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Gender Inequality and Economic Growth in Spain: An Exploratory Analysis[+]

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ABSTRACT. This paper compares the geometric variant of the Gender-Related Development Index with that of the Human Development Index for Spanish provinces (EUROSTAT Nomenclature of Territorial Units for Statistics-3, NUTS-3) in 1959, 1981, and 1999. The main objective is to carry out an exploratory analysis of the relationship between these indices and two alternative indices of gender inequality— the Relative Status of Women and the Gender Inequality Index. An analysis of the relationship between these indices and economic growth at the provincial level is also conducted.

Key Words: Gender Inequality, Economic Growth, Human Development.

JEL Classifications: O15, O18.

1. INTRODUCTION

Over the last three decades, development economics has opened up a research program into the construction and use of synthetic welfare indices. Following early work by Nordhaus and Tobin (1972), Seers (1972), Usher (1973), Sen (1976, 1979 and 1981), Goedhart et al. (1977), Morris (1979), and Morris and McAlpin (1979), a series of criticisms and new proposals led to what Fukuda-Parr (2003) termed the "human development paradigm." This new paradigm is related to Sen and Anand's ideas on capabilities. The indices have contributed to a burgeoning literature on welfare since 1990. These indices are products of refined articulation and expansion of basic concepts and measuring tools proposed by Sen and Anand (1990, 1994a, 1994b, 1995, 2000). Through them, the human development paradigm has extended into gender development (Firebaugh and Beck, 1994; Bardhan and Klasen, 1999; Villota, 1999; Dijkstra and Hanmer, 2000; Robeyns, 2003; Maestro and Martínez, 2003; Martínez and Cairó, 2004; Klasen, 2006; Dijkstra, 2006; Schüler, 2006). This research program has raised many new issues. This paper focuses on the direction and nature of the relationship between the various welfare indices and economic growth. We therefore perform a fairly long-run intertemporal analysis of gender inequality in a country that is transitioning toward greater development. This differentiates the paper from its predecessors, given that most research of this genre has focused on static or, at best, short-run analysis in developed or developing countries.

Literature on welfare indices in Spain has focused on a series of provincial and regional analyses of the physical quality of life index (henceforth, PQLI) (Domínguez, 1999, 2002; Domínguez and Guijarro, 2000, 2001), international comparisons of the PQLI and the human development index (henceforth, HDI) (Escudero and Simón, 2003), and provincial and regional reconstruction of the HDI, the gender-related development index (GDI), and the human poverty

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index for the period 1980- 2000 (IVIE, 2004a, 2004b, 2004c, 2004d, 2005a, 2005b; Herrero, Soler, and Villar, 2004). The research laid out here aims to take advantage of the somewhat backward nature of Spain's fairly recent economic past to advance the aforementioned literature in order to investigate the nature of the country's advancements in development and gender equality.

The underlying hypothesis of the paper, therefore, is that distributive issues between genders are important when measuring welfare. Hence, the research presented here has two objectives. First, it is designed to perform a comparative analysis of the geometric variants of the GDI (GDIg), the HDI (HDIg) and the Relative Status of Women (henceforth, RSW) for the Spanish provinces in 1959, 1981, and 1999. Three indices—life expectancy, education, and income indicators—are used to calculate the GDI. The additive nature of the GDI and HDI can lead to erroneous interpretations since an increase in their values can be due to an increase in a single component. Therefore, in this study we propose the geometric variants GDIg and HDIg, whose multiplicative natures avoid this type of error and its implication in economic policy. The study will include analysis of a) interprovincial, or σ-convergence of the three indices; and b) gender convergence, from this point onward referred to as γ-convergence, by comparing the GDIg and HDIg using the gender inequality index (henceforth, GII). The second objective involves an exploratory analysis of the GDIg, HDIg, RSW, and economic growth at the provincial level. This is done to determine the extent to which economic growth influences gender inequality (or perhaps whether gender inequality influences growth) and to discover why gender inequality persists in certain Spanish regions but generally tends to converge due to strong migration flows among provinces. The results are relevant to the discussion about the relationship between gender inequalities and economic growth in the current development and transition economics.

The paper is structured as follows. The following section provides a brief description of the construction of the GDI, RSW and GII. Section 3 summarizes the nature and direction of the relationship between gender development/gender inequality (GDIg, RSW, and GII) and economic growth. Section 4 focuses on the construction of the GDIg, the HDIg, and the RSW for the Spanish provinces in 1959, 1981 and 1999. Section 5 provides details of the exploratory analysis of gender development, gender inequality and growth. The paper concludes by presenting the main results and offering some considerations for future research.

2. GENDER DEVELOPMENT AND GENDER INEQUALITY INDICES

The introduction of the GDI by the United Nations in 1995 coincided with the institutionalization of feminist economics (The International Association for Feminist Economics was created in 1992 and the first copy of the journal *Feminist Economics* was published in 1995). The GDI is a compound index that evaluates gender equality and is constructed similar to the manner in which the HDI is built: that is, the GDI is essentially the HDI adjusted (downwards) for gender inequality. Following the *Human Development Report* issued by the United Nations Development Programme (UNDP, 1995), while the HDI measures average achievement of a region or country's adult population, the GDI adjusts this average achievement to reflect the inequalities between men and women in three dimensions. A low GDI value represents a high degree of inequality. In order to obtain the HDI and the GDI, the principal health indicator is taken as the index of life expectancy at birth; the indicator of knowledge is taken as an education index (the rate of adult literacy weighted at 0.67 and the gross rate of primary, secondary, and tertiary schooling weighted at 0.33); and the standard-of-living indicator is the GDP per capita.[1]

The GDI is not a measure of inequality in itself, but is interpreted in relation to the HDI. The greater is the positive difference (implying HDI is higher than GDI), the greater is the area's gender inequality (Schüler, 2006; Klasen, 2006). In this way, it is possible to get some notion of the extent of gender inequality by applying a simple formula known as the gender inequality index (GII), which was proposed by the UNDP (1995):

(1) $$\text{GII} = (\text{HDI} - \text{GDI})/\text{HDI},$$

where GII=0 implies perfect equality between men and women for a specified geography. Despite the simple construction of this index, its interpretation can cause difficulties when comparing territorial units, since a low GII value may be due to the combination of small or large GDI and HDI values that are close in absolute terms.

