Minimum wages, public transfers, and development in Puerto Rico

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Abstract

Puerto Rico's long running experiment with active wage floor and public transfer policies manifests substantial program benefits at great efficiency costs. Transfers have sheltered large segments of the population from a deep and prolonged recession and in past decades been important instruments of positive distributive change. They have also curtailed growth potential, reducing the effective labor force through retirements that occur at very early ages and through limited market entry among the low-skilled. A high wage floor has in the past driven large increases in productivity and real wages, but has also resulted in structural unemployment and a marked loss in competitiveness concentrated in the lower half of the earnings distribution. Resulting policy design interaction has contributed to an economy with scarce job opportunities and one of the lowest workforce participation rates in the world.

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JEL classification codes: O1, J3, J6, D3

1 Introduction

Before Taiwan, South Korea, Singapore, and Japan showed that it was possible to break from poverty to rapid development, Puerto Rico had already adopted the open economy, high investment strategy that would suit the Asian tigers well. Incorporated to the US in 1898 and described decades later as the stricken land, it embarked on an industrialization drive that would lift its economy by its own bootstraps, in the words of policy architects. Stable institutions, low taxes on foreign capital, complementary public investment, an open economy and generally market-friendly policies led to growth that trebled per capita income in a span of three decades. Poverty was cut 40%, mean schooling doubled, infant mortality fell 75%. It was held as a showcase to Latin America at a time when other countries were experimenting with very different paths to development. Even after difficulties that would follow, it would be put forward as the fifth "tiger" (Baumol and Wolff, 1996).[1]

Alas, this remarkable story of success has been turned on its head, especially as of late. A long recession has set back output some fifteen years and prospects for a strong recovery and long-term growth are not promising. Soaring external debt restricts the scope for public investment, expansionary fiscal policy, and its service constitutes a large drain of local resources. The economy's capacity to attract investment also appears impaired, as its foreign-capital industrial sector slowly winds down production. Growth potential is further curtailed by exceedingly low labor force participation among a population that has ceased to grow. Under the circumstances, is not far fetched to fear that economic viability is at stake and that the odds are not in the Island's favor.

How did it come to this? The paper argues that labor market data provide answers and unifying themes. While having direct relevance to the Puerto Rican case, they show how institutional convergence, full fiscal, banking, and monetary union can still be compatible

[1]See Baer (1959), Dietz (1986, 2003), Weisskoff (1986), Baumol and Wolff (1996), and Bosworth and Collins (2006) for evaluations of the development experience and Tugwell (1946) for a tale of political, social, and economic conditions in the 1940s. Distribution data is taken from Sotomayor (2004) and social indicators from Weisskoff (1986:52), Dietz (2003:8), and Ladd and Rivera Batiz (2006). The Island's chief economic official was coordinator of the Alliance for Progress, an important element of the Kennedy Administration's drive to improve relations with Latin America.

with economic stagnation and even divergence. As the developing world shows increasing taste for minimum wage and transfer policies as inequality-fighting tools, lessons on program effectiveness and efficiency can also be derived from Latin America's longest experiment with both. The island's experience highlights that as much as the policies themselves, program design and incentives matter, and greatly so. Evidence shows that the higher replacement rates characterizing the public transfer programs it shares with the United States, translate to markedly lower workforce participation patterns in the island. The phenomenon is associated with limited labor market engagement among the low-skilled and an early retirement process among those with higher education, where even college graduate participation rates that rival those in the US, drop precipitously after middle age. Replacement rates, early retirement age dispositions, and disability benefits interact with poor labor market conditions associated with a binding minimum wage. In the past its dis-employment effects were moderated by a shock effect that led to more efficient use of the management input. More recently, the effect has not manifested itself through increased labor productivity or disproportionate investment in human capital. Decades after its introduction, both levels and changes in earnings distribution are still dominated by the minimum wage. Resulting earnings convergence to the US driven by changes in returns to low-skilled labor has resulted in a loss of competitiveness at the bottom half of the wage distribution.

