Regional Convergence in Outputs and Incomes in Italy and the US

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Paper prepared for the European Regional Science Association Congress at Dortmund. Germany, August 2002

Abstract

This research paper is primarily focused on identifying, analyzing and comparing the degree of convergence or divergence in three important economic performance measures- per capita real outputs, family and household incomes, and per capita incomes within the regions of Italy and the U.S. over the past two decades. In this study, three statistical measures of regional inequality are used: the coefficient of variation (sigma convergence), the size of relative differences between the highest and the lowest per capita output or family income region, and simple regression tests for the unconditional convergence of per capita outputs or family/median household incomes across regions of Italy and the U.S. (Beta convergence).

Findings in this research paper will reveal that over the 1980s and 1990s there was no convergence in either family incomes or value added per capita of Italian regions. However, the coefficients of variation for these two economic variables were characterized by substantial differences for Italian regions. On the other hand, the U.S. was categorized by similar degrees of inequality in per capita real outputs and family incomes. The U.S. experienced convergence in both gross regional output (GRP) per capita and median household incomes in the 1990s. Adjusting family incomes for differences in household size across regions, however, substantially raised inequality in the Italian family income measures while affecting only slightly those for the U.S.

Key Words

Convergence, beta convergence, family income, per capita real output, sigma convergence, value added per capita.

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Introduction

The puzzling phenomenon of uneven economic growth and macro economic performance across nations and regions within a nation became an increased focus of economic study since the early 1990s. As a result, the economic growth literature has contained an increasing number of studies on economic convergence/divergence across nations and regions within nations. The empiric al studies in this particular field have been primarily based on neo-classical growth models augmented by endogenous growth theory stressing the importance of endogenous technical change in promoting economic growth. However, there is no unanimous consensus on the causes of uneven economic growth within and across the nations or regions although capital investment, technology, human capital, and economic institutions and policies have been identified as the key factors in the new economic growth literature (Adams and Pigliaru 1999, Barro 1997; Mankiw, Romer, and Weil 1993).

Some empirical studies have shown that convergence and divergence among regions or nations in the short-term occurs under various settings (Barro and Sala-i-Martin 1992; Pritchett 1997), but other studies have shown that in the long-run convergence may not necessarily occur across nations (Seers, Schafer, and Kiljunen 1979 and 1980; Pritchett 1997). However, in the U.S., strong convergence in incomes and outputs among regions occurred in the period between 1929 and 1980, followed by divergence in the 1980s and then renewed convergence in the 1990s (Sum and Fogg, 1999 (a); Goicoechea, Sum, and Schachter, 2000).

There are numerous alternative statistical measures that can be used to assess the comparative economic performance of regions within any nation. The most widely used measures, including per capita earnings, employment, per capita incomes, and per capita real outputs, are particularly helpful in analyzing the degree to which regions are converging or diverging over time (Sum and Fogg, 1999 (b)). It has been consistently found in empirical studies that the degree of convergence or divergence among regions over time varies depending on the economic performance measures employed. For example, studies of output per capita and labor productivity in regions of Italy (Paci and

Saba 1997) and Western Europe (Schachter and Schachter 1996) have revealed the existence of convergence in labor productivity but not in real output per capita. Very little convergence was found in key output measures among regions of Canada and Mexico in recent decades. In contrast to experiences in Western Europe, Canada and Mexico, the U.S. states have converged on real output measures, though convergence has been stronger on labor force participation rates and employment rates than labor productivity or earnings (Sum and Fogg 1997; Goicoechea, Schachter, Sum 2000).

As one would expect, there are various factors that contribute to the economic disparities among regions of a nation. We cannot possibly account for all of them in this paper. Here we focus only on convergence in per capita outputs, household income, family size, and per capita incomes of families. The main objective of this research paper is to identify, analyze and compare the degree of convergence or divergence in real outputs per capita and mean family/ household incomes among regions of Italy and the U.S. over the decades of the 1980s and 1990s.

The Regions of Italy and the U.S. Included in the Convergence Analysis

Our analysis of trends in the degree of convergence or divergence in regional per capita outputs and median family/household incomes in Italy and the U.S. is based on standard regional definitions used by national governments in each of these countries. For Italy, regional value added at factor cost and monthly family income data are available for twenty regions. For U.S., gross state product (GSP) and median household income data are available for nine regions from the U.S. Census Bureau and the Bureau of Economic Analysis. Regions of Italy and the U.S. included in our analysis are displayed in Table 1.

Table 1: Regions of Italy and the U.S.

Italian Regions		U.S. Regions
Valle D'Aosta	Marche	New England
Emilia Romagna	Umbria	Middle Atlantic
Lombardia	Abruzzo	East North Central
Friuli-Venezia Giulia	Molise	West North Central
Trentino-Alto Adige	Sardegna	South Atlantic
Veneto	Puglia	East South Central
Liguria	Basilicata	West South Central
Piemonte	Sicilia	Mountain
Lazio	Campania	Pacific
Toscana	Calabria	

Measures of Regional Per Capita Output and Family/Household Income Inequality

Our study is primarily focused on per capita outputs and median family/ household incomes of regions of Italy and the U.S. over the past 20 years. The time series data on value added at factor cost and family income by regions for Italy were made available by the Istituto Nazionale di Statistica, ISTAT (the Italian Institute of Statistics) and the Center of Social Investment Studies (CENSIS). The time series data on Gross Regional Product (GRP) per capita and median household income by regions for the U.S. are available from the U.S. Bureau of Economic Analysis and the U.S. Bureau of Census.

As mentioned earlier, the main purpose of this research paper is to measure, compare and assess the degree of inequality in per capita outputs and median family/household incomes among regions of Italy and the U.S. during the period of 1985-1997. In this research study, three major statistical measures are used to compare and assess the degree of regional inequality:

1. Coefficient of variation (Sigma Convergence).
2. Size of relative differences between the highest and the lowest per capita output or family/median household income of regions of Italy and the U.S.