The GDI's construction and measurement also have problems. Of particular interest to the research here is the calculation of the female contribution. The average international urban female-male wage ratio is about 75 percent: albeit, according to 1995 UNDP data the female/male wage ratio in developed countries (76.2 percent) is higher than that of underdeveloped countries (73 percent). Still the measure tends to reflect populations of urban areas of nations. As a result, published wage gaps between men and women could be underestimated, given that such differentials are greater in rural areas and informal sectors of the economy (UNDP 1995; Dijkstra and Hanmer, 2000). In part this is simply because official statistics often fail to estimate female employment in some rural areas and certainly in the informal sector (Benería, 1981 and 1993; Dixon, 1982; Buvinic and Mehra, 1990; Cloud and Garrett, 1997; Dijkstra and Hanmer, 2000; Mammen and Paxson, 2000): indeed, a lack of government monitoring defines informal sectors. Consequently, the index is likely to be underestimated if the share of unrecorded female labor in a sector is larger than the gender wage differential in that sector, and overestimated in the opposite case. It is clear that the GDI incorporates, but does not measure, discrimination. Some authors have, therefore, proposed a return to using early HDI formulations by gender such as the Women's Development Index, calculated through 1995. The RSW is a variant of these formulations (Dijkstra and Hanmer, 2000). Using the same indicators as those used to construct the HDI, the RSW is calculated as:

(2) $$\text{RSW} = \frac{1}{3}\left(\frac{H_W}{H_M} + \frac{K_W}{K_M} + \frac{w_W}{w_M}\right),$$

where H_M and H_W represent, respectively, male and female life expectancy, K_M and K_W the educational levels of each gender (both calculated on the same scale as the HDI), and w_M and w_W the rates of return to male and female labor. Assuming men and women work the same hours (including domestic work) and borrowing the standard neoclassical assumption that wage rates approximate the rate of return to labor, the w_W/w_M ratio should be equivalent to the total income earned by women Y_W divided by the proportion of women in the total population p_W (Dijkstra and Hanmer, 2000). The formula could, therefore, be rewritten as

[1] See Appendix for indices calculations.

(3) $$\text{RSW} = \frac{1}{3}\left(\frac{H_W}{H_M} + \frac{K_W}{K_M} + \frac{Y_W}{p_W}\right).$$

All of the RSW components have equal weight. Therefore, on a scale of 0 to 1, if

(4) $$\text{RSW} = \frac{H_W}{H_M} = \frac{K_W}{K_M} = \frac{Y_W}{p_W} = 1$$

there is equality between men and women. If $\text{RSW} < 1$, women are discriminated against and if $\text{RSW} > 1$, then men are discriminated against. This new index can help to identify areas with high levels of inequality at specific levels of development, such as women's income participation, which depends on their level of involvement within the active population and the gender wage gap (Martínez and Cairó, 2004). It can also be used in tests of the possible influence of inequality on the rate of economic growth.

3. GENDER DEVELOPMENT AND ECONOMIC GROWTH

There has been a parallel evolution in the literature on gender inequality and economic growth and the debates over economic inequality and growth (Domínguez, 2002b). Research initially explored the relationship between economic growth and the evolution of gender inequality. However, recent studies have turned this around and explored the influence of gender inequality on growth.

The relationship between economic growth and gender inequality was originally analyzed by Adam Smith (1776) and Nicolas de Condorcet (1794): the wealth of nations—and therefore their level of development—was correlated with the gradual decrease of the level of inequality between men and women (Nyland, 1993; Sutherland, 1995; Groenewegen, 2003). The Smith-Condorcet thesis was adopted over a period of many years by neoclassically inspired development literature, an approach adopted by influential international institutions such as the World Bank. New theories of growth have recently verified it (Lagerlöf, 2003): gender equality is positively and highly correlated with per capita income and negatively with fertility rate (in rich countries women have a higher status and fewer children than in poor countries). For the years 1970 and 1992, the correlations between the GDI and the GDP per capita in a sample of 130 countries have respective coefficients of 0.83 and 0.81; and the data show that the improvement in GDI was more pronounced in those countries that grew more quickly (Forsythe, Korzeniewicz, and Durrant, 2000). A study by Boserup (1970) produces similar results and plots a gender inequality curve resembling Kuznets's inverted U curve. In the early stages of growth there is an increase in inequality between men and women up to a certain threshold. From that point there is a decrease in inequality in the long term due to the effects of technological progress on growth—the expansion of market opportunities reduces fertility rates, which in turn suppresses discriminatory practices in education and the work environment (Boserup, 1970 and 1987). This model was questioned by some economists on account of the impoverishing effects of some structural adjustment policies on women and the effects of globalization (Elson, 1995, 2000; Benería, 2000; Pyle and Summerfield, 2000; Bakker, 2000; Berik, 2000). Such policies were designed to eliminate the downward section of the inverted U curve. It has since been shown that at low levels of economic development initial improvements in GDP per capita do not result in a significant increase in GDI and that, at a certain point, the GDI improves more rapidly alongside a rise in GDP per capita until reaching a certain threshold beyond which GDI returns from GDP growth per capita diminish (Dijkstra and Hanmer, 2000). Finally, no empirical evidence exists to justify Boserup's inverted U curve. The only evidence is a set of significant linear correlations between the GDI and the natural log of GDP per capita for 1970 and 1992 (Forsythe, Korzeniewicz, and Durrant, 2000).

Much debate has recently begun to center on the influence of gender inequality on growth. The current debate revisits many of the arguments from the debate on the effects of economic inequality on growth (Domínguez, 2002b). On the one hand, and following the neo-Keynesian tradition of the 1950s and 1960s, some authors have reached the conclusion that gender inequality is stimulating for growth. The result appears to be linked to the structure of the economy, such that in certain contexts (for instance, semi-industrialized middle income countries that from 1975-1995 developed an export-oriented industry using female labor), the segregation of the female work force and the high differentials between sexes in wages and education lead to high rates of economic growth. Gender inequality stimulates both investment and investment productivity due to the effect of low female wages on technology transfer. In high-income industrialized countries or very underdeveloped low income countries, the relationship between gender inequality and growth could be null or negative (Seguino, 2000). In the wake of the new international consensus that economic inequality advocates lower growth, on the other hand, a negative correlation between the education differential by gender (the rate between the educational levels of men and women based on primary and secondary schooling) and the level of development has been shown for a wide range of countries in 1975, 1980, and 1995 (Hill and King, 1995). Indeed, Hill and King find that the larger the differential, the lower are GDP per capita and life expectancy, and the higher are infant death rates and fertility rates. Similar results have been obtained by using the female school achievement as a growth predictor (Ranis, Stewart, and Ramírez, 2000). Likewise, it has been shown that gender inequality in education has a direct negative effect on economic growth, which leads to a decline in human capital accumulation and an indirect negative effect via its impact on capital investment and population growth (Klasen, 2002).

4. THE GDIg AND THE RSW FOR SPANISH PROVINCES, 1959-1999

In addition to the cross-country gender analysis outlined in the previous section, an intra-country analysis can be carried out by combining the feminist literature on growth and women's well-being with literature on regional development and differences throughout the development transition process (Kjeldstad and Kristiansen, 2001; Esteve-Volart, 2004; Martínez and Cairó, 2004; Basu and Basu, 2005). The spatial dimension of our analysis is focused on the Nomenclature of Territorial Statistical Units-3, NUTS-3 in EUROSTAT classification, which divides Spain into provinces (equivalent to UK County Councils).