The paper begins with a brief discussion of the country's modern development experience. In Section 3 cross-section and time-series evidence sheds light on the processes generating one of the lowest labor force participation rates in the world. Section 4 examines wage trends and establishes a rapid process of convergence to US levels concentrated in the bottom of the earnings distribution. A quintile regression decomposition approach is employed in Section 6 to gain a measure of its impact on competitiveness and its relationship to the value of the minimum wage. The wage floor's role during the Great Recession and on possible adjustment mechanisms are also assessed. Section 7 concludes and offers potential lessons for development.

2 Background

The 20th century witnessed explicit or implicit implementation of a variety of development initiatives in Puerto Rico. Incorporation to the US brought a currency union and free trade with one of the world's largest markets. The country's comparative advantage in tropical crops and tariff protection legislated for American sugar cane growers, led to almost immediate specialization in that sector. Large volumes of outside capital flowed in to modernize cane production and industry at a later stage (Clark et al., 1930). Sugar output grew by a factor of 20 between 1899 and 1934, national employment doubled by 1948 (Perloff, 1950: 64), but lagged population growth. While efficient, the sector was a high-cost producer, depending on subsidies and tariff protection (Perloff, 1950: 77). As other production locations became more competitive and its export quota stagnated, sugar could no longer be the economy's driving force.

Focus was placed on developing the industrial sector, and after a brief attempt at a state-led drive in the 1940s, the Island turned to external investment sources. A favorable gap separated US and Puerto Rican wages, the institutional framework was stable and aligned to that of the US, political risk was low, and foreign corporations exempted from taxes. Public investment in transportation, schooling, health, and productive infrastructure in the form of factory space was likely complementary to private investment. A public agency reduced information and transaction costs and promoted the Island as an investment location. As a result of these factors, capital flowed in large quantities and the Island became a low-cost production platform of tradable goods. Between 1950 and 1970, manufacturing output rose by a factor of five, while employment doubled.

Diminishing returns to the strategy set in the 1970s. Output growth of 3.3%, paled in comparison to rates of 5.3% and 7% achieved in the decades of the 1950s and 1960s, respectively. A sharp decline in investment appears to be at the center of the slowdown (Bosworth and Collins, 2006), but its source remains unclear. Increasing competitiveness of other low-cost locations could have played a role at a time when the local minimum wage was set to converge US levels. Furthermore, as the development initiative did not result in the creation of a large entrepreneurial class or endogenous capital base (Dietz,

2003), little in the way of supplementary investment sources were forthcoming.

Whether the early success of the strategy represented a curse or a missed opportunity to adapt to a changing world, is a matter of debate. As fact, increased flows of public transfers from the Federal government provided alternatives to unemployment, boosted consumption, and helped avoid painful reforms.[2] At the same time, effective full exemption from Federal taxes did the same to investment, turning the Island into a global pharmaceutical powerhouse. However, as the the incentive proved increasingly costly to the US Treasury, it was phased out beginning in 1995 (see Dietz, 2003: 139).

Despite setbacks and blemishes such as low labor force participation, Baumol and Wolff (1996) argue that the growth record experienced between 1950 and 1990 placed the economy in the same league as that of Japan, Taiwan, Singapore, and South Korea.[3] Circumstances related to its special relationship to the US had little to do with performance since in their absence, growth over the period would have held at 3.8% rather than the observed 4.2%. The authors argue that the factors that mattered were were education, investment, low population growth, and trade openness. On the distribution front, poverty fell sharply during the early stages of development. Thereafter, public transfers were associated with declining poverty and compressed income differentials (Sotomayor, 2004).

In the 2000s, unable to redress the investment slowdown set in the mid 1970s, the Island turned to credit as a source of growth. As a share of gross product, public debt rose from 60% in 2000 to 75% in 2005, and 105% in 2012. Output grew with a slight pause during the early century recession, until it began to contract in 2006. Since then, real per capita output has been set back some 15 years and labor force participation, already one of the lowest in the world before the recession, has steadily declined from 48% in 2005 to 40% in 2012. Patently difficult labor market conditions may explain the bulk of the recent decline, but in the past other factors have played contributing roles.[4]

[2]Fiscal reforms laid out by a Committee headed by James Tobin went largely unimplemented (see Committee to Study Puerto Rico's Finances, 1975).

