we focus on the employment rate, both aggregate and for the groups of young workers and we analyse some factors that may explain employment rate performance.

4. Employment rates in Poland and their determinants

As the main aim of the paper is to verify the hypothesis that minimum wages in Poland could be potentially affecting the employment, we present some statistics about the employment rates in Poland. Looking at the average employment rate (fifteen to sisty-four) in Poland we may notice that among UE27 countries it is below the average (figure 6). Especially low is the employment rate among young (fifteen to twenty-four), and in 2011 it was more than twice lower than in the Netherlands (figure 6).

Looking at the regional diversity of employment rates in Poland we can notice considerable differences (map 2). In 2010 the highest employment rate (64%) in Mazowieckie, capital region, was 10 p.p. higher than the lowest value (54% in Zachodniopomorskie, western part). Even bigger differences were observed in employment rates among young (fifteen to twenty-four). The highest employment rate (32%) was about 12 p.p. higher than the lowest one (19.6%).

While analysing the impact of the minimum wages on employment at the regional labour markets in Poland we should however have in mind that labour costs are only one of the factors affecting labour demand. According to the Keynesian theory the main determinant of the demand for labour is the aggregate demand level, usually approximated by the GDP volume. In our case, as the data concerning the regional GDP in Poland are published with considerable delay [12] we decided to approximate it by the widest available measure and use data on total retail sales per capita (map 3). Not surprisingly the highest values were registered in the capital (Mazowieckie region) and other regions where big cities are located (Pomorskie, Wielkopolskie, Dolnoslaskie, Malopolskie).

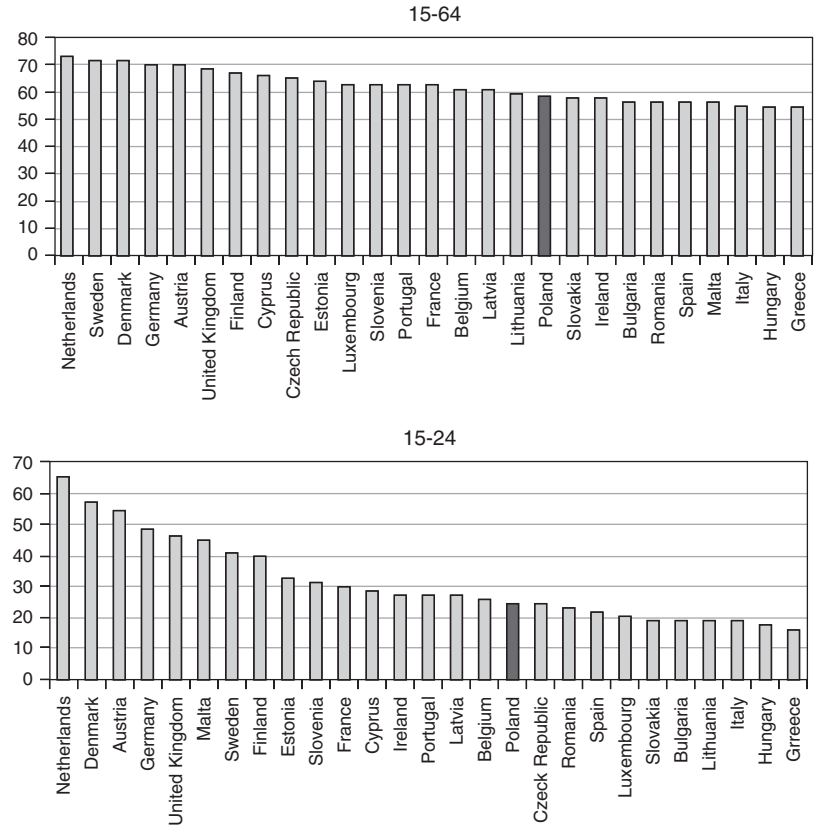
On the other hand the employment rate, especially among the younger workers should be negatively influenced by the student enrolment ratio (measured in the paper as the ratio of full time students to the population of twenty to twenty-four years old). Not surprisingly the highest enrolment ratios are registered in regions with big cities and big academic centres. The lowest ones are observed in the rural regions.

As a factor, which could on one hand additionally support measuring the business cycle, and on the other hand, covering the structural problems on some of the Polish

[11] These are the sectors in which there is the highest percentage of production in the shadow economy (GUS 2011). This is apparently factor that may complicate accurate measurement of minimum wage employment coverage and also may put bias on estimated effect of minimum wage legislation.

[12] Latest available data refer to 2009 (Local Data Bank, *www.stat.gov.pl*).