Using available sources of information, three periods were selected for the construction of the GDIg, HDIg, and RSW, in an attempt to achieve, as far as possible, homogeneity in the time intervals and to reflect different stages of the Spanish economy—1959 as the beginning of the development process; 1981 as the period of industrial crisis, and 1999 as the convergence period following Spain's entry into the EU. The philosophy behind the GDI, HDI, and RSW has also been respected as far as possible, although some modifications have been made to their components (income data, income maximum and minimum, female income calculation, education data). Due to data difficulties, a new method is proposed for the construction of an index.

Since it is comprised of three component indices, the GDI can be constructed as a geometric variant as long as no particular set of relative weights is attributed to the components. We label the result the GDIg, the geometric mean of the three components (see Appendix). As opposed to the additive version, the value of the multiplicative equivalent index is improved only if each of the components behaves in the same direction (Sagar and Najam, 1998). Therefore, all three components are essential to determining the level of gender development. Hence, while the additive nature of GDI supposes that the index can increase as a result of an increase in any one of its components, GDIg is not as sensitive to changes in a single component.

Regarding component modifications, the first is the use of the minimum and maximum values for the GDP per capita. Given that our series starts several decades earlier than that of the UNDP and refers to the provinces of a single country, we have provisionally adopted 20,000 and 8,000,000 pesetas in constant year 1986 terms as GDP per capita's minimum and maximum, respectively. These have been obtained in the following way. Following the procedure corresponding to the first report from the UNDP (1990), the lowest value for the previous few years has been taken, which in the BBVA income series can be calculated in 1955 with the female per capita GDP data for the active population in the 1950 Census and which correspond (in rough figures) to the province of Cáceres—$[(92{,}616{,}000{,}000 \cdot 0.07)/295{,}761]$. To deduce the maximum we applied 2.5 percent, which is the result of the quotient 100/40,000 from the UNDP data. These values are then used to calculate the RSW female/male income ratio, unlike Dijkstra and Hanmer (2000), who for this particular indicator prefer to forgo use of the systematic GDI maximum and minimum scale. For this reason, as with the GDIg, we opt not to apply natural logarithms.

The study years contain the values closest to the set of data that is taken as a reference, which is the market-price GDP of the BBVA Foundation (1999, 2000) income series for 1959, 1981, and 1999. The GDP per capita has been calculated using the population for 1960 and 1981 from the *Population Census* and for year 2000 from the *2001 Statistical Year Book of Spain*. The female GDP per capita has been calculated by multiplying GDP by the share of the women among the total working population (from the *Population Census* of 1960 and 1981 and from the four-month average extracted from the *1999 Economically Active Population Survey*, and the denominator is population of all women for the corresponding years.

Unfortunately, due to a lack of statistical information it is not possible to use wage differentials. A national wage differential for 1959 and 1981 is unavailable. Indeed, since in the 1960s only very general information regarding aspects of national production was available (Benería, 1977). Increased feminization of the working population and an increased focus on the manufacturing and service sectors have introduced biases that are difficult to eliminate (Capel, 1999; Klasen, 2006). In 1959, if a large share of the female working population was to be employed in the resource industries, the index for income could be biased downward if the share of the unrecorded working female population over the total working population was greater than the wage differential in that sector, and biased upwardly in the opposite case. The problem becomes more serious given that, research advances aside (Silvestre, 2005), no data are available for provincial wage differentials during the second half of the 20th century. A fall in national differentials between 1959 and 1981 (as the female working population moved out of agriculture) and a tendency towards convergence in disparities at the provincial level can only be speculated.

After 1981, it is possible that the wage differentials and the disparities arising from them rebounded. The first available national figure is to be found in the *Survey on Living Conditions and Work in Spain 1985-1986* (a sample survey of 60,000 homes) and indicates a national female/male wage ratio of between 55 and 60 percent. This is a rather unreliable estimate since it is based on controls for the various types of contracts that exist. The *Pilot Study on Discrimination against Women in the Workplace*, which was carried out in 1988, was generated from 3,000 interviews. It provides information that suggests a national wage ratio between 80.8 percent and 83.0 percent, depending on the different controls that are applied (Hernández, 1995 and 1996; Ugidos, 1997; Moltó, 2002). For the 1990s, the 1995 *Wage Structure Survey* combines data from a survey of 175,000 employees in the manufacturing and service sectors—the *Survey on Wages in Industry and the Service Sector*—with those from another on the budgets of 25,000 homes—the *Family Budget Surveys*. It indicates a notable rise in the differentials after 1988—to 70 percent in 1995, between 74.9 percent and 78.1 percent for 1996-1999, and between 77.1 percent and 79 percent for 1994-1997, respectively (Martín and Zarapuz, 2000; Moltó, 2002). Durán (1997) reaches the same conclusion using tax sources for 1994, as does Lago (2002). Based on their work, the generally accepted average for the 1990s ranges between 70 percent and 72 percent. Finally, Herrero, Soler, and Villar (2004) from the IVIE (2004d) calculate that the ratio of the average female to average male wage for 1989-2000 period was 71 percent in Spain, ranging from 78.2 percent in the Canaries to 63.7 percent in Aragón.

With regard to life expectancy and education we follow UNDP standards. In our case, data on education correspond exclusively to the adult literacy rate. Since this variable accounts for two thirds of the education achievement indicator and progress in the area of schooling is strongly correlated with that of reading and writing abilities, it is reasonable to assume that the result would be very similar if unbiased schooling data were used. The problem, however, is that no such data exist at the regional level in Spain. The gross education rate does not enable students who live in one province and study in another to be properly accounted for, adding an upward bias in favor of those provinces with more educational facilities (especially at the university level) or those which, for a variety of reasons, receive students from other provinces. It has been proven that the sum of this bias plus that deriving from students older than 23 years enrolling at educational centers (in the numerator for the schooling rate, the age group of the population taken into account is from 6 to 23 years of age) can actually cause the schooling rate to exceed 100 in certain provinces (IVIE, 2004b; Herrero, Soler, and Villar, 2004).

A final point to be made here is that life expectancy for 1959 corresponds to the average for 1960-1961 and life expectancy for 1981 to the average for 1975-1980 as recorded in Devolder (1986) by province and sex; that for 1999 is available from the Spanish National Statistical Office (INEbase) for provinces by gender only through 1995. Hence, we use the projection produced by Herrero, Soler, and Villar (2004) for 1999.

Data for the literacy variable are taken from the *Population Census* for the years 1960, 1981, and 1991: the last being the most recent census available when this paper was written. By all accounts, however, the figures from the 1991 *Census* are very similar to those deduced from the active population literacy for 2000 in the IVIE (2004b) by Herrero, Soler, and Villar (2004). It is, however, important to clarify changes inherent across these different sources. The 1960 *Population Census* collects two different kinds of literacy data. Using the number of people identifying themselves as *literate*, it is possible to deduce a much lower literacy crude rate (74.9 percent at national level) than one obtained using the residual of the percentage of people who identify themselves as *illiterate* (88.8 percent). We have chosen this second alternative because its derivation more closely approximates those used to produce the literacy figures available for 1981 and 1991. The figures in the 1981 *Census* indicate the illiteracy rate for the population aged 10 years and over, which we have transformed into the residual literacy rate expressed in a percentage. The 1991 *Census* contains the same kind of data in percentage form, which we have once again transformed into a residual literacy rate.