[3]See Baer (1959), Dietz (1986), Weisskoff (1986), Baumol and Wolff (1996), and Bosworth and Collins (2006) for evaluations of the development experience and Tugwell (1946) for a tale of political, social, and economic conditions in the 1940s.

[4]In the more distant past, access to fallow land resulted in low formal labor force participation. See

3 Labor force participation

Puerto Rico shares with the US a public transfer system that includes housing, food, and retirement benefits. Burtless and Sotomayor (2006) argue that its design generates high implicit tax rates for low-skilled individuals who contemplate labor force participation. Old age and disability benefits are progressive and generate higher replacement rates on the Island where they replace 57% of earnings at the middle of the distribution, as compared to 43% in the US. At the bottom they can replace much more, especially when spousal benefits are also taken into account. The authors place public transfers at the center of the economy's low labor force participation levels, while Enchautegui and Freeman (2006) consider a more comprehensive evaluation that also includes selective migration, informality, high reservation wages, and changes in employment composition.

Figures 1 and 2 suggest that low labor force participation is product of two different processes, with rates estimated using data drawn from the 2005-10 American and Puerto Rico Community Surveys.[5] The top left panel of Figure 1 shows that among highly skilled males, low market engagement is associated with a pattern of very early retirement. That is, hardly any differences separate participation rates of college-educated Puerto Rican and American men up to about age 50, when a gap begins to develop. At age 64, only 40% of Puerto Ricans are active labor force participants, while the figure for the US is some 50% higher. Among women with at least a bachelors degree, participation in the Island is marginally *higher* at a range of ages, until the sixth decade of life when a gap begins to develop. By age 58, only half are still at work as opposed to 75% in the US. Gaps grow at earlier ages when the samples are extended to include individuals with lower levels of education, and much more so among women, but the general pattern of very early retirement still holds.

Time trends in Figure 3 suggest that the male phenomenon dates to the 1960s when the early retirement age of 62 was legislated and other benefits liberalized in the Social

Bobonis and Morrow (2014) for an analysis of effects of 19th century coercive labor arrangements on human capital accumulation.

[5]The surveys have been conducted annually since 2001 and 2005, respectively. All microdata are drawn from Ruggles et al. (2010).