Figure 6. Employment rate in Poland and other EU countries in 2011 (%)

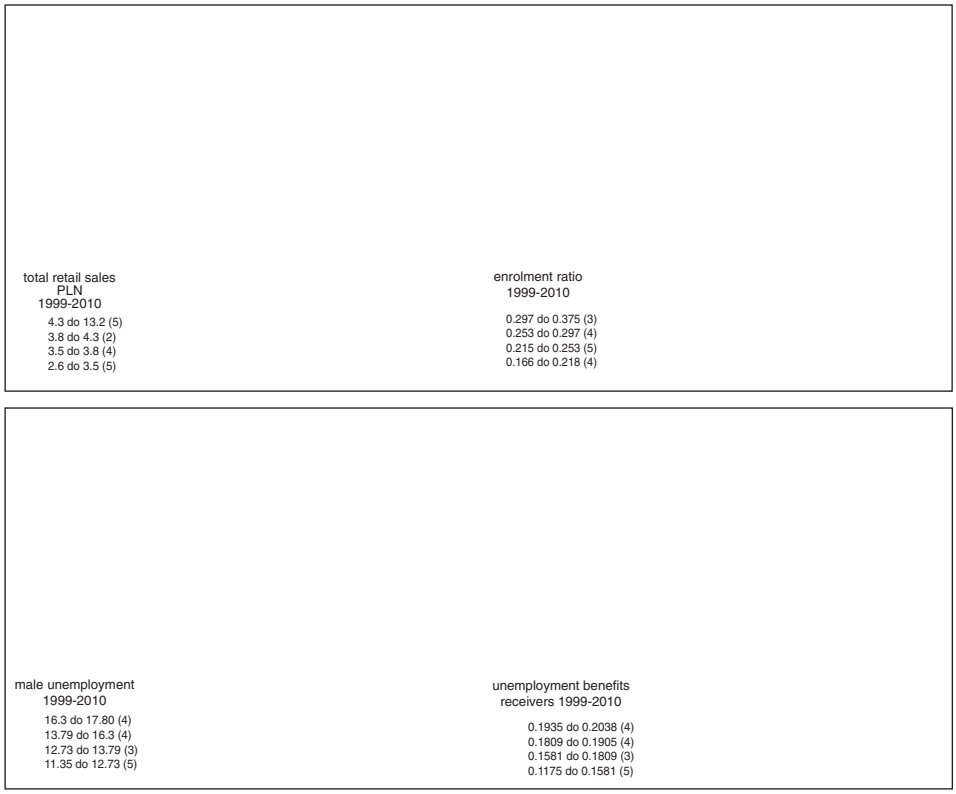


Source: Eurostat.

Map 2. Employment rate (15-64, left map and 15-24, right map) at the NUTS2 level in Poland on average in 1999-2010 (%)

Source: Eurostat.

Map 3. Regional diversity of total retail sales per capita, enrolment ratio, male unemployment and unemployment benefits receivers in Poland in 1999-2010



Source: CSO, *www.stat.gov.pl*, own estimates.

regional labour markets we use the male unemployment rate. High unemployment rate in some northern and western regions since the beginning of the transformation period is the result of liquidation of large State-managed Agricultural Farms (PGR) at the beginning of the 1990s in which approximately 40% of all employed in region worked.

Institutional factors other than minimum wage may also affect demand for and supply of employees. One of these factors is unemployment benefit and in particular its ratio to average or minimum wage (replacement ratio). While in general, overly generous unemployment benefits adversely affect motivation to work and thus increase unemployment rate, as Bukowski (ed), 2009 argue, this seems to be not the case for Poland where replacement ratio of unemployment benefit with respect to average wage decreased considerably over the last years (*e. g.,* from 42% in 1995 to 19% in 2009) and is lower than European average (for European OECD members). However, taken into account considerable regional variation of average wage, we treat unemployment benefits as potential explanatory factor in our analysis. Given

lack of data on replacement rate of unemployment benefits by region, we decided to take share of unemployed who receive unemployment benefits by region as a proxy. Looking at the regional data we can notice that in the western and northern part of Poland the share of unemployment benefits receivers is much higher than in the south-eastern part. This pattern reflects substantial regional variation of eligibility period for unemployment benefits, being the effect of differing conditions at local labour markets [13].

In the next section the analysed above factors will be used to empirically verify the impact of minimum wages on regional employment.