5. GENDER DEVELOPMENT, CONVERGENCE, AND GROWTH IN SPAIN

The results obtained are grouped in accordance with our two objectives: a convergence analysis and an exploratory analysis of the relationship between gender inequality and growth. First, the three indices (GDIg, HDIg, and RSW) reveal the existence of interprovincial σ-convergence. This is due both to the convergence of their components (especially GDP per capita) and to the fact that the trajectories of life expectancy and literacy trajectories are quite nonlinear. It is important to point out here that the statistical variance associated with GDIg is always greater than that for either HDIg or RSW because of the differences in index construction, which assigns different weights to their subcomponents (Table 1). Secondly, the provinces that improve most are those which start out with lower levels of GDIg, HDIg, and RSW. This confirms the presence of an association between the index values in 1959 and their subsequent change, by means of the values of the Spearman's rank coefficient (Table 2). The strength of the association is greater for the GDIg than for the HDIg, indicating a tendency for more rapid progress in gender development than in human development in Spanish provinces. Thirdly, there is also γ-convergence of the GDIg with respect to the HDIg, illustrating a general decline in gender discrimination across Spanish provinces. This is measured by the reduction in the GII indicator (Table 3).

The sets of provinces with either higher- or lower-than-average GDIg have remained relatively stable through the years. With few exceptions (Teruel, in the region of Aragón, and Soria, Ávila, and Zamora, in the region of Castilla y León), provinces with lower gender development are located in southern Spain (in the regions of Castilla-La Mancha, Extremadura, and Andalucía, all with negative net of domestic interregional migration during the 1960s). Five

TABLE 1. Variation coefficients for GDIg, HDIg and RSW (Interprovincial σ-convergence)

	GDIg	HDIg	RSW
1959	0.244	0.134	0.063
1981	0.124	0.092	0.041
1999	0.088	0.084	0.031

Sources: Annexes 1 and 2.

TABLE 2. Spearman's Rank Coefficients for Indexes in 1959 and Their Variation

	Coefficient	*t* value	*p*-value
GDIg	-0.956	-22,476	0,000
HDIg	-0.812	-9,641	0,000
RSW	-0.840	-10,730	0,000

Note: The statistic $t = \rho / \sqrt{(1-\rho^2)/(n-2)}$ under the null hypothesis ($\rho = 0$) has a Student *t*-distribution with 48 degrees of freedom. The *p*-value is obtained considering the alternative hypothesis $\rho < 0$.

Sources: Annexes 1 and 2.

TABLE 3: Gender γ-convergence in Spain 1959-1999

	1959	1981	1999
GII	0.168	0.104	0.020

Sources: Annexes 1 and 2.

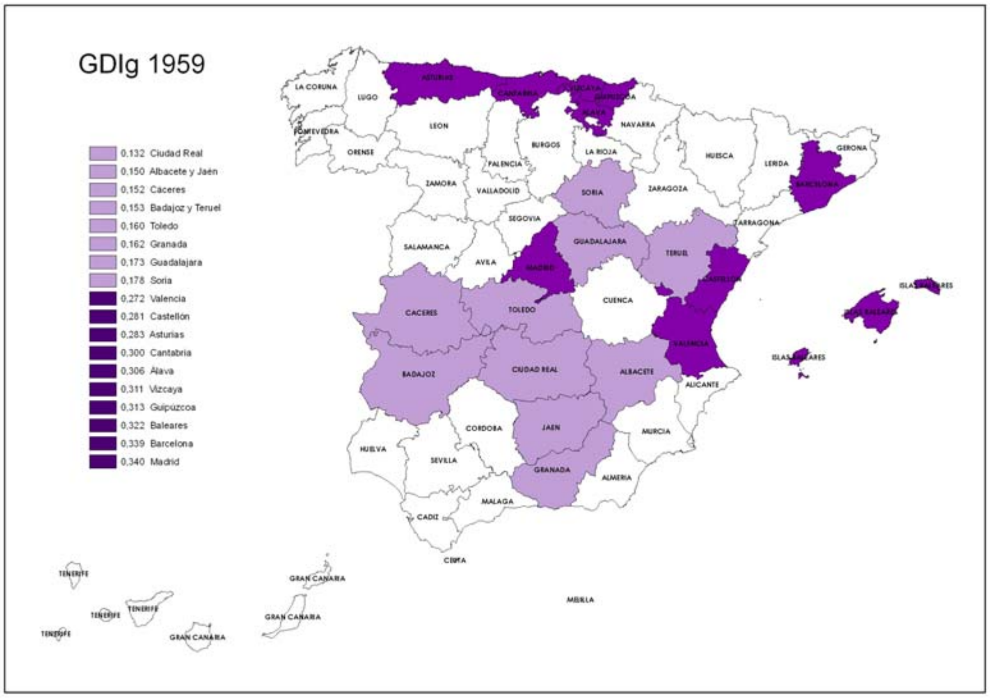
provinces have persistently displayed a low GDIg from 1959 to 1999 (Ciudad Real, Albacete, Badajoz, Jaén, and Granada). These provinces are home to Spain's largest agrarian estates. The highly concentrated ownership of land that results can negatively affect growth rates through imperfect capital markets. Galor and Zeira (1993) and Deininger and Squire (1997, 1998) suggest this arises from a lack of access to credit, which in turn affects the agency levels and the accumulation of human and physical capital.[2]

On the other hand, provinces with higher-than-average levels of gender development tend to be in Spain's more developed north (e.g., Madrid, Cataluña, and País Vasco), with the exceptions of Castellón and Valencia in 1959 in the region of Comunidad Valenciana. Provinces of the Cataluña region (Barcelona, Tarragona, and Gerona) have also had higher-than-average gender development since 1959 along with Madrid, Barcelona, Baleares, Vizcaya, and Álava, provinces with positive net in-migration. (Figures 1, 2, and 3, and Table 4). Figure 4 illustrates the main migration flows among Spain's regions with 1965 as the base year. The highest flows originated from the poorest regions (Castilla-La Mancha, Extremadura, and Andalucía)—the provinces with the lowest gender development—and moved to wealthier regions, which tend to have higher gender development (País Vasco, Cataluña, Madrid, and Comunidad Valenciana). As pointed out by various studies (García, Greciano, and Raymond, 1999), such internal migration flows helped to induce regional convergence through the end of the 1970s (Guijarro and Hierro, 2007).

It is worth noting the cases of Navarra and La Rioja, which form part of the group of provinces with the highest GDIg since 1981. In these largely agrarian provinces, female employment rates are under-registered, influencing the index. With structural change, female employment rises as women seek work in manufacturing sectors and perhaps more so in service sectors, which exerts a positive effect upon the GDP component of GDIg.