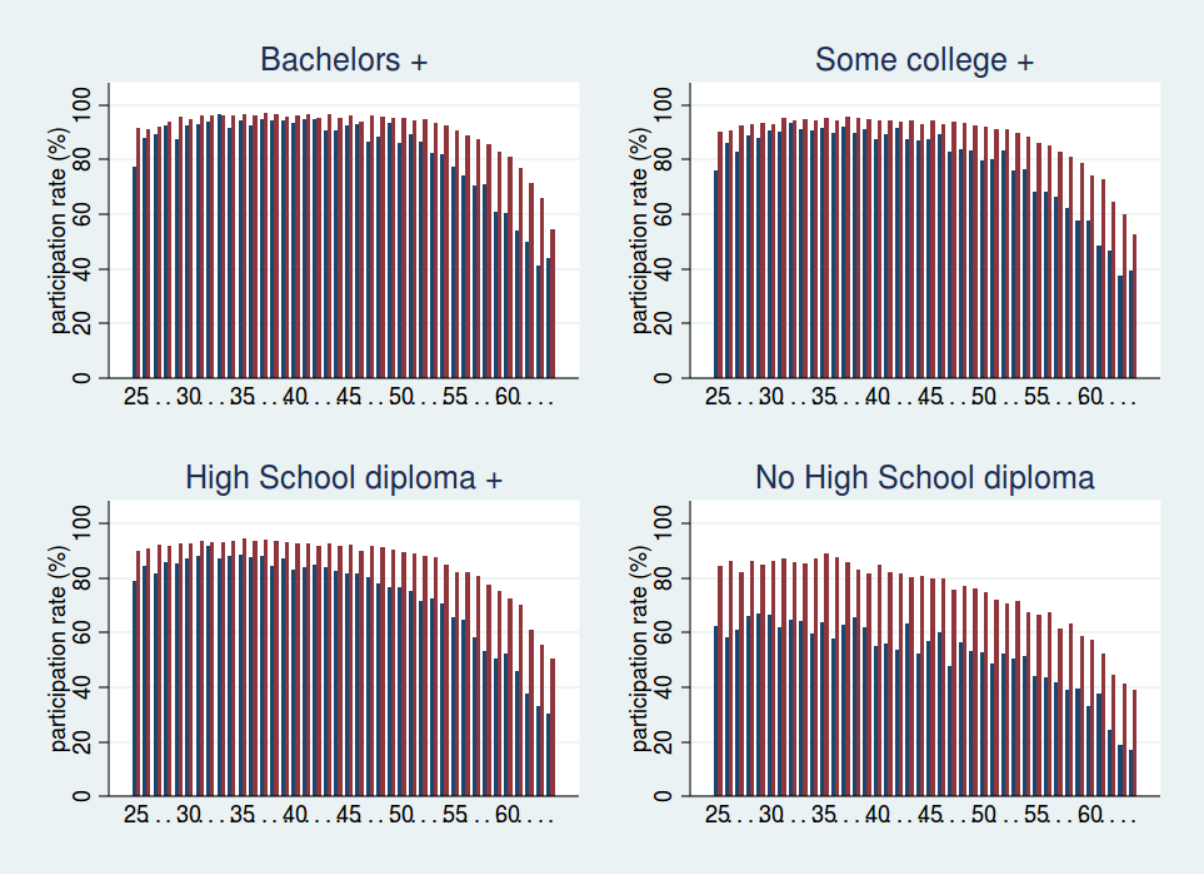

Figure 1: Puerto Rican and American male participation rates by age and education

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Note—Puerto Rican (US) participation rates in blue (red).

Security Amendments of 1961. Just between 1965 and 1980, participation dropped by 30 percentage points in the 60-64 age range, and by 15 percentage points in the 55-59 range. Participation among the two groups also declined in the US (Blau and Goodstein, 2010), but it did so to a much lesser extent, as can be appreciated from trends that are expressed as ratios of US rates. During the same period, Social Security Disability Insurance rolls as a share of the adult population rose by about a factor of two in the US. In Puerto Rico, they rose by a factor of eight, from 0.7% in 1965, to 3.6% in 1974, and 5.6% in 1980 (Figure 4). Contrary to old age insurance, which can be obtained at age 62 at the earliest, disability coverage can take place at any age, although it more commonly accrues to individuals between the ages of 60 and 64, followed by the 55-59 age group. About a quarter (fifth) of the population aged 60 to 64 (55 to 59) receives disability benefits in Puerto Rico, compared to less than 15% (10%) in the US. Among men, the differences