5. Econometric analyses

In the earlier research on minimum wage impact on employment, equation (1) was being estimated econometrically as time-series model. Since 1990s combined time series and cross section data analyses became more and more popular together with the progress in panel data econometrics techniques. Panel data models proved to be particularly useful in the analyses of impact of minimum wage legislation across regions, especially for short time data. The key problem with this type of models is whether the results based on panel data models are robust to relaxation of assumptions underlying the use of the panel-data methodology, especially on the stability of the regression coefficients both over time and across regions.

Mostly due to a limited number of individual observations for Polish regions, we decided to verify the impact of minimum wages on employment using the panel data techniques. We use data for the 16 NUTS2 regions of Poland, the analysed period is 1999-2010, therefore the total number of observations is 176. Our dependent variables are the total employment rate (age group fifteen to sixty-four), the employment rate among young (age group fifteen to twenty-four) and additionally the employment rate for age group twenty-five to thirteen-four.

Taking into account the properties of the labour market processes in Poland we decided to estimate the dynamic version of the model. This method includes the lagged values of employment as additional explanatory variables to measure the adjustment of employment to changes in labour demand and supply. We use the Arellano-Bond (AB) and Blundell-Bond system estimator (BB). The first one formed moment conditions using lagged-levels of the dependent variable and the predetermined variables with first differences of the disturbances. However Arellano-Bover (1995) and Blundell-Bond (1998) found that lagged levels can be weak instruments if the autoregressive process is too persistent. In these cases the estimated values of the parameters are downward biased especially when the number of periods is small. The Blundell-Bond system estimator uses additional moment conditions in which lagged

[13] In Poland, eligibility period for unemployment benefits is longer with higher local unemployment rate and some personal characteristics of the claimant (*e. g.* being over 50 with long work record, having dependent children or spouse without sources of income).

differences of the dependent variable are orthogonal to levels of the disturbances (Drukker, 2008).

While aiming at verifying impact of minimum wage on employment, we follow the strand of literature that suggests including in the list of regressors variables representing other than minimum wage supply factors, demand factors representing business cycle dynamics and some institutional variables, usually related to labour market characteristics (*e. g.,* Brown *et al*., 1982; Neumark and Wascher, 2007). As for other than minimum wage supply factors we will use school enrolment rate as one of our hypotheses is that young workers may be potentially the group mostly affected by minimum wage legislation [14]. The use of this variable in minimum wage impact models was extensively discussed in Neumark and Wascher (2007) and Brown *et al*. (1982) applied this approach in their seminal work. Business cycle dynamics is represented in our model by total retail sales (a proxy to unavailable for this time horizon regional data on GDP) as for instance in Dickens *et al*. (1999). We also use male unemployment rate as explanatory variables to control changes in the level of economic activity, as envisaged by the literature quoted above. Additionally, we use share of unemployed who receive unemployment benefits as one of the institutional factors other than minimum wage affecting employment.

We estimated the following version of model (1):

$$er_{it} = \alpha_0 + \alpha_1 er_{it-1} + \beta_1 w\min_{it} + \beta_2 y_{it} + \beta_3 se_{it} + \beta_4 u_{it} + \beta_5 ub_{it} + \xi_{it} \qquad (2)$$

where:

- er_{it} — log of employment rate on regional labour market i (i = 1, 2, ..., 16) in Poland at time t (t = 1999, 2000, ..., 2010) [15],
- $w\min_{it}$ — log of minimum to average wage ratio [16] on regional labour market i in Poland at time t,
- y_{it} — log of total retail sales per capita on regional labour market i in Poland at time t,
- se_{it} — log of school enrolment on regional labour market i in Poland at time t,
- u_{it} — log of male unemployment rate on regional labour market i in Poland at time t,
- ub_{it} — log of share of unemployment benefits receivers on regional labour market i in Poland at time t,
- ξ_{it} — error term.

The logarithmic specification of the model allows us to interpret the parameters estimates as the respective elasticities.

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[14] Variable representing the number of workers covered by minimum wage legislation might be also useful for controlling of the actual scale of minimum wage influence but these data are not available neither by regions nor even at aggregate level as time series.

[15] The definitions and sources of all the dependent and explanatory variables are provided in annex 2.

[16] As explained in section 3, unfortunately due to limited availability of the regional inflation data, we could not define our wage variables in real terms.

The results of this estimation for age group fifteen to sixty-four are presented in columns 1-2 of table 1. The results confirm negative and significant impact of the relative minimum wages on total employment rate. The estimated coefficient is –0.10 when estimated with AB and increases to –0.08 when using the BB system estimator. The results indicate also that in 1999-2010 total employment rate on regional labour markets in Poland was affected by business cycle variables (the total retail sales and unemployment rate). In general, higher enrolment ratio and also the unemployment benefits recipients ratio were conducive to decrease of the employment rate.