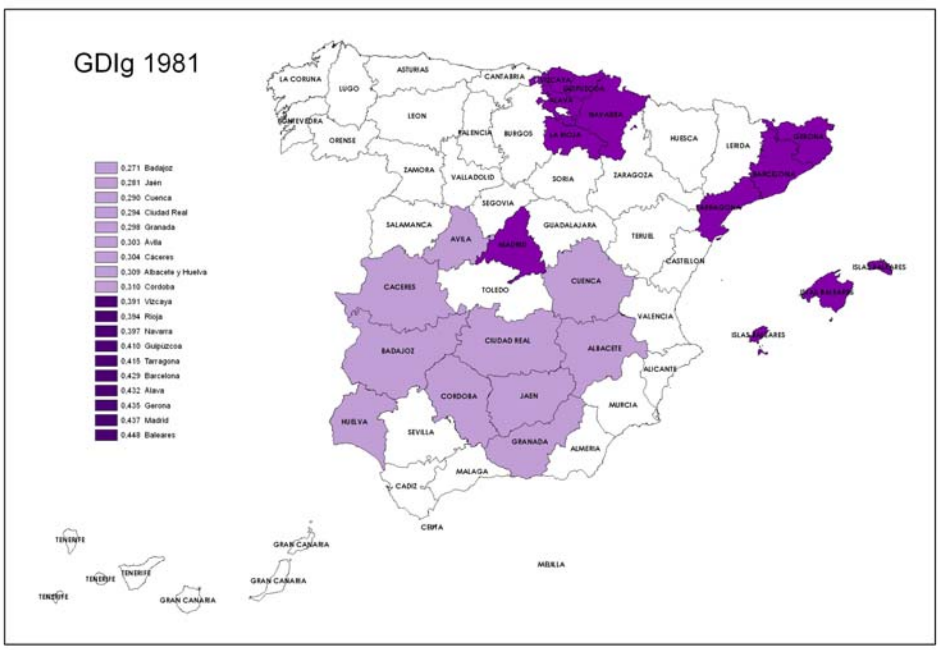
[2] The concentration of land ownership is significantly and negatively related to the education level of the population and predicts, in the long run, slower economic growth, especially in developing economies and, within them, rural areas (Barro, 2000; Thorbecke and Charumilind, 2002; Ghosh and Pal, 2004).

FIGURE 1. GDIg by Spanish Province for 1959



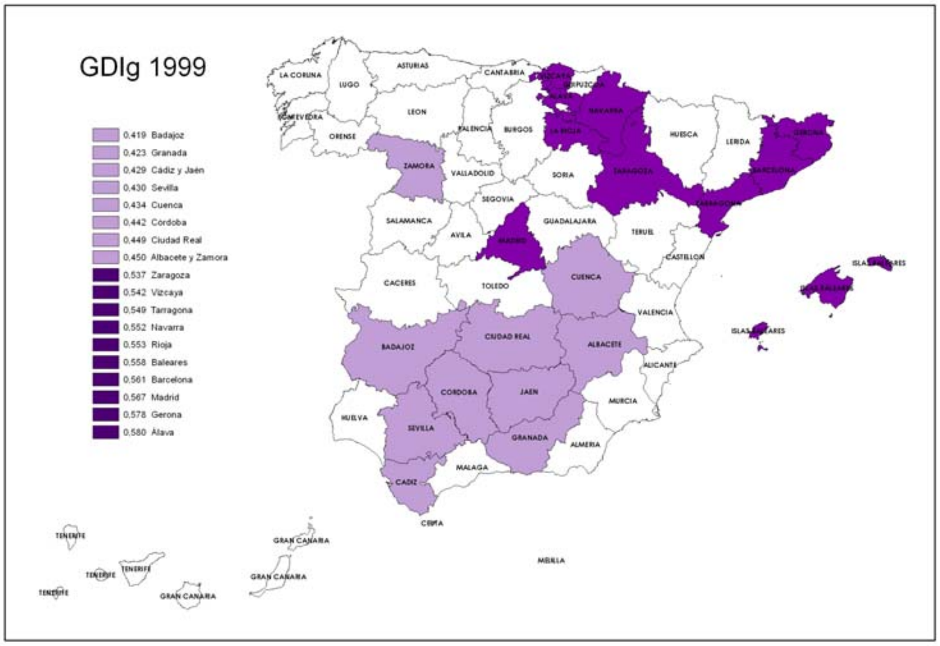
Source: Annex 1.

FIGURE 2. GDIg by Spanish Province for 1981



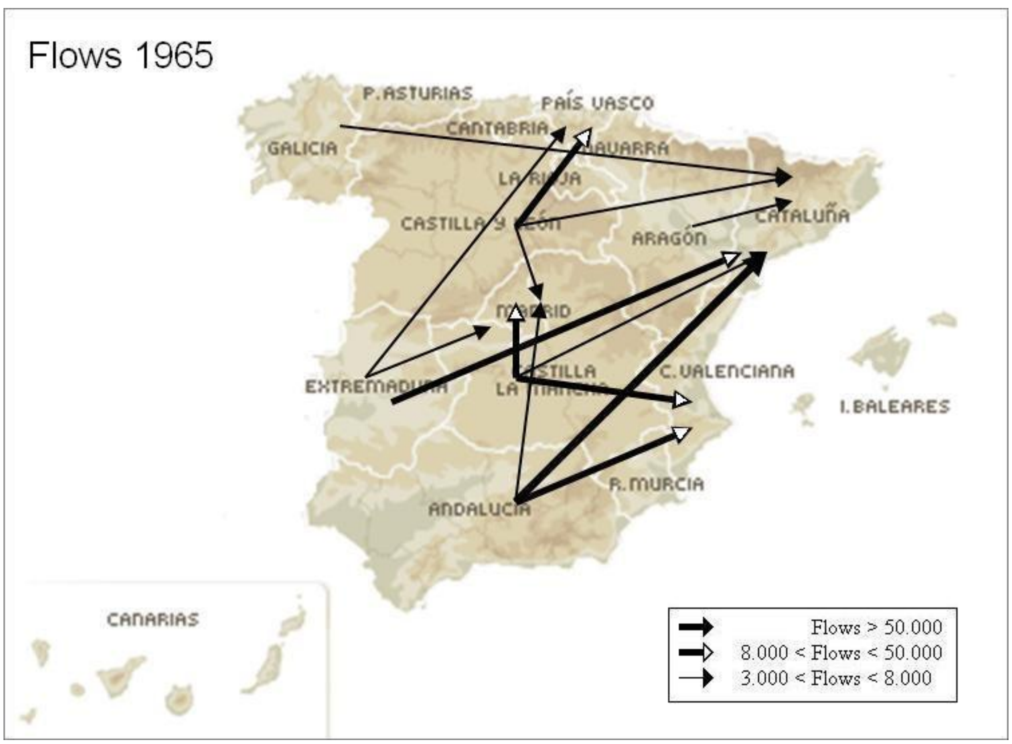
Source: Annex 1.

FIGURE 3. GDIg by Spanish Province for 1999



Source: Annex 1.

FIGURE 4: Interprovincial Migration Flows in Spain, 1965-2000



Source: Own elaboration of data from Guijarro and Hierro (2007).