3. Simple regression tests for the unconditional convergence of per capita outputs or median family/household incomes across regions of Italy and the U.S. (Beta convergence).

The first measure, the coefficient of variation, measures the degree of relative dispersion in the distribution of regional per capita outputs and median family/ household incomes of Italy and the U.S. The coefficient of variation is obtained by dividing the value of the standard deviation by the mean. The second measure of inequality involves comparisons of the relative degree of differences in the values of per capita outputs and family/household incomes within regions of Italy and the U.S. In our study, due to the small number of regions in both countries, we use a relative measure of output and income inequality based on the relative size of the difference between the per capita output and family income of the highest and the lowest ranked regions in each country during selected years. The third measure of regional per capita output or family/household income inequality involves the unconditional test for convergence. The economic rationale behind unconditional convergence is the following. Under the assumption of diminishing returns to capital, the poorer regions or countries will grow faster than their richer counterparts because regions/countries with lower initial ratios of capital to labor will have higher per capita income growth rates than their affluent counterparts, thus converging in the long run.. We use simple regression models to test for unconditional convergence.

Trends in Per Capita Outputs of Italian and U.S. Regions

The regional output performance measures for Italy and the U.S. represent value added per capita for Italy and per capita gross regional product (GRP) for the U.S. Table 2 displays trends in real value added per capita for Italy and real GRP per capita for the U.S. over the 1985-1996 period. Both countries had substantial increases in the size of their per capita outputs over this time period. The per capita value added for Italy was 26.14 million Lira in 1985, and it increased to 30.64 million Lira in 1996, an absolute

increase of 4.5 million Lira, or 17 percent, over the 1985-1996 period. The per capita GRP for the U.S. was $22,086 in 1985 and it increased to $26, 267 in 1996, an absolute increase of $4,181, or 19 percent during the same time period.

Table 2: Value Added Per Capita of Italy and GRP Per Capita of the U.S., Selected Years, 1985-1996

Year	Real Value Added Per Capita of Italy (in Million of Constant 1996 Lira)	Real GRP Per Capita of U.S. (in Constant 1996 Dollars)
1985	26.14	$22,086
1986	27.12	$22,447
1987	27.53	$23,107
1988	28.57	$23,931
1989	NA[1]	$24,222
1990	29.76	$24,240
1991	29.73	$23,781
1992	30.01	$24,051
1993	29.36	$24,343
1994	29.79	$25,109
1995	30.38	$25,600
1996	30.64	$26,267

Data Source: ISTAT, Italy, 2000 and the U.S. Bureau of Economic Analysis, 2000

Both Italy and the U.S. enjoyed growth in per capita outputs during the period of 1985-1996, but the U.S. clearly outperformed Italy in the growth rate of output per capita over this time period. Table 3 displays the growth rates of real value added per capita for Italy and real GRP per capita for the U.S over the 1985-1996 period. Over this 1985-1990 period, Italian value added per capita experienced a high growth rate of 13.9%, but the growth rate slowed considerably during the period of 1990-1996, rising by only 3%. The overall growth rate of value added per capita of Italy was 17.2% over the entire 1985-1996 period. GRP per capita in the U.S. grew substantially by 10% and 8% during the time periods of 1985-1990 and 1990-1996, respectively. Overall, U.S. GRP per capita grew by 19% during the period of 1985-1996.

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[1] Due to an error in the official 1989 Italian value added data, we are not including the estimates for this year.

Table 3: Growth Rates of Real Value Added Per Capita of Italy and Real Per Capita GRP

of U.S. for Selected Time Periods

Time Period	Italy Growth Rate of Real Value Added per Capita	U.S. Growth Rate of Real GRP Per Capita
1985-1990	13.9%	9.8%
1990-1996	3.0%	8.4%
1985-1996	17.2%	18.9%

Table 4 displays the values of real value added per capita of the twenty Italian regions for the years 1985 and 1996. Estimates of nominal value added per capita were converted into their constant 1996 lira equivalents using the CPI index for metropolitan areas in each region of Italy. The Lombardia region had the highest real value added per capita of 32.84 million Lira in 1985 and it increased to 33.19 million Lira in 1996, a relative growth rate of 28.9% over this 11 year period. The Calabria region had the lowest real value added per capita of 14.53 million Lira in 1985, and it increased to 17.64 million in 1996, a growth rate of 21.4%. Although the growth rates of real value added per capita in most Italian regions during the period 1985-1996 were fairly high, the size of the differences in real value added per capita across regions were quite large at the beginning and ending years of this time period.

Table 4: Real Value Added Per Capita of Italian Regions (In Constant 1996 Million Lira)

Regions	Value Added Per Capita, 1985	Regions	Value Added Per Capita, 1996	Percentage Change, 1985-1996
Emilia Romagna	30.63	Emilia Romagna	39.49	28.9%
Lombardia	32.84	Lombardia	39.41	20.0%
Valle D'Aosta	32.70	Valle D'Aosta	38.99	19.2%
Trentino Alto Adige	29.38	Trentino Alto Adige	38.00	29.3%
Friuli Venezia Giulia	27.30	Friuli Venezia Giulia	37.54	37.5%
Veneto	27.18	Veneto	36.99	36.1%
Liguria	27.75	Liguria	35.58	28.2%
Piemonte	28.87	Piemonte	35.01	21.3%
Lazio	27.14	Lazio	33.88	24.9%
Toscana	27.22	Toscana	33.00	21.2%
Marche	25.39	Marche	31.68	24.8%
Umbria	23.55	Umbria	29.10	23.6%
Abruzzo	20.71	Abruzzo	26.67	28.8%
Molise	17.99	Molise	23.44	30.3%
Sardegna	17.00	Sardegna	21.60	27.1%
Puglia	17.73	Puglia	21.18	19.5%
Basilicata	15.37	Basilicata	20.73	34.9%
Campania	17.18	Campania	19.59	14.0%
Sicilia	16.26	Sicilia	19.58	20.4%
Calabria	14.53	Calabria	17.64	21.4%