Table 1. Estimated parameters of equation 2 for the period 1999-2010 (*t*-ratios in the parentheses)

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Dependent variable	Employment rate 15-64		Employment rate 15-24		Employment rate 25-34	
Estimation method	AB	BB	AB	BB	AB	BB
Employment rate (–1)	0.58 (12.54)	0.61 (11.94)	0.43 (4.82)	0.58 (6.14)	0.37 (3.81)	0.49 (5.37)
Employment rate (–2)	—	—	—	–0.13 (–3.78)	—	—
Minimum to average wage ratio	–0.10 (–3.13)	–0.08 (–3.03)	–0.07 (–0.34)	–0.27 (–1.94)	–0.16 (–3.32)	–0.06 (–1.40)
Total retail sales	0.07 (4.65)	0.07 (3.78)	0.28 (4.01)	0.09 (2.29)	0.046 (3.39)	—
School enrolment	–0.06 (–2.26)	–0.08 (–3.03)	–0.57 (–3.62)	—	—	—
Male unemployment rate	–0.05 (–6.73)	–0.06 (–6.53)	–0.07 (–2.02)	–0.10 (–3.29)	–0.07 (–5.49)	–0.09 (–11.72)
Unemployment benefits receivers	–0.03 (–1.79)	–0.05 (–3.48)	–0.04 (–0.54)	—	—	–0.06 (–3.65)
Cons.	1.80 (11.96)	1.84 (10.37)	1.77 (3.14)	2.23 (5.34)	3.07 (8.50)	2.79 (8.21)
Obs.*	160	176	160	176	160	176
Sargan	60.86 0.24	71.37 0.24	63.84 0.17	68.60 0.26	63.63 0.17	64.12 0.47
ABond(1)	–2.95 0.003	–2.76 0.006	–2.99 0.003	–3.25 0.001	–2.92 0.003	–3.46 0.0005
ABond(2)	–1.01 0.31	–0.92 0.36	–1.98 0.05	–1.41 0.16	–0.008 0.99	0.55 0.58

AB – Arellano-Bond estimator. BB – Blundell-Bond system estimator. Sargan – Sargan test of overidentifying conditions. ABond(1) and ABond(2) – Arellano-Bond test for serial correlation of first and second order.
* In case of Arellano-Bond estimator, parameters are estimated on first differences of explanatory variables observations and as for Blundell-Bond estimator, observations expressed in levels are used. Hence in case of AB estimation number of observation is lower than for BB estimation by the number of regions (16).

Source: own estimates.

The results for the age group fifteen to twenty-four are shown in columns 3-4 of table 1. The minimum wage coefficient estimated by AB method is negative (–0.07) but not significant and the Arellano-Bond test for the serial correlation indicates the problems with second order autocorrelation. Therefore we decided to include the second lag of the dependent variable in the model. The BB estimations with two lags show the negative and statistically significant elasticity of –0.27 and the tests show no problem with model specification. We can notice that the employment rate of young workers on regional labour markets was also more (than in case of total employment) affected by the business cycle.

To check the robustness of the results, we took age group twenty-five to thirteen-five as a control group (column 5-6 of table 1). This group consists of people who have already been on the labour market since some time and for that group we may notice that employment rate is slightly less responsive that the one observed for total employment rate but not significant (BB method). Dependent variable has been also significantly explained by changes in unemployment rate and unemployment benefit coverage (both negatively) while not surprisingly, the enrolment ratio was not significant for this age group.

In the next step, trying to check the robustness of our results across time, we divided our sample into two subsamples: 1999-2004 and 2005-2010. During most of the first period the slowdown in economy was observed and the employment rates were decreasing, and the ratio of minimum wage to average exhibit tendency to decrease. In the second period, before the global crisis [17], the economic recovery took place and an increase in employment rate was observed (even in 2009-2010 the employment rate slightly increased), while minimum-to-average wage ratio considerably increased.

Table 2 presents the results for the period 1999-2004. They indicate that in this period minimum wage was not the factor limiting overall employment in Poland. The estimated parameter at minimum wage variable is negative but not significant both for the total and young employment rate. For the control group twenty-five to thirteen-four the coefficient on minimum wages is positive [18]. Employment in that period was mostly driven by the demand factors.

The opposite situation was observed in the second period (2005-2010, table 3). The minimum wage coefficient is negative and significant for both total and young employment rates. Also negative but insignificant minimum wage coefficient estimate was received for the control group twenty-five to thirteen-four. The demand factor (total retail sales) was not significant. The results indicate therefore that to a greater extent the cost and not demand factors determined the employment in that period. However, as this sub-period covers the slow-down of the Polish economy as

[17] Which in case of Polish economy was less visible. In 2009 Poland was the only EU country with positive growth rate.