TABLE 4. Ten Provinces with Least and Most Gender Development (GDIg), 1959, 1981, and 1999

	1959		1981		1999
Ciudad Real	0.132	Badajoz	0.271	Badajoz	0.419
Jaén	0.150	Jaén	0.281	Granada	0.423
Albacete	0.150	Cuenca	0.290	Cádiz	0.429
Cáceres	0.152	Ciudad Real	0.294	Jaén	0.429
Teruel	0.153	Granada	0.298	Sevilla	0.430
Badajoz	0.153	Ávila	0.303	Cuenca	0.434
Toledo	0.160	Cáceres	0.304	Córdoba	0.442
Granada	0.162	Albacete	0.309	Ciudad Real	0.449
Guadalajara	0.173	Huelva	0.309	Albacete	0.450
Soria	0.178	Córdoba	0.310	Zamora	0.450
Spain	**0.257**	**Spain**	**0.381**	**Spain**	**0.510**
Madrid	0.340	Baleares	0.448	Álava	0.580
Barcelona	0.339	Madrid	0.437	Gerona	0.578
Baleares	0.322	Gerona	0.435	Madrid	0.567
Guipúzcoa	0.313	Álava	0.432	Barcelona	0.561
Vizcaya	0.311	Barcelona	0.429	Baleares	0.558
Álava	0.306	Tarragona	0.415	Rioja	0.553
Cantabria	0.300	Guipúzcoa	0.410	Navarra	0.552
Asturias	0.283	Navarra	0.397	Tarragona	0.549
Castellón	0.281	Rioja	0.394	Vizcaya	0.542
Valencia	0.272	Vizcaya	0.391	Zaragoza	0.537

Source: Annexes 1 and 2.

Unfortunately, it appears that RSW's performance in at least ten of Spain's provinces somewhat weakens the value of the GDIg as an indicator. Some of its performance is confirmatory, however. Several provinces with a lower RSW are in southern Spain (in the regions of Castilla-La Mancha, Extremadura, and Andalucía). An exception is Teruel, one of five that have been in this sector from 1959 to 1999. The others are Ciudad Real, Albacete, Badajoz, and Jaén, all of which demonstrate negative domestic net migration during the period. Conversely, provinces with a greater RSW in northern Spain since 1959 are Pontevedra, Barcelona, Baleares, Vizcaya, and Álava, which demonstrate positive domestic net migration (Table 5). Still, there are the exceptions. The high position of the Galician provinces (La Coruña, Lugo, Orense, and Pontevedra) in the rankings appears to be caused by the greater weight that the RSW gives to the income component and to female labor-force participation rates. Hence, since it fails to account for wage differentials, the validity of RSW as an indicator of gender disparities may need cautious consideration (Dijkstra and Hanmer, 2000). In fact, all the exploratory analysis adjustments concerning inequality and growth are weakened with the incorporation of RSW data.

The triple convergence process that we have analyzed has been in concert with GDP per capita. Growth in income appears to have stimulated improvements in both GDIg and HDIg (Table 6). Changes over time in Spearman's rank correlation coefficients between each of the two indices and GDP suggest that economic growth has not benefited men and women equally,

TABLE 5. Ten Spanish Provinces with Lowest and Highest RSW in 1959, 1981, and 1999

	1959		1981		1999
Ciudad Real	0.621	Ciudad Real	0.682	Cuenca	0.790
Jaén	0.624	Jaén	0.685	Ciudad Real	0.801
Albacete	0.627	Cuenca	0.689	Zamora	0.813
Toledo	0.638	Albacete	0.703	Jaén	0.819
Teruel	0.641	Badajoz	0.704	Toledo	0.836
Córdoba	0.644	Toledo	0.705	Teruel	0.839
Granada	0.647	Ávila	0.709	Guadalajara	0.842
Cáceres	0.649	Córdoba	0.710	Badajoz	0.842
Badajoz	0.649	Huelva	0.711	Albacete	0.843
Guadalajara	0.651	Teruel	0.713	Murcia	0.851
Spain	**0.709**	**Spain**	**0.758**	**Spain**	**0.875**
La Coruña	0.800	Pontevedra	0.797	Gerona	0.912
Pontevedra	0.792	Guipúzcoa	0.794	Pontevedra	0.903
Cantabria	0.776	Lugo	0.792	Orense	0.902
Barcelona	0.772	Madrid	0.790	Vizcaya	0.902
Álava	0.757	Barcelona	0.784	Baleares	0.901
Madrid	0.754	Álava	0.783	Álava	0.899
Baleares	0.754	Gerona	0.780	Lugo	0.896
Guipúzcoa	0.751	Navarra	0.780	Las Palmas	0.896
Asturias	0.745	Baleares	0.779	Tarragona	0.896
Vizcaya	0.742	Vizcaya	0.778	Barcelona	0.895

Source: Annexes 1 and 2.

Table 6. Correlation of Economic Growth and Gender and Human Progress in Spain, 1959-1999

	Coefficient	*t* value	*p*-value
GDIg	0.711	7.007	0.000
HDIg	0.953	21.923	0.000
RSW	0.376	2.812	0.002

Note Spearman's rank coefficients amongst per capita GDP variation rates, 1959-1999. The *p*-value is obtained considering the alternative hypothesis $\rho > 0$.

Source: Annexes 1 and 2. For per capita GDP data see BBVA Foundation (1999-2000).

although it does suggest that the gap between them has reduced. This could partly explain the poor intertemporal adjustment displayed by the RSW (no improvement from 1959-1981, 0.344, or from 1981-1999, -0.023.)

Analysis of the relationship between gender inequality and growth yields results contrary to those outlined in neo-Keynesian literature. This can largely be explained by the levels of GDP per capita of Spanish provinces; the usual linkages between inequality and lower growth rates do appear to exist in Spain (Barro, 2000). The GDIg, HDIg, and RSW values in the first year of study all have a negative and statistically significant correlation with long-term per capita GDP growth rates. (That is, provinces with the highest levels of growth were those with an initially lower level of human development or greater gender inequality.) Still, the set of provinces at the extremes of GDP-growth ranking remained quite stable over the study period.[3] Analysis of GII yields similar findings: provinces with higher levels of growth early on tended to have more gender inequality at the start and, therefore, also a higher GII. The relationships highlight the period of greatest positive influence as that between 1959 and 1981. This highlights the importance of exploring the relationship between domestic migration and inequality reduction. Migration is clearly a possible key element that can induce convergence according to Hirschman's (1993) reflections on the voice strategy of migration (García, Greciano, and Raymond, 1999; Raymond, 2002).[4] Finally, it is important to emphasize that inequality in human development has a greater influence on growth than gender inequality (Table 7).

6. CONCLUSIONS

The principle contribution of the research presented here is the inclusion of a spatial analysis of inequality and gender convergence in the development transition process of Spanish provinces. Spain is a country that, over the course of 50 years, has emerged from being somewhat economically backward with rather low human and gender development to find itself now "catching-up" rather rapidly, gaining higher levels of human and gender development. This paper presents geometric variants of United Nation's HDI and GDI to demonstrate what occurred internally in Spain during this period of economic shift. The variants are the HDIg and the GDIg, which incorporate indicators that directly measure gender inequality, such as the RSW and the GII for 1959, 1981, and 1999.