Data Source: ISTAT, Italy, 2000

There were very large differences in per capita outputs among these twenty Italian regions. Table 5 displays the highest and the lowest ranked per capita value added regions for 1985 and 1996. The Lombardia region and Valle D'Aosta were the highest ranked regions in 1985 with real value added per capita of 32.84 million and 32.70 million Italian Lira, respectively. On the lower end of the spectrum, Calabria and Basilicata were the lowest ranked regions in 1985 with value added per capita of 14.53 and 15.37 million Italian Lira, respectively. The highest and the lowest ranked real per capita output regions changed modestly over the 1985-1996 period. The two regions with the highest output per capita in 1996 were Emilia Romagna and Lombardia, with real output per capita of 39.49 million and 39.41 million Italian Lira, respectively, and the two lowest output per capita regions were Calabria and Sicilia with real output per capita of

only 17.64 million and 19.58 million Italian Lira, respectively. The relative size of the differences between the highest and lowest ranked Italian regions for the year 1985 was 126% but had increased to 156% in 1996, indicating greater inequality in per capita outputs among regions of Italy.

Table 5: Real Value Added Per Capita of the Highest and the Lowest Ranked Regions of Italy, 1985 and1996 (in Constant 1996 Million Lira)

Year	Highest Ranked Region	Real Value Added Per Capita of Highest ranked Region	Lowest Ranked Region	Real Value Added Per Capita of Lowest ranked Region	Relative Size of the Difference
1985	Lombardia	32.84	Calabria	14.53	126%
1996	Emilia Romagna	39.49	Basilicata	15.37	156%

Data Source: ISTAT, Italy, 2000

Table 6 displays trends in inequality in real value added per capita of Italian regions for the 1985-1996 period. The mean real value added per capita for Italian regions has shown an upward trend over the 1985-1996 period, increasing from a mean of 23.84 million Italian Lira in 1985 to a mean of 29.96 million Italian Lira in 1996, an absolute increase of 6.12 million Italian Lira. The coefficient of variation of value added per capita across regions however, increased modestly from .251 in 1985 to .255 in 1996, indicating a slight divergence in value added per capita among Italian regions during the 1985-1996 period.

Table 6: Trends in Inequality in Real Value Added Per Capita of Italian Regions, 1985-1996 (In Constant 1996 Million Lira)

Year	Mean	Standard Deviation	Coefficient of Variation
1985	23.84	5.97	0.251
1986	24.84	6.35	0.256
1987	25.68	6.50	0.253
1988	26.96	6.86	0.254
1990	28.59	7.09	0.248
1991	29.16	7.08	0.243
1992	29.29	7.15	0.244
1993	28.68	7.03	0.245
1994	28.94	7.24	0.250
1995	29.48	7.52	0.255
1996	29.96	7.65	0.255

Table 7 displays values of the per capita GRP for the nine U.S. regions for the years 1977 and 1997 in constant 1996 dollars. The Pacific region had the highest GRP per capita in 1977 while West North Central region had the lowest real GRP per capita in 1977. The rankings of the U.S. regions on per capita GRP have changed over the years. New England has surpassed the Pacific region, with the highest GRP per capita in 1997 of $31,162. New England's GRP per capita enjoyed a substantial growth rate of 72.4% over the 1977-1997 period. On the other hand, the East South Central region had the lowest real GRP per capita in 1977 ($22,722), but the region had a substantial growth rate of 50.5% during over the 1977-1997 period. The growth rates of GRP per capita by region over the 1977-1997 period ranged from highs of 72.4% and 50.5% in the New England and East South Central regions to lows of only 29.4% and 30.4% in the West South Central and Pacific regions, respectively.

Table 7: Real GRP Per Capita of U.S. Regions (In Constant 1996 Dollars), Selected Years, 1977-1997

	1977	1997	Percentage Change
New England	$18,077	$31,162	72.4%
Middle Atlantic	$20,020	$29,989	49.8%
East North Central	$19,265	$26,851	39.4%
West North Central	$17,803	$26,167	47.0%
South Atlantic	$17,997	$26,188	45.5%
East South Central	$15,098	$22,722	50.5%
West South Central	$20,249	$26,198	29.4%
Mountain	$18,755	$25,939	38.3%
Pacific	$21,923	$28,557	30.3%

Data Source: U.S. Bureau of Economic Analysis, 2000

Unlike the Italian regions, the relative sizes of the differences in GRP per capita across the U.S. regions have decreased over the 1977-1997 period, indicating a shrinking gap between the highest and the lowest ranked regions. Table 8 displays the real GRP per capita of the highest and the lowest ranked regions of the U.S during the 1977-1997 period. The regions with the highest GRP per capita have shifted over the past two decades while the East South Central region has consistently ranked last from 1977 to 1997. The Pacific region was the front-runner in GRP per capita for most of the 1660's, 1970s, and early 1980s; however, New England took over the lead in the late 1980s and maintained it in the 1990s with the highest GRP per capita. Over the 1977-1997 period, the relative size of the GRP per capita gap between the top and the bottom ranked regions in the U.S. declined from 45% in 1977 to 37% in 1997.

Table 8: The Values of Real GRP Per Capita of the Highest and the Lowest Ranked

Regions of the U.S., Selected Years, 1977-1997 (In Constant 1996 Dollars)

Year	Highest Ranked Regions	Real GRP Per Capita	Lowest Ranked Regions	Real GRP Per Capita	Relative Size of the Difference
1977	Pacific	$21,923	East South Central	$15,098	45%
1985	Pacific	$24,971	East South Central	$17,339	44%
1989	New England	$28,094	East South Central	$19,138	47%
1997	New England	$ 31,162	East South Central	$22,722	37%

Data Source: U.S. Bureau of Economic Analysis, 2000

Table 9 displays trends in per capita real GRP of the U.S. regions over the 1977-1997 period. The coefficient of variation of real GRP per capita for the U.S. regions has declined modestly over the past 20 years. For example, the coefficient of variation in 1977 was 0.096 and it declined to 0.087 in 1997. The coefficient of variation for regional per capita outputs for U.S. regions was stable between 1977 and 1979. However, there was a divergence in regional GRP per capita during the period 1979-1989 as indicated in Table 9. The situation was reversed in the 1990s as the U.S. regions were marked by reversed convergence in real GRP per capita over the period 1991-1997, with the coefficient of variation declining to .087 in 1997 from .126 in 1989.