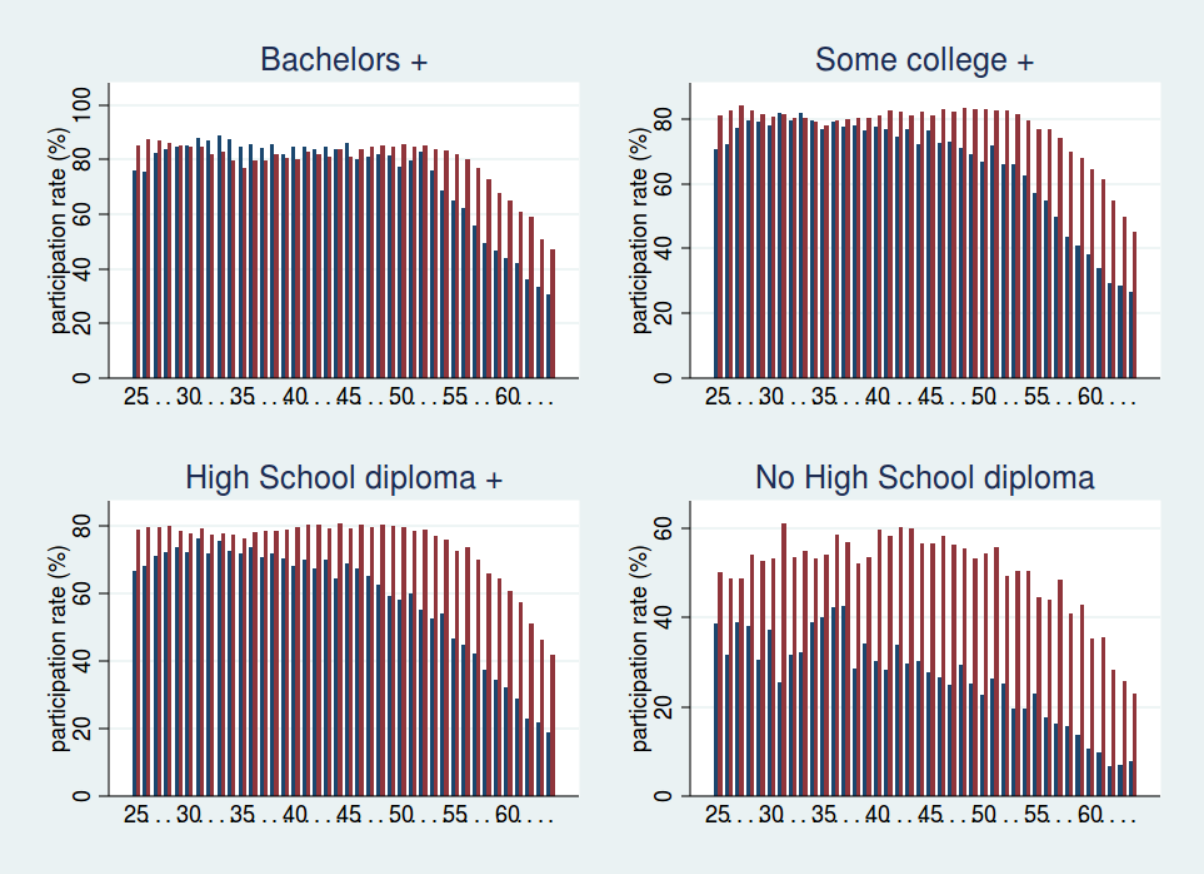

Figure 2: Puerto Rican and American female participation rates by age and education

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Note—Puerto Rican (US) participation rates in blue (red).

are starker, with 32% of those aged 60-64 and 22% of those aged 55-59 receiving benefits in Puerto Rico, versus 16% and 10% for the corresponding age groups in the US.

Gruber (2000) and Autor and Duggan (2003) find substantial labor supply responses to changes in replacement rates using Canadian and US data, respectively. In light of the progressive nature of benefits and the lower wages prevalent in the Island, a more pronounced withdrawal process is consistent with the evidence. Given the more challenging labor market environment, higher disability rates in the Island are also consistent with the finding that worsening economic conditions foster Social Security disability applications by able-bodied individuals (von Wachter, Song, and Manchester, 2011).[6] Difficult labor market conditions and higher replacement rates are also likely behind stronger responses to the early retirement age. That is, while Social Security receipt jumps by 21 percentage

[6]Residual work capacity is greatest among those with non-terminal conditions such as mental disorders or muskuloskeletal conditions (Maestas, Mullen, and Strand, 2013).