[18] However one have to look carefully at the results for twenty-five to thirteen-four years old group as the estimated autoregression parameters are above the one estimated by OLS which indicates that the results in these cases are upward biased.

Table 2. Estimated parameters of equation 2 for the period 1999-2004 (*t*-ratios in the parentheses)

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Period	1999-2004	1999-2004	1999-2004	1999-2004	1999-2004	1999-2004
Dependent variable	Employment rate 15-64		Employment rate 15-24		Employment rate 25-34	
Estimation method	AB	BB	BB	BB pre	AB	BB
Employment rate (–1)	0.34 (2.42)	0.56 (5.26)	0.74 (2.35)	0.28 (1.91)	0.54 (2.24)	0.61 (8.77)
Minimum to average wage ratio	–0.06 (–0.43)	–0.05 (–0.44)	–0.31 (–0.47)	–0.47 (–0.69)	0.18 (0.60)	0.33 (2.97)
Total retail sales	0.07 (3.17)	0.07 (3.06)	0.48 (1.95)	0.20 (1.74)	0.05 (1.19)	0.05 (2.22)
School enrolment	—	0.03 (0.65)	–0.47 (–1.56)	—	0.10 (1.34)	0.14 (1.95)
Male unemployment rate	–0.13 (–5.80)	–0.12 (–4.27)	–0.17 (–1.32)	–0.35 (–3.34)	–0.13 (–3.54)	–0.13 (–3.60)
Unemployment benefits receivers	0.04 (1.07)	—	—	0.18 (1.78)	—	—
Cons.	2.46 (3.01)	1.60 (2.48)	—	2.78 (1.14)	—	—
Obs.*	64	80	80	80	64	80
Sargan	0.50	0.63	0.66	0.21	0.24	0.58
ABond(1)	0.07	0.05	0.06	0.04	0.04	0.03
ABond(2)	0.35	0.98	0.59	0.16	0.68	0.77

AB – Arellano-Bond estimator. BB – Blundell-Bond system estimator. BB pre – Blundell-Bond system estimator with predetermined minimum to average wage variable. Sargan – Sargan test of overidentifying conditions. ABond(1) and ABond(2) – Arellano-Bond test for serial correlation of first and second order.

Source: own estimates.

the reaction to the global crisis, cyclical factors (as represented by the male unemployment rate) proved significant as explanatory variable.

In the next step we check the robustness of the results across space by estimating equation (2) separately for high (table 4) and low (table 5) wage regions. The results show that, firstly, for overall and twenty-five to thirteen-four employment rates the estimated coefficients on minimum wage were negative and smaller (in absolute terms) for the high wage regions than for the low wage ones. However, in the high wage regions only the employment elasticities with respect to minimum wages for twenty-five to thirteen-four years old workers were statistically significant.

For the low wage regions we can confirm the significant and negative impact of minimum to average wage ratio on overall and twenty-five to thirteen-four employment rate. The estimated parameters for the fifteen to twenty-four workers are not significant. Therefore our results support the hypothesis that in low wage regions (being

Table 3. Estimated parameters of equation 2 for subperiod 2005-2010 (*t*-ratios in the parentheses)

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Period	2005-2010	2005-2010	2005-2010	2005-2010	2005-2010	2005-2010
Dependent variable	Employment rate 15-64		Employment rate 15-24		Employment rate 25-34	
Estimation method	BB	BB	BB	BB	AB	BB
Employment rate (–1)	0.82 (10.95)	0.66 (11.32)	0.91 (5.68)	0.56 (5.60)	0.27 (2.25)	0.35 (3.18)
Minimum to average wage ratio	–0.16 (–3.33)	–0.07 (–2.64)	–0.50 (–2.55)	–0.27 (–2.56)	–0.06 (–1.01)	–0.09 (–1.30)
Total retail sales	—	—	—	—	—	—
School enrolment	—	—	—	—	—	—
Male unemployment rate	–0.06 (–4.25)	–0.06 (–6.85)	—	–0.10 (–2.11)	—	—
Unemployment benefits receivers	–0.05 (–2.23)	–0.04 (–3.08)	—	—	–0.07 (–4.42)	–0.06 (–4.53)
Cons.	1.59 (7.35)	1.90 (10.28)	2.15 (4.03)	2.64 (5.18)	3.52 (9.01)	3.27 (10.57)
Obs.*	80	80	80	80	64	80
Sargan	0.35	0.23	0.98	0.98	0.69	0.67
ABond(1)	0.02	0.02	0.003	0.01	0.01	0.01
ABond(2)	0.35	0.26	0.21	0.11	0.81	0.56

AB – Arellano-Bond estimator. BB – Blundell-Bond system estimator. BB pre – Blundell-Bond system estimator with predetermined minimum to average wage variable. Sargan – Sargan test of overidentifying conditions. ABond(1) and ABond(2) – Arellano-Bond test for serial correlation of first and second order.