Table 9: Trends in Inequality in Real GRP Per Capita Among the U.S. Regions, Selected

Years, 1977-1997 (In Constant 1996 Dollars)

Year	Mean Real GRP	Standard Deviation	Coefficient of Variation
1977	$18,799	$1,808	0.096
1979	$19,918	$1,874	0.094
1981	$19,954	$1,988	0.100
1983	$19,745	$2,012	0.102
1985	$21,742	$2,207	0.102
1987	$22,506	$2,749	0.122
1989	$23,726	$2,989	0.126
1991	$23,357	$2,521	0.108
1993	$24,032	$2,225	0.093
1995	$25,510	$2,099	0.082
1997	$27,086	$2,359	0.087

Trends in Family Incomes of Italy and Median Household Incomes by Region in the U.S.

Another set of economic measures for use in conducting regional convergence analysis involves median or mean household/family incomes. The regional family income performance measures for Italy represent monthly family income for Italy while those for the U.S. represent median household incomes. Monthly family incomes include returns from market activity (labor and property) as well as cash transfer incomes from the government. The monthly family income data for Italian regions from 1980 to 1996 are available from ISTAT and also were published in the CENSIS series on economic and social indicators for Italian regions. The monthly family income data represent monthly available pre-tax incomes in thousand of Italian Lira and are available in both nominal and constant Lira. For the U.S., median income data for households are measured pre-tax and include all cash income from market activity, government transfers, pensions, alimony, and child support, but exclude in-kind transfers and capital gains (U.S. Census Bureau, 2000). For the U.S., estimates of median real household incomes for 1976 and 1998 are displayed in Table 15. The estimates of family income for Italy and the U.S. for selected years are displayed in Table 10. Findings in Table 10 show that, in Italy, the mean annual family income was 32,220 thousand Lira in 1985, and it increased to 37,428 thousand Lira in 1996, an absolute increase of 5,208 thousand Lira, or 16 percent, over this 16 year period. On the other side, median real household income of the U.S increased to $38,885 in 1998 from $35,076 in 1980, an absolute increase of $3,809, or ten percent, over the 1980-1998 period. Mean household incomes in the U.S. grew at a much higher rate, reflecting growing inequality in household incomes over the past 20 years.

Table 10: Monthly Family Incomes of Italy and Median Household Incomes of the U.S.,

Selected Years, 1980-1998

Year	Mean Annual Family Income (in 1000's of 1993 Italian Lira)	Median Household Income of the U.S. (In 1998 CPI-U Adjusted Dollars)
1980	32,220	$35,076
1982	NA	$34,392
1984	NA	$35,165
1985	33,048	$35,778
1986	33,456	$37,027
1988	35,256	$37,512
1990	37,152	$37,343
1992	37,716	$35,593
1994	37,428	$35,486
1996	37,428	$36,872
1998		$38,885

Data Source: ISTAT, CENSIS, Italy, 2000 and U.S. Census Bureau, 2000

Growth rates of monthly family incomes of Italy and median household incomes of the U.S. are displayed in Table 11. In Italy, monthly real mean family income (in constant 1996 Lira) increased by 16.2% between 1980 and 1990, rising from a mean income of 32,220 thousand Italian Lira to 37,428 thousand Italian Lira. The growth rate of real family income of Italy during the unfavorable economic period of 1990-1996 was only 0.7%. On the other hand, median real household income of the U.S. increased by 6.5% during the 1980-1990 decade, rising from a median income of $35,076 in 1980 to $36,872 in 1990, and median household income increased by 1.3 percentage points over the time period 1990-1998. Overall, the growth rate of mean real family income in Italy was 16.2% during the entire 1980-1996 period. The growth rate of median household income in the U.S. was just under11% between 1980 and 1998.

Table 11: Growth Rates of Real Mean Family Incomes of Italy and Real Median

Household Incomes of the U.S. for Selected Time Period, 1980-1998

Time Period	Growth Rate of Monthly Mean Family Income of Italy (In 1000's of 1996 Italian Lira)	Growth Rates of Median Household Income of the U.S. (in 1998 CPI-U Adjusted Dollars)
1980-1990	15.3%	6.5%
1990-1998	0.7%	4.1%
1980-1998	16.2%	10.9%

Findings on the regional structure of family incomes in Italy are displayed in Table 12. The family income estimates for 1980 ranged from a low of 26,328 thousand Lira in the Basilicata region to a high of 39,336 thousand Lira for the Veneto region. By 1996, the mean family incomes of each region had risen over their 1980 levels, with the size of the relative gains ranging from a low of 2.0% for the Sicilia region to a high of 32.0% for the Umbria region.

Table 12: Annual Mean Family Incomes in Italian Regions, 1980 and 1996 (In 1000's of

Constant 1993 Lira)

	Annual Family Income, 1980	Annual Family Income, 1996	Growth Rate of Family Income
Lombardia	38,388	45,456	18.4%
Veneto	39,336	44,820	14.0%
Emilia Romagna	35,736	44,784	25.3%
Trentino Alto Adige	36,552	42,960	17.5%
Valle D'Aosta	32,352	41,916	29.6%
Umbria	31,620	41,724	32.0%
Piemonte	35,028	41,628	18.8%
Toscana	35,424	41,616	17.5%
Marche	36,864	39,720	7.8%
Friuli Venezia Giulia	34,680	38,604	11.3%
Liguria	30,528	37,860	24.0%
Lazio	31,260	37,440	19.8%
Abruzzo	31,116	35,400	13.8%
Sardegna	26,892	32,724	21.7%
Puglia	28,728	32,088	11.7%

Campania	29,256	31,416	7.4%
Molise	29,076	30,360	4.4%
Basilicata	26,328	29,964	13.8%
Sicilia	28,692	29,256	2.0%
Calabria	26,472	28,848	9.0%

Data Source: ISTAT, CENSIS, Italy, 2000

Table 13 indicates that, in Italy, the region with the highest mean family income (Lombardia) has not changed since the mid 1980s while the lowest ranked region has consistently changed. Over 1980-1996 period, the relative size of the family income gap between the top and the bottom ranked regions in Italy increased from 49.4% in 1980 to 71.7% in 1996, an increase of 22.3 percentage points over the 1980-1996 period. Thus, the inequality gap between the top and bottom ranked Italian regions was widening over time.