The main research results can be summarized in five parts. First, it appears that the RSW may have rather poor analytical properties. Second, the results highlight interprovincial σ-convergence of all indices, an association between lower initial index levels and their increase, and a reduction in gender inequality, which we call γ-convergence. There is also a certain north-south stability among the provinces at the extremes of the GDI distribution for the entire period, coinciding with the different provincial GDP per capita levels and confirming the existence of convergence clubs also from the perspective of gender inequalities.

Table 7. Correlation of Gender Inequality and Economic Growth in Spain by Period

	1959-1999		1959-1981		1981-1999	
	Coefficient	*t* value	Coefficient	*t* value	Coefficient	*t* value
GDIg	-0.611	-5.343*	-0.597	-5.151*	-0.246	-1.757**
HDIg	-0.645	-5.850*	-0.610	-5.339*	-0.252	-1.804**
RSW	-0.500	-3.995*	-0.498	-3.981*	-0.186	-1.311***
GII	0.509	4.097*	0.497	3.964*	0.166	1.166

Notes: Spearman's rank coefficients amongst initial values and per capita GDP variation rates. The *p*-value is obtained considering the alternative hypothesis $\rho < 0$ for GDIg, HDIg and RSW, and $\rho > 0$ for GII.

*Significant at 1%; ** significant at 5%; *** significant at 10%.

Source: Annexes 1 and 2. For per capita GDP data see BBVA Foundation (1999, 2000).

[3] The existence of convergence clubs where countries polarize in distributions integrated by rich and poor (Quah, 1996) is confirmed for the Spanish provinces by Villaverde and Sánchez-Robles (1998).

[4] Population decline (in absolute or relative terms) of provinces with negative domestic net migration contributed in numerous provinces to the establishment of convergence patterns and structural change by default (Collantes and Domínguez, 2006).

Third, related to the direction and relationships between gender inequality and economic growth, we find that GDP growth appears to stimulate improvements in GDI and HDI and to reduce the gap between them. In addition, the GDIg, HDIg, and RSW values in the first year of study showed a negative and statistically significant correlation with the long-term per capita GDP growth rates, although extreme rankings (the highest and lowest) revealed considerable stability. The findings for GII were similar: provinces with higher levels of growth tended to have greater gender inequality and therefore higher GIIs. The relationships underline the greatest positive influence between 1959 and 1981. Fourth, we show that inequality in human development tended to have a greater influence on growth than gender development. Finally, we find that life expectancy and education components on the Spanish GDIg are greater than 100 for the three study years, 1959, 1981, and 1999 (although the results present a downward trend: 294, 217, and 177 for life expectancy and 345, 246, and 190 for education, respectively) whereas the income component is well below 100 (although presenting an upward trend: 10, 19, and 30).

Future research should further address the hypotheses that gender inequality induces internal migration or, alternatively, that internal migration causes gender inequality. It could also create a body of evidence to develop a more definitive range for the elasticities of GDP per capita upon the various indices.

Although we contend that our results are important, we do so recognizing they are truly provisional since they should rely on a more appropriately devised set of interprovincial wage differentials. Such differentials could be obtained by applying a national calculation based on the industrial structure of both male and female employment and gross value added by province.

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APPENDIX: Calculating the HDI and the GDI[5]

The HDI measures the average of three dimensions of human development: health (measured by life expectancy at birth), knowledge (adult literacy and gross rate of primary, secondary and tertiary schooling) and standard of living (GDP per capita). Before the HDI is calculated, these three dimensions are expressed as a value between 0 and 1 by the general formula:

$$\text{(6)}\quad \text{dimension index} = \frac{\text{actual value - minimun value}}{\text{maximun value - minimum value}}$$

The maximum and minimum (goalpost) values are 85 and 25 years for life expectancy at birth, 100 percent and 0 percent for adult literacy rate and combined gross enrolment ratio and 40,000 and 100 PPP US$ for GDP per capita.

Then, the HDI is a simple average of the three dimension indices.

The construction of the GDI has three steps. First, the dimension indices are calculated for females and males, according to the former formula; the maximum and minimum values for life expectancy at birth are 87.5 and 27.5 for women and 82.5 and 22.5 for men. Second, if H_M and H_W are, respectively, the dimension indices for men and women in the health component and p_M and p_W their populations shares, the equally distributed index is the harmonic mean:

$$\text{(7)}\quad I_H = \left(p_F \cdot H_F^{-1} + p_M \cdot H_M^{-1}\right)^{-1}$$

Analogously, I_K and I_Y are the equally distributed indices for education and standard of living. Finally, the GDI is a simple arithmetic mean of the three equally distributed indices:

$$\text{(8)}\quad \text{GDI} = \left(I_H + I_K + I_Y\right)/3$$

The GDI geometric variant, GDIg, is the geometric mean of the three equally distributed indices:

$$\text{(9)}\quad \text{GDIg} = \left(I_H \cdot I_K \cdot I_Y\right)^{1/3}.$$

[5] See UNDP (1995) for further information about the process used to construct the indices.

ANNEX 1. GDIg and HDIg for Spanish Provinces

Provinces and regions	GDIg 1959	GDIg 1981	GDIg 1999	HDIg 1959	HDIg 1981	HDIg 1999
Andalucía						
Almería	0.196	0.317	0.469	0.250	0.373	0.479
Cádiz	0.187	0.311	0.429	0.273	0.377	0.442
Córdoba	0.187	0.310	0.442	0.260	0.362	0.452
Granada	0.162	0.298	0.423	0.246	0.348	0.434
Huelva	0.183	0.309	0.450	0.259	0.386	0.463
Jaén	0.150	0.281	0.429	0.239	0.351	0.445
Málaga	0.195	0.340	0.459	0.273	0.386	0.469
Sevilla	0.226	0.328	0.430	0.284	0.377	0.441
Aragón						
Huesca	0.185	0.378	0.514	0.312	0.445	0.524
Teruel	0.153	0.348	0.510	0.266	0.423	0.526
Zaragoza	0.262	0.389	0.537	0.326	0.438	0.551
Asturias (Principado)						
Asturias	0.283	0.380	0.480	0.325	0.433	0.490
Baleares (Illes)						
Baleares	0.322	0.448	0.558	0.351	0.485	0.565
Canarias						
Palmas, Las	0.221	0.370	0.491	0.288	0.418	0.501
Santa Cruz T	0.218	0.365	0.483	0.279	0.415	0.497
Cantabria (Comunidad)						
Cantabria	0.300	0.388	0.496	0.331	0.436	0.514
Castilla y León						
Avila	0.192	0.303	0.474	0.252	0.377	0.487
Burgos	0.220	0.372	0.533	0.293	0.423	0.543
León	0.190	0.364	0.487	0.283	0.405	0.496
Palencia	0.215	0.357	0.500	0.280	0.418	0.518
Salamanca	0.214	0.340	0.501	0.287	0.398	0.511
Segovia	0.191	0.335	0.506	0.286	0.405	0.517
Soria	0.178	0.339	0.509	0.271	0.392	0.523
Valladolid	0.236	0.374	0.518	0.306	0.433	0.529
Zamora	0.187	0.322	0.450	0.268	0.366	0.477
Castilla-La Mancha						
Albacete	0.150	0.305	0.450	0.245	0.363	0.461
Ciudad Real	0.132	0.294	0.449	0.237	0.371	0.470
Cuenca	0.199	0.290	0.434	0.245	0.360	0.458
Guadalajara	0.173	0.365	0.521	0.281	0.427	0.538
Toledo	0.160	0.325	0.467	0.255	0.388	0.480
Cataluña						
Barcelona	0.339	0.429	0.561	0.369	0.463	0.570
Gerona	0.306	0.435	0.578	0.344	0.471	0.584