Source: own estimates.

the effect of low productivity) the minimum wages may be binding the employment, especially for relatively young workers (twenty-five to thirteen-four years old).

6. Conclusions

In this paper we have tried to verify the hypothesis that minimum wage may be the factor reducing demand for labour in Poland, in particular in case of some labour market segments and particular groups of regions. For this reason we have used NUTS 2 regional data in our analysis and also defined employment rate variable for the various age groups. Our analytical tool has been dynamic panel regression model, specified according to specification common in the literature.

The following main conclusions may be drawn from our study. First, minimum wage has had an adverse impact on employment in Poland during 1999-2010. Employment rate (our dependent variable) has been also co-determined by cyclical de-

Table 4. Estimated parameters of equation 2 for high wage regions (*t*–ratios in the parentheses)

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
	High wage regions					
Period	1999-2010	1999-2010	1999-2010	1999-2010	1999-2010	1999-2010
Dependent variable	Employment rate 15-64		Employment rate 15-24		Employment rate 25-34	
Estimation method	AB	BB	AB	BB	AB	BB
Employment rate (–1)	0.56 (14.46)	0.58 (9.19)	0.39 (3.61)	0.55 (7.08)	0.40 (7.80)	0.45 (6.48)
Employment rate (–2)	—	—	—	–0.20 (–5.27)	—	—
Minimum to average wage ratio	–0.12 (–3.00)	–0.04 (–0.94)	–0.06 (–0.40)	–0.07 (–0.49)	–0.11 (–2.25)	–0.09 (–2.07)
Total retail sales	0.05 (3.51)	0.02 (1.29)	0.18 (2.07)	0.04 (1.10)	0.04 (2.47)	0.04 (2.82)
School enrolment	—	—	–0.34 (–2.43)	—	—	—
Male unemployment rate	–0.05 (–5.21)	–0.08 (–7.31)	–0.10 (–2.41)	–.12 (–4.46)	–0.06 (–5.27)	–0.06 (–5.33)
Unemployment benefits receivers	—	–0.06 (–2.18)	—	—	—	—
Cons.	1.87 (11.91)	2.01 (13.38)	2.00 (3.61)	2.29 (4.61)	2.74 (12.22)	2.53 (7.57)
Obs.	80	88	80	88	80	88
Sargan	0.65	0.77	0.17	0.52	0.15	0.19
Abond(1)	0.05	0.03	0.05	0.03	0.03	0.05
Abond(2)	0.16	0.11	0.07	0.08	0.54	0.69

AB – Arellano–Bond estimator. BB – Blundell–Bond system estimator. Sargan – Sargan test of overidentifying conditions. ABond(1) and ABond(2) – Arellano–Bond test for serial correlation of first and second order.

Source: own estimates.

mand factors (sales per capita), labour market position (unemployment rate), demographic characteristics (school enrolment) and institutional factors (unemployment benefits coverage) with the expected signs of the parameter estimates. Second, our results show that during the period of substantial increase of the minimum wage (2005-2010) it is the group of young workers (of age fifteen to twenty-four) that has been the most adversely affected by the minimum wage legislation. For this group estimated elasticity of employment rate with respect to relative minimum wage is more much larger as for the total labour force (age fifteen to sixty-four). Third, our additional estimations have shown some evidence that a uniform national minimum wage may be particularly harmful to employment in poorest regions (with lower wages).

Table 5. Estimated parameters of equation 2 for low wage regions (*t*-ratios in the parentheses)