Table 13: The Size of the Annual Mean Family Incomes of the Highest and The Lowest

Ranked Regions of Italy, Selected Years, 1980-1996 (In 1000's of Constant 1993 Lira)

Year	Highest Ranked Region	Family Income of Highest Ranked Region	Lowest Ranked Region	Family Income of Lowest Ranked Region	Percentage Difference Top to Bottom
1980	Veneto	39,336	Basilicata	26,328	49.4%
1985	Lombardia	41,580	Sicilia	24,912	66.9%
1990	Lombardia	45,372	Sicilia	29,832	52.1%
1996	Lombardia	45,456	Calabria	26,472	71.7%

Data Source: ISTAT, CENSIS, Italy, 2000

Table 14 indicates that the coefficient of variation for the regional family income distribution in Italy has increased over the past two decades; however, the pace of divergence varied quite substantially during this time period. Between 1980 and 1990, the coefficient of variation was basically unchanged. Since 1991, however, the coefficient of variation has increased from .115 to .149, indicating greater inequality in monthly family incomes across the Italian regions.

Table 14: Trends in Inequality in Mean Annual Family Incomes of Italian Regions,
Selected Years, 1980-1996 (In 1000's of Constant 1993 Lira)

Year	Mean	Standard Deviation	Coefficient of Variation
1980	32,220	3,936	0.122
1985	33,048	4,176	0.126
1986	33,456	3,816	0.114
1987	34,380	4,536	0.132
1988	35,256	4,908	0.139
1989	36,408	5,016	0.138
1990	37,152	4,452	0.120
1991	38,412	4,440	0.115
1992	37,716	4,680	0.124
1993	36,444	4,668	0.128
1994	37,428	5,112	0.136
1995	37,164	5,028	0.135
1996	37,428	5,580	0.149

Data Source: ISTAT, CENSIS, Italy, 2000

The regional income data for the U.S. represent median household incomes. In the U.S., only slightly more than two-thirds of all households in the late 1990's was families. A household consists of one or more persons occupying separate living quarters. Estimates of median household incomes are expressed in constant 1998 dollars. Estimates of median real household income for each of the nine U.S. regions are displayed in Table 15 for 1976 and 1998. The growth rates of median household incomes over the 1976-1998 period ranged from highs of 18% and 17% in the East South Central and New England regions to lows of 5.4% and 10.8% for the East North Central and West South Central regions, respectively.

Table 15: Median Household Incomes of Regions in the U.S., 1976 and 1998 (In Constant 1998 Dollars)

Region	Median Household Income, 1976	Region	Median Household Income, 1998
New England	$36,255	New England	$42,434
Middle Atlantic	$35,756	Middle Atlantic	$40,100
East North Central	$39,016	East North Central	$41,140
West North Central	$34,304	West North Central	$39,317
South Atlantic	$32,883	South Atlantic	$37,333
East South Central	$28,937	East South Central	$34,081
West South Central	$30,844	West South Central	$34,186
Mountain	$34,900	Mountain	$39,423
Pacific	$36,096	Pacific	$41,616

Data Source: Census Bureau of the U.S., 1998

Findings presented in Table 16 indicate that, in the U.S., the region with the highest median household income has shifted over the past three decades. In 1976, the East North Central region (which includes the states of Ohio, Illinois, Indiana, Michigan, and Wisconsin) had the highest median household income of $39, 016. The lowest ranked region in 1976 was the East South Central region (which includes the states of Arkansas, Louisiana, Oklahoma, and Texas) with a median household income of $28937. In 1980, the Pacific region (which includes the states of Alaska, California, Hawaii, Oregon and Washington) had the highest median household income of $38,550. The New England region (states of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont) has held dominance over the other regions since the mid 1980s in median household income. The median household income for the New England region for 1998 was $42,434. The East South Central region was always ranked at the bottom of the median household income distribution.

Table 16: Size of the Median Household Incomes of the Highest and the Lowest Ranked Regions of the U.S., Selected Years, 1976-1998 (In Constant 1998 Dollars)

Year	Highest Ranked Region	Median Household Income of Highest Ranked region	Lowest Ranked Region	Median Household Income of Lowest Ranked Region
1976	East North Central	$39016	East South Central	$28973
1980	Pacific	$38550	East South Central	$29221
1985	New England	$41336	East South Central	$26600
1990	New England	$44539	East South Central	$28381
1995	New England	$40196	East South Central	$30057
1998	New England	$42434	East South Central	$34081

Data Source: U.S. Bureau of Census, 1998

Table 17 displays the coefficients of variation for regional median household incomes for the U.S. over the 1976-98 period. The findings are characterized by a number of important swings over the past two decades. The coefficient of variation increased substantially between 1980 and 1990, rising from .078 to .120, an increase of 54%. Since 1990, however, the coefficient of variation for median household incomes has declined substantially, falling to .074 in 1998, its lowest value.