Lérida	0.247	0.388	0.532	0.312	0.438	0.541
Tarragona	0.259	0.415	0.549	0.328	0.467	0.557
Valenciana (Comunidad)						
Alicante	0.248	0.381	0.496	0.303	0.426	0.504
Castellón	0.281	0.383	0.537	0.314	0.430	0.547
Valencia	0.272	0.381	0.517	0.333	0.426	0.529
Extremadura						
Badajoz	0.153	0.271	0.419	0.241	0.345	0.433
Cáceres	0.152	0.304	0.463	0.237	0.362	0.474
Galicia						
Coruña (La)	0.270	0.372	0.490	0.282	0.405	0.496
Lugo	0.227	0.351	0.466	0.260	0.371	0.470
Orense	0.195	0.318	0.466	0.252	0.354	0.468
Pontevedra	0.270	0.375	0.486	0.284	0.400	0.490
Madrid (Comunidad)						
Madrid	0.340	0.437	0.567	0.385	0.473	0.577
Murcia (Región de)						
Murcia	0.213	0.337	0.470	0.270	0.390	0.483
Navarra (Comunidad)						
Navarra	0.256	0.397	0.552	0.328	0.442	0.564
País Vasco						
Álava	0.307	0.432	0.580	0.347	0.478	0.586
Guipúzcoa	0.313	0.410	0.534	0.366	0.450	0.541
Vizcaya	0.311	0.391	0.542	0.367	0.440	0.548
Rioja (Comunidad)						
La Rioja	0.260	0.394	0.553	0.318	0.439	0.569
Spain	0.257	0.381	0.510	0.309	0.424	0.521

Source: own elaboration

ANNEX 2. GII and RSW for Spanish provinces

Provinces and regions	GII 1960	GII 1981	GII 1999	RSW 1960	RSW 1980	RSW 1999
Andalucía						
Almería	0.216	0.149	0.021	0.673	0.720	0.868
Cádiz	0.316	0.176	0.031	0.677	0.722	0.855
Córdoba	0.279	0.145	0.023	0.644	0.710	0.859
Granada	0.341	0.144	0.026	0.647	0.718	0.852
Huelva	0.291	0.198	0.027	0.673	0.711	0.853
Jaén	0.372	0.200	0.036	0.624	0.685	0.819
Málaga	0.286	0.119	0.022	0.666	0.745	0.872
Sevilla	0.203	0.130	0.024	0.686	0.735	0.865
Aragón						
Huesca	0.409	0.150	0.020	0.661	0.731	0.869
Teruel	0.426	0.177	0.031	0.641	0.713	0.839
Zaragoza	0.196	0.112	0.026	0.706	0.759	0.862
Asturias (Principado)						
Asturias	0.130	0.121	0.021	0.745	0.768	0.886
Baleares (Illes)						
Baleares	0.081	0.075	0.013	0.754	0.779	0.901
Canarias						
Palmas, Las	0.233	0.116	0.020	0.691	0.755	0.896
Santa Cruz T	0.216	0.120	0.028	0.684	0.746	0.868
Cantabria (Comunidad)						
Cantabria	0.092	0.110	0.036	0.776	0.777	0.854
Castilla y León						
Avila	0.240	0.196	0.027	0.681	0.709	0.854
Burgos	0.250	0.122	0.018	0.707	0.766	0.886
León	0.328	0.101	0.017	0.679	0.768	0.885
Palencia	0.233	0.145	0.036	0.705	0.749	0.855
Salamanca	0.254	0.146	0.021	0.688	0.742	0.875
Segovia	0.333	0.173	0.022	0.673	0.738	0.863
Soria	0.344	0.136	0.028	0.668	0.747	0.862
Valladolid	0.231	0.135	0.022	0.702	0.756	0.873
Zamora	0.301	0.118	0.056	0.666	0.744	0.813
Castilla-La Mancha						
Albacete	0.387	0.160	0.024	0.627	0.703	0.843
Ciudad Real	0.443	0.207	0.045	0.621	0.682	0.801
Cuenca	0.189	0.193	0.052	0.669	0.689	0.790
Guadalajara	0.385	0.145	0.032	0.651	0.727	0.842
Toledo	0.372	0.164	0.027	0.638	0.705	0.836
Cataluña						
Barcelona	0.081	0.073	0.016	0.772	0.784	0.895
Gerona	0.110	0.076	0.010	0.736	0.780	0.912

Lérida	0.210	0.115	0.017	0.694	0.748	0.883
Tarragona	0.210	0.113	0.013	0.690	0.749	0.896
Valenciana (Comunidad)						
Alicante	0.181	0.106	0.016	0.699	0.750	0.884
Castellón	0.108	0.111	0.020	0.722	0.744	0.872
Valencia	0.183	0.104	0.022	0.698	0.755	0.870
Extremadura						
Badajoz	0.364	0.213	0.031	0.649	0.704	0.842
Cáceres	0.361	0.159	0.023	0.649	0.714	0.856
Galicia						
Coruña (La)	0.040	0.080	0.012	0.800	0.776	0.888
Lugo	0.129	0.054	0.009	0.718	0.792	0.896
Orense	0.225	0.103	0.005	0.674	0.753	0.902
Pontevedra	0.047	0.061	0.008	0.792	0.797	0.903
Madrid (Comunidad)						
Madrid	0.117	0.076	0.018	0.754	0.790	0.891
Murcia (Región de)						
Murcia	0.213	0.137	0.027	0.673	0.723	0.851
Navarra (Comunidad)						
Navarra	0.220	0.100	0.022	0.719	0.780	0.878
País Vasco						
Álava	0.115	0.096	0.010	0.757	0.783	0.899
Guipúzcoa	0.145	0.088	0.014	0.751	0.794	0.890
Vizcaya	0.155	0.111	0.011	0.742	0.778	0.902
Rioja (Comunidad)						
Rioja	0.183	0.103	0.029	0.719	0.768	0.858
Spain	0.168	0.104	0.020	0.709	0.758	0.875

Source: own elaboration