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
	Low wage regions					
Period	1999-2010	1999-2010	1999-2010	1999-2010	1999-2010	1999-2010
Dependent variable	Employment rate 15-64		Employment rate 15-24		Employment rate 25-34	
Estimation method	AB	BB	AB	BB	BB	BB pre
Employment rate (–1)	0.54 (9.62)	0.63 (10.52)	0.33 (3.31)	0.48 (3.82)	0.44 (3.54)	0.37 (4.89)
Minimum to average wage ratio	–0.15 (–2.22)	–0.11 (–2.53)	0.16 (0.54)	–0.05 (–0.16)	–0.14 (–2.39)	–0.11 (–1.80)
Total retail sales	0.10 (3.74)	0.07 (3.03)	0.28 (3.56)	0.11 (1.52)	—	—
School enrolment	–0.08 (–2.77)	–0.06 –2.52	–0.69 (–3.27)	–0.36 (–2.49)	—	—
Male unemployment rate	–0.05 (–3.09)	–0.05 (–4.87)	–0.09 (–2.00)	–0.14 (–2.92)	–0.10 (–9.33)	–0.11 (–11.50)
Unemployment benefits receivers	—	–0.03 (–2.22)	–0.10 (–2.16)	–0.10 (–2.07)	–0.05 (–2.49)	–0.04 (–2.10)
Cons.	1.88 (7.89)	1.69 (10.17)	1.82 (1.76)	2.70 (2.54)	3.30 (6.65)	3.51 (9.30)
Obs.	80	88	80	88	88	88
Sargan	0.15	0.04	0.42	0.34	0.83	0.53
Abond(1)	0.06	0.08	0.03	0.02	0.01	0.01
Abond(2)	0.72	0.92	0.28	0.22	0.50	0.61

AB – Arellano-Bond estimator. BB – Blundell-Bond system estimator. Sargan – Sargan test of overidentifying conditions. ABond(1) and ABond(2) – Arellano-Bond test for serial correlation of first and second order.

Source: own estimates.

Our main results proved to be rather robust to the tests applied in the paper but some grain of salt has to maintained. One of the reasons for our caution is limitation on the side of data that seriously restrained us from fully appropriate specification of the model. Some relevant variables could not be defined for the reason of the lack of data at regional level (*e. g.* unemployment and social benefits, minimum wage coverage) and the other variables had to be defined only as proxies of the correct specifications, like for instance nominal instead of real wages and sales because of the lack of the long enough data on regional CPI indices. Also statistics on regional variation of the cost of living, if available, would be very important for the proper assessment of minimum wage significance, given relatively large inequalities of level of regional development in Poland. Therefore the question of the impact of minimum wage legislation on market performance in Poland requires, on the one hand, further improvement of analytical tools, but on the other hand it also calls

for extending statistical information on the social and economic development at regional level.

As for the potential policy recommendations, we would like to highlight three of them. First, as our study seems to prove that minimum wage may be a binding factor for employment in Poland. Therefore, further increase of minimum wage over the average wage, should be very carefully analysed from the point of view of labour market impact, and rather avoided, as OECD experts recommend. Second, since our results show that impact of minimum wage on employment is more harmful in the poorer regions, there is some room for consideration the regional differentiation of minimum wage level to adjust it to local labour market conditions, which was also suggested by OECD. Third, our study clearly points young workers as the group especially vulnerable to minimum wage legislation. Unemployment rate in this group is already much higher than average and —as our results show— situation may be aggravated by the future minimum wage rises. Moreover, relatively low participation of students in the labour market in Poland was pointed out in some previous OECD studies. Therefore, further reforms of both higher education system and labour market to increase economic activity of students will alleviate negative impact of minimum wage on employment of younger workers.

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Annex 1. Territorial map of Poland (in the territorial breakdown in force since 1 January 1999)

Annex 2. Description of variables used in the model

Variable	*Definition*	*Unit*	*Source*
Employment rate	Ratio of the number of the persons aged 15-64 in employment to the total population of the same age group (based on the EU Labour Force Survey).	%	Eurostat
Employment rate 15-24	Relation of the number of the persons aged 15-24 in employment to the total population of the same age group (based on the EU Labour Force Survey).	%	Eurostat
Employment rate 25-34	Relation of the number of the persons aged 25-34 in employment to the total population of the same age group (based on the EU Labour Force Survey)	%	Eurostat
Minimum wage	Statutory minimum wage level.	PLN	Eurostat (for international comparison) and Ministry of Labour and Social Affairs (for Polish data)
Average wage	Average gross monthly earnings (approximated upon quarterly data).	PLN	Zatrudnienie i wynagrodzenia w gospodarce narodowej (Employment, wages and salaries in national economy). Central Statistical Office (CSO), *www.stat.gov.pl*
Minimum to average wage ratio	Minimum wage divided by the average wage.	%	Own calculations based on CSO data
School enrolment	Share of full time students to the total population of 20-24 years old.	%	Own calculations based on Local Data Bank, CSO, *www.stat.gov.pl*
Total retail sales	Retail sales of goods (including VAT, current prices) refer to entities employing more than 9 persons divided by the total population.	Thousands of PLN	Own calculations based on Local Data Bank, CSO, *www.stat.gov.pl*
Male unemployment	Unemployment rate of men aged 15-64.	%	Local Data Bank, CSO, *www.stat.gov.pl*
Unemployment benefits receivers	Share of unemployed receiving the unemployment benefits in total unemployment.	%	Local Data Bank, CSO, *www.stat.gov.pl*