Table 17: Trends in Inequality in Median Household Incomes in the U.S. Regions for Selected Years, 1976-1998 (In Constant 1998 Dollar)

Year	Means of Median Household Income	Standard Deviation	Coefficient of Variation
1976	$34,332	$2,877	0.084
1980	$34,803	$2,730	0.078
1985	$35,515	$4,091	0.115
1990	$36,929	$4,435	0.12
1995	$36,246	$3,240	0.089
1998	$38,848	$2,880	0.074

Testing for Beta Convergence in the Per Capita Outputs and Family Incomes of Regions of Italy and the U.S.

As mentioned earlier, our third approach to analyzing trends in regional inequality involves testing for unconditional convergence in regional per capita outputs and family incomes in Italy and the U.S. The test for convergence involves the use of a simple regression model in which the annual family/household income growth rate of each region within a country is regressed against its initial level of family/household income. Previous empirical studies of per capita income inequality applying this approach have shown trends of both convergence and divergence among nations or regions within a nation (Baumol et.al 1994; Barro and Sala-i-Martin, 1992, Pacci and Saba, 1997; Sum and Fogg, 1999; Vohra 1993). This type of convergence model is referred to in the economic growth literature as a test of beta convergence or unconditional convergence. This model of unconditional convergence is borrowed from a Solow-type neoclassical growth model with Cobb-Douglas production technology and exogenously determined aggregate savings rates and technological progress.

$$\frac{1}{T} \bullet \log\left(\frac{Y_{i,\,t}}{Y_{i,\,t\,-\,T}}\right) = B_0 + B_1 \log\left(Y_{i,\,t\,-T}\right) + \varepsilon_i$$

The left hand side dependent variable represents the annual average growth rate in per capita real outputs or the family/household incomes of residents of regions over a given time period, T. The log of per capita income (family/household incomes) of each region in the initial year appears as the independent variable on the right hand side of the model. A negative, statistically significant coefficient for B1 implies the existence of unconditional Beta convergence, and the size of B1 can be interpreted as a measure of the speed of convergence in per capita outputs (family/household incomes) across regions. For example, an estimated value of -.020 for B1 implies that regional inequality in per capita outputs is being reduced at a rate of 2% per year, and inequality would be eliminated in 50 years. Separate Beta convergence models have been estimated for regions in Italy and the U.S. for time periods for up to two decades.

Findings of the unconditional convergence test for value added per capita among Italian regions are displayed in Table 18. The Beta convergence test for real value added per capita for Italian regions was carried out for the time period 1985-1996. There was no convergence in real value added per capita of Italian regions during the 1985-1996 period.

Table 18: Findings of the Test for Unconditional Beta Convergence in Real Value Added Per Capita of Italian Regions for the Time Period: 1985-1996 (at 1993 Prices)

Time Period	β_o	$\delta\beta_o$	t-statistic	β_1	$\delta\beta_1$	t-statistic
1985-1996	0.016	0.012	1.34	0.001	0.004	0.352

Note: ** sig. At .05 level.
        *sig. At .10 level

Beta convergence tests for per capita real GRP for the U.S regions were carried out for several different time periods. Table 19 indicates that there was a significant degree of convergence in real GRP per capita among U.S. regions during the 1990-1997 period, but not during the 1980's.

Table 19: Findings of the tests for Unconditional Beta Convergence in Real GRP Per Capita for U.S. Regions for Selected Time Periods, 1976-1998 (at 1996 Prices)

Time Period	β_o	$\delta\beta_o$	t-statistic	β_1	$\delta\beta_1$	t-statistic
1977-1987	0.036	0.47	0.78	-0.035	-0.048	-0.74
1980-1990	0.167	0.364	0.460	-0.015	0.036	-0.41
1990-1997	0.348***	0.109	3.177	-0.032***	0.109	-2.97

Note: *** sig. At .01 level
        ** sig. At .05 level.

Beta convergence tests for real mean family incomes for Italian regions were carried out for the period 1980-1996. Table 20 indicates that there was no convergence in real family incomes of Italian regions over the 1980-1996 period.

Table 20: Findings of the Tests for Unconditional Beta Convergence in Real Family Incomes of Italian Regions for Selected Time Periods, 1980-1996 (at 1993 Prices)

Time Period	β_o	$\delta\beta_o$	t-statistic	β_1	$\delta\beta_1$	t-statistic
1980-1990	0.217*	0.123	1.76	-0.011	0.011	-1.64
1990-1996	-0.473**	0.203	-2.33	0.045	0.019	2.33
1980-1996	-0.107	0.081	-1.33	0.011	0.007	1.44

Note: *** sig. At .01 level
     ** sig. At .05 level.
     *sig. At .10 level

Beta convergence tests for median household incomes for the U.S. regions were carried out for several time periods. For the period of 1976-1986, there was no convergence. Similarly, convergence tests for the period 1980-1990 revealed a significant increase in divergence for the U.S. regions. However, convergence tests for the 1990-1998 period revealed a significance degree of convergence in median household incomes among the U.S. regions, restoring long term trends. (Table 21).

Table 21: Findings of the Tests for Unconditional Beta Convergence in Real Households Incomes of U.S. Regions for Selected Time Period,1980-1996 (at 1998 Prices)

Time Period	β_o	$\delta\beta_o$	t-statistic	β_1	$\delta\beta_1$	t-statistic
1976-1986	-0.238	0.327	-0.728	0.023	0.031	0.74
1980-1990	-0.363**	0.121	-3.001	0.035**	0.011	3.04
1990-1998	0.587***	0.129	4.54	-0.055***	0.012	-4.48

Note: *** sig. At .01 level
     ** sig. At .05 level.
     *sig. At .10 level

Mean Family Size in the U.S. and Italy

Findings for Italy with respect to regional differences in per capita outputs and family incomes revealed a considerably lower degree of inequality in regional family incomes than in per capita outputs. For example, the coefficient of variation for real value

added per capita in 1996 was .255 versus a CV of only .149 for regional mean family incomes. Why does this difference exist? We try to solve this puzzle by looking at regional variation in mean household sizes of both countries' regions. The findings in table 22 show that mean household sizes have exhibited a declining trend in both countries. Mean household size declined from 2.84 to 2.66 in Italy between 1985-1997, and it declined from 2.75 to 2.57 in the U.S. during the period of 1980-1999.