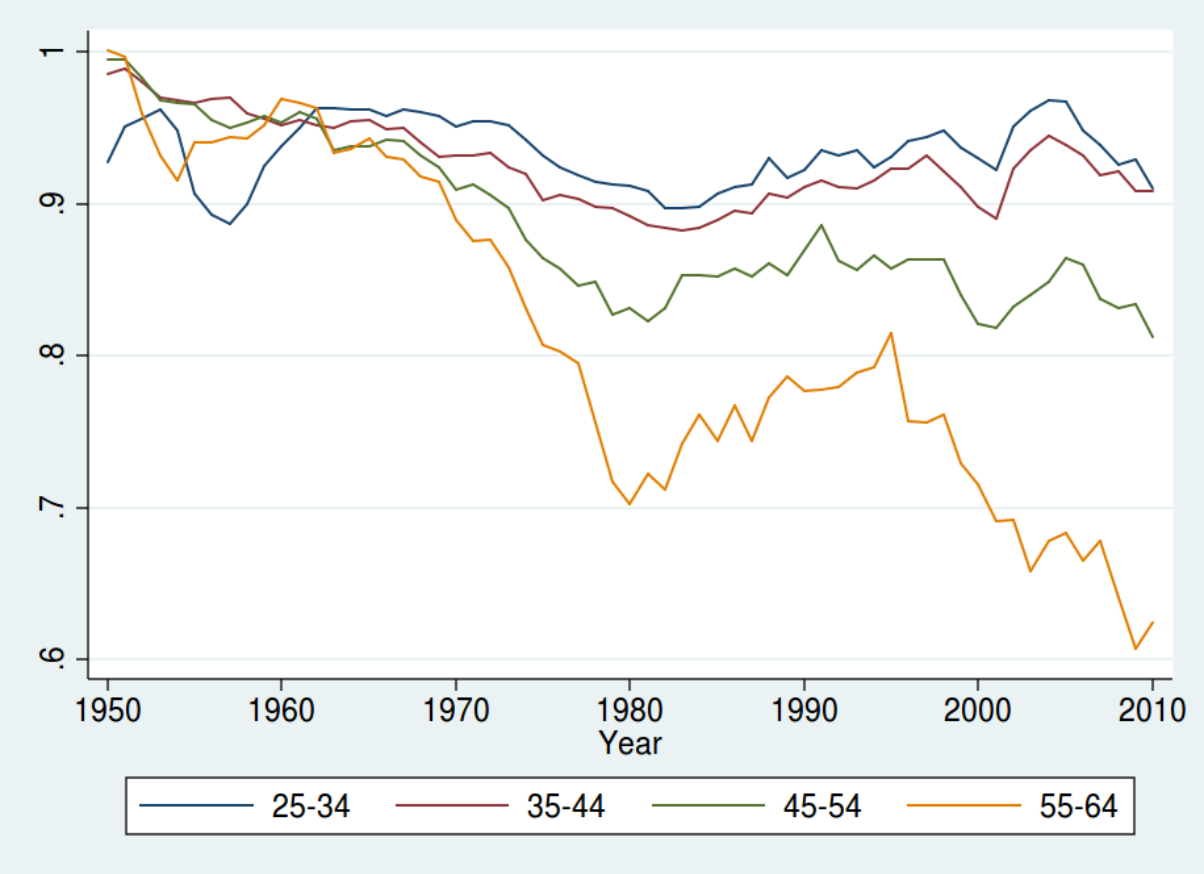

Figure 3: Ratios of Puerto Rican to American male participation rates by age group

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Source—Puerto Rico Department of Labor and Bureau of Labor Statistics.

points between age 61 and age 62 in the US, it jumps by 30 points in Puerto Rico, an age when a full 60% of individuals are receiving either old age or disability benefits, compared to 33% in the US Mainland.

Instead of very early retirement, however, a different process appears to be at work among the low-skilled. Across the entire age spectrum, Puerto Ricans without high school degrees have substantially lower participation rates relative to their American counterparts. Among women, they are astoundingly low, relative either to higher-skilled Puerto Rican women, or to low-skilled Americans who are almost twice as likely to be economically active. Male participation is 15 to 20 percentage points lower relative to the Mainland, and even between the ages of 30 and 45, 40% of low-skilled Puerto Rican men are neither working nor seeking a job. As a measure of the phenomenon's impact on overall participation, Puerto Ricans without high school degrees comprise 26% and 20%