Comment on «The impact of minimum wage on employment in Poland», by Aleksandra Majchrowska and Zbigniew Żółkiewski

J. D. Tena *

Introduction

Estimating the effect of the national minimum wage (NMW) on employment is an issue of great relevance for both academic researchers and policy makers. Following the current economic crisis, it has become an even more interesting topic because the importance of NMW should be more evident in periods of downturn and for countries and regions that more affected by financial turmoil. This paper tries to address this issue for the Polish economy by estimating the effect of NMW on employment for different regions and groups of workers. The authors conclude that NMW does not have a significant aggregate impact but could negatively affect employment for some specific groups, such as young workers.

The analysis has at least two original aspects. First, although estimating the effect of NMW is not a new topic, the existing research typically does not analyse regional differences but mainly focuses on the study of discrete increases in NMW [Dickens *et al.* (2010) and Stewart (2004)], age-related increases [Dickens *et al.* (2007) and Fidrmuc and Tena (2012)], or surveys/meta studies [Dolado *et al.* (1996) and Doucouliagos and Stanley (2009)] [19]. The reasons for this lack of analysis will be explained in the following section and are mainly based on the difficulty of finding a control group of regions. The second contribution is that the analysis is conducted for an Eastern European country.

The remainder of this comment discusses the econometric approach used in the estimation, followed by some concluding remarks.

Methodological aspects

It is always difficult for the social sciences to estimate the real impact of a given policy action. In this particular context, a perfect experiment to analyse the effect of NMW would be to observe the employment output of a given region, then clone the region and impose a NMW under similar circumstances. The average difference between the results observed in the two regions would provide an estimation of the impact of the NMW. Of course, this ideal experiment cannot be performed, but it is still possible to run a relatively similar analysis. In order to do that, it is necessary to

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[19] Card and Krueger (1994) is a remarkable exception to this pattern.

define a treatment group (those directly affected by the NMW), and a control group (people very similar to the first group except for the fact that they are not affected by NMW).

The paper proposes the following specification (equation 2 in the paper) to estimate the impact of the NMW-to-average wage ratio on the employment rate of region *i* at time *t*:

$$\frac{\#employed_{it}}{working\ \ age\ \ population} = \alpha_0 + \alpha_1 \frac{NMW_t}{Average\ \ wage_{it}} + \alpha_2 X_{it} + \xi_{it} \qquad (1)$$

where X_{it} is a set of control variables and ξ_{it} a stochastic error component.

My first comment to this approach is that I am very sceptical of the fact that estimation of parameter α_1 provides relevant information about the impact of NMW on employment, mainly because all Polish regions face the same NMW. In other words, we do not have the treatment and control groups of regions that are required for a sound estimation. Because of this, the regional variation of the NMW-to-average wage ratio is caused by the evolution of the average wage.

As mentioned in the introduction, perhaps because NMW is typically set at the national level, there are few attempts in the previous literature to estimate the impact of NMW across regions. One exception is Card and Krueger (1994) who, in their seminal paper, developed a comparative analysis of employment in fast food restaurants in New Jersey and Pennsylvania after the April 1992 increase in New Jersey's minimum wage.

In addition, there are at least two additional weaknesses of the approach taken by the paper. The first is the potential endogeneity of the key explanatory variable, given that both NMW and average wage are affected by the economic cycle. This type of endogeneity cannot be corrected by including individual effects that are fixed through time in the equation. Indeed, the significantly negative impact of NMW found in some estimations could simply be due to the positive correlation between the numerator of the dependent variable and the denominator of the NMW-to-average wage ratio. Second, it is also problematic that both the dependent and the key explanatory variables are defined as ratios because we cannot identify the individual impact of each variable. It would be more helpful to separately estimate the impact of NMW and average wage on employment and activity.

Conclusions

The paper presents an empirical analysis on the relationship between the employment rate and the NMW-to-average wage ratio across regions. Although there are important flaws that make me very cautious about the conclusions of the paper, I think it is important to value its originality. Furthermore, I think this paper should not be considered conclusive but an initial step encouraging the continuation of work on

this type of analysis in the future. Some suggestions are (1) to extend the time dimension of the data and compare the aggregate impact of NMW through time and (2) to compare the effect of different NMWs in different groups of countries.

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