Table 22: Mean Household Sizes in Italy and the U.S., Selected Years, 1985-1997

Year	**Italy**	**Year**	**U.S.**
1985	2.84	1980	2.75
1990	2.73	1988	2.58
1995	2.69	1990	2.63
1997	2.66	1999	2.57

Table 23 displays trends in the means and standard deviations of household sizes of Italy and the U.S. regions. The mean household sizes of both Italian and U.S. regions exhibit a decreasing trend; however, the coefficients of variation in Italy are considerably higher than those in the U.S.

Table 23: Mean Household Sizes in the Regions of Italy and the U.S., Selected Years, 1985-1997

Mean Household Size of Italian Regions				**Mean Household Size of U.S. Regions**			
Year	Mean	Std Dev	CV	Year	Mean	Std Dev	CV
1985	2.84	0.263	0.093	1980	2.75	0.049	0.018
1990	2.72	0.241	0.088	1990	2.60	0.050	0.019
1997	2.66	0.231	0.087	1999	2.57	0.082	0.032

Findings in Table 24 show the mean household size of Italian regions in the two main geographic areas of the nation: Central-North and South. Mean household sizes in the Southern region, which is the poorer region of Italy, are larger than those in the Central-North region. In 1997, mean household size in the South was 2.88 versus 2.52 in the North-Central region, a difference of 14%.

Geographic Area of the Country, 1985-1997

	Center-North Region				South Region		
	1985	1990	1997		1985	1990	1997
Emilia Romagna	2.66	2.55	2.47	Abruzzo	2.94	2.80	2.80
Friuli Venezia Giulia	2.54	2.46	2.40	Molise	2.84	2.78	2.72
Lazio	2.88	2.68	2.64	Campania	3.07	3.11	3.08
Liguria	2.29	2.24	2.23	Puglia	3.21	3.07	2.97
Lombardia	2.70	2.60	2.50	Basilicata	3.09	2.90	2.86
Marche	2.93	2.85	2.75	Calabria	3.13	2.94	2.90
Piemonte	2.53	2.39	2.37	Sicilia	3.02	2.85	2.80
Toscana	2.73	2.65	2.56	Sardegna	3.25	3.05	2.92
Trentino Alto Adige	2.93	2.77	2.63	**Mean**	**3.07**	**2.94**	**2.88**
Umbria	2.78	2.66	2.71	**Std Dev**	**0.13**	**0.12**	**0.11**
Valled' Aosta	2.34	2.30	2.26	**CV**	**0.041**	**0.040**	**0.036**
Veneto	2.97	2.83	2.72				
Mean	**2.69**	**2.58**	**2.52**				
Std Dev	**0.22**	**0.19**	**0.17**				
CV	**0.081**	**0.074**	**0.068**				

Table 25 displays the mean household sizes of U.S. regions. The mean household size of U.S. regions declined modestly from 2.74 in 1980 to 2.57 in 1999. The coefficient of variation of mean household size has increased modestly from 1.8% in 1980 to 3.2% in 1999. The coefficient of variations for the U.S. region in the late 1990's were lower than those of the Italian regions in the aggregate.

Table 25: Household Size of U.S. Regions, 1990-1999

	1980	1990	1999
New England	2.74	2.57	2.50
Mid Atlantic	2.74	2.61	2.55
East North Central	2.78	2.59	2.57
West North Central	2.68	2.57	2.49
South Atlantic	2.73	2.53	2.48
East South Central	2.83	2.58	2.51
West South Central	2.80	2.65	2.62
Mountain	2.79	2.57	2.68
Pacific	2.68	2.71	2.72
Mean	**2.75**	**2.60**	**2.57**
Standard Deviation	**0.049**	**0.05**	**0.08**
CV	**0.018**	**0.019**	**0.032**

Data Source: U.S. Census Bureau

Trends in Per Capita Incomes of Families by Region

Table 26 displays the variations in mean family income across all Italian regions and those within the Central-North region and South region over the 1985-1996 period. There is a considerably greater variation in the family incomes of all Italian regions than in the Central-North region and the Southern regions separately. The coefficients of variation of mean family income for the Central-North region and the Southern region are relatively small (less than half) when compared to those for all regions.

Table 26: Mean Real Family Income of All Italian Regions, Those in the Central-North Region, and Those in the South Region (in 1000's of 1993 Italian Lira)

	For All Regions			Central-North Region			South Region		
Year	Mean	Std Dev	CV	Mean	Std Dev	CV	Mean	Std Dev	CV
1985	33,049	4,171	0.126	35,684	2,884	0.081	29,098	2,234	0.077
1986	33,455	3,818	0.114	35,779	2,629	0.073	29,968	2,413	0.081
1987	34,378	4,534	0.132	37,526	2,365	0.063	29,655	2,416	0.081
1988	35,256	4,910	0.139	38,610	2,910	0.075	30,225	2,321	0.077
1989	36,409	5,015	0.138	39,729	2,909	0.073	31,429	2,973	0.095
1990	37,155	4,456	0.12	40,066	2,696	0.067	32,788	2,635	0.080
1991	38,408	4,435	0.115	41,502	2,103	0.051	33,767	2,578	0.076
1992	37,720	4,677	0.124	40,968	2,856	0.070	32,847	1,701	0.052
1993	36,448	4,664	0.128	39,637	3,068	0.077	31,665	1,464	0.046
1994	37,431	5,108	0.136	41,239	2,356	0.057	31,718	1,582	0.050
1995	37,161	5,023	0.135	40,789	2,701	0.066	31,720	1,670	0.053
1996	37,429	5,575	0.149	41,544	2,601	0.063	31,256	2,009	0.064

The family incomes of each Italian region were adjusted for differences in mean family size. Table 27 displays the real per capita family incomes of all Italian regions, those in the Central-North Regions, and the South Regions. The coefficient of variation for all regions was much larger than those for the North-Central region and South regions, separately. This clearly indicates that the greater regional per capita income inequality in Italy can be explained to a large extent on the basis of differences in family size between regions in the Central-North region and the South.