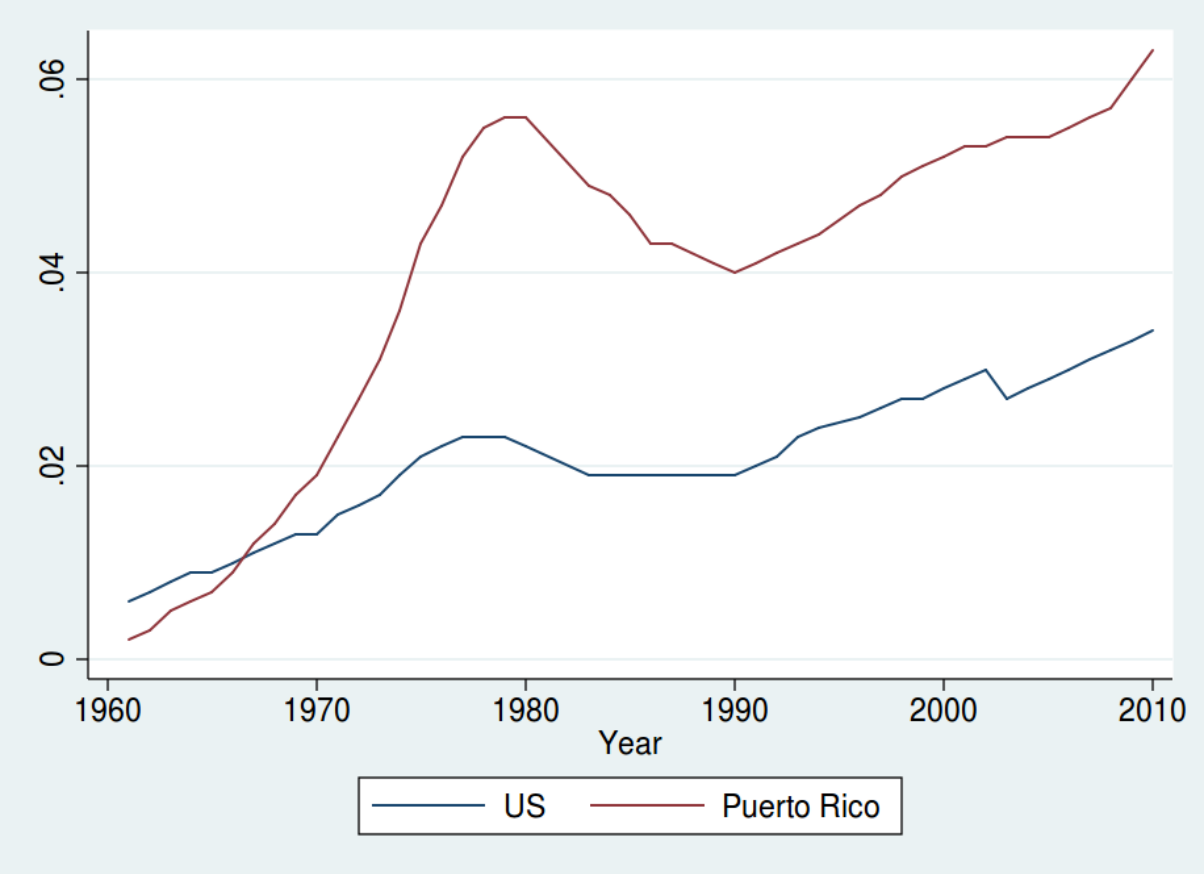

Figure 4: SSDI participants as ratio of the adult population

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Source—Annual Statistical Report on the Social Security Disability Insurance Program, various years.

of the male and female population in the 25 to 64 age range, respectively.

Therefore, whereas the answer to why so few Puerto Ricans work is generally that many have retired, a different process appear to influence decisions among the low-skilled. Explanations that include informality, high reservation wages related to public transfers and to migration possibilities, as well as a changing sectoral structure of the economy may be particularly relevant to this group. As Enchautegui and Freeman (2006) also point out, a high minimum wage could also be playing a role by eroding employment prospects for the low-skilled.

4 Wages and