Table 27: Mean Per Capita Real Family Incomes of All Italian Regions, Those in the Central-North Region, and in the South Region (in 1000's of 1993 Italian Lira)

	All Regions			North Region			South Region		
	Mean	Std Dev	CV	Mean	Std Dev	CV	Mean	Std Dev	CV
1985	11,791	2,127	0.180	13,322	1,145	0.086	9,495	745	0.078
1986	12,051	2,080	0.173	13,525	1,102	0.082	9,839	917	0.093
1987	12,523	2,464	0.197	14,317	1,237	0.086	9,831	899	0.091
1988	12,967	2,528	0.195	14,839	1,158	0.078	10,159	907	0.089
1989	13,475	2,593	0.192	15,385	1,130	0.073	10,611	1,108	0.104
1990	13,805	2,352	0.170	15,565	991	0.064	11,165	860	0.077
1991	13,867	2,324	0.168	15,585	989	0.063	11,291	985	0.087
1992	13,287	2,419	0.182	15,087	1,119	0.074	10,587	774	0.073
1993	13,509	2,395	0.177	15,272	1,214	0.079	10,864	690	0.064
1994	13,965	2,765	0.198	16,059	1,214	0.076	10,824	672	0.062
1995	13,982	2,682	0.192	16,016	1,146	0.072	10,932	708	0.065
1996	14,182	2,997	0.211	16,436	1,358	0.083	10,800	796	0.074

Table 28 displays the mean real family incomes and per capita family incomes of U.S regions as well as the coefficients of variation for both distributions. The findings indicate that variations in mean regional real family incomes are basically identical to the variation in mean per capita real family income across the same nine regions of the U.S. The coefficients of variations for both variables in 1999 were .085 and .083 for mean family income and mean per capita income, respectively.

Table 28: Mean Real Family Income and Mean Per Capita Real Family Income of U.S. Regions, 1990-1999 (in 1999 Dollars)

	Mean Family Income			Mean Per Capita Family Income		
	1990	1998	1999	1990	1998	1999
U.S.	$42,638	$59,207	$61,171	$13,540	$19,038	$19,606
New England	$44,650	$67,128	$69,858	$14,274	$21,866	$22,608
Middle Atlantic	$43,002	$64,109	$66,407	$13,535	$20,352	$21,149
East North Central	$44,095	$61,446	$63,451	$14,003	$19,758	$20,402
West North Central	$40,533	$57,909	$60,095	$12,917	$19,112	$19,768
South Atlantic	$41,051	$57,027	$59,622	$13,513	$19,137	$20,075
East South Central	$35,494	$51,487	$52,907	$11,476	$17,105	$17,754
West South Central	$40,678	$53,573	$54,512	$12,808	$17,062	$17,361
Mountain	$43,035	$56,510	$57,712	$13,619	$17,770	$17,923
Pacific	$46,883	$61,536	$63,366	$14,333	$18,876	$19,144

Mean	$42,158	$58,970	$60,881	$13,386	$19,004	$19,576
Std Dev	$3,059	$4,735	$5,167	$841	$1,473	$1,626
CV	0.073	0.080	0.085	0.063	0.077	0.083

Summary of Main Findings

Our comparative study of the degree of inequality in per capita real outputs for Italian and U.S. regions between 1985 and 1996 has shown that Italian regions are characterized by a substantially higher degree of inequality. The coefficient of variation in regional per capita value added in Italy was nearly three times higher than in the U.S. in the late 1990. Our analysis also revealed that there was no convergence in value added per capita among the Italian regions while, there was a significant degree of convergence in GRP per capita among U.S. regions over the 1990-1997 period. Regional family incomes of Italy and the U.S. were characterized by divergence in the decade of the 1980s while the U.S. regions were characterized by renewed convergence in household incomes during the1990s. The Italian regions showed no sign of convergence over the last two decades for any of our measures. The disparity in mean per capita family income for Italian regions was also much larger than that for the U.S. regions. The smaller degree of inequality in mean family incomes in Italy relative to per capita incomes was explained by large regional variations in family size.

There are myriad of factors that play some role in the convergence or divergence of regional output and family income in the U.S. and Italy. In comparison to the U.S., Italian regions are characterized by a much higher degree of inequality in labor force participation rates and employment rates. Economically, for the last 50 years the Italian South has lagged behind the North. Even though the Italian government has placed a major emphasis on the development of the Southern region since the early 1950s through the transfer of development funds and establishment of large industries, its attempts have been futile to some extent when it comes to achieving regional convergence. In the labor market arena, labor force participation rates in the Southern region of Italy are very low

compared to the North region and productivity levels in both industrial and agricultural sectors have been relatively low in the Southern region. Unemployment in the South region has been very high compared to the North region despite the establishment of new industries. There is very little contribution in direct employment from these industries as they are frequently capital intensive. The population of the South consumes more than it produces average (Schachter and Engelbourg, 1988). Given all these circumstances, economic convergence of Italian regions in per capita real outputs is likely to take a long time.

The U.S. Southern regions also were very poor in terms of per capita income in most of the 19th century. The per capita income of the South was only half the national average in 1930; however, Southern incomes have increased strongly since the early 1960s, coming closer to the national average. Demographic, geographic, political, and economic factors were favorable for the U.S. South. The U.S. South had more market autonomy and the population consumed less than they produced. Labor productivity and employment was also on an upward trajectory in the South as capital moved into the region.

Given above findings, economic convergence among regions of the U.S. and Italy has been shaping up quite differently. U.S. regions are once again converging in terms of output per capita, incomes per capita, and household income while Italian regions are slightly diverging. There is a much greater degree of divergence in per capita incomes and outputs and in the Italian regions than in the U.S. Future research should document trends in convergence in regional labor force participation rates, employment rates and labor productivity in the Italy and the U.S regions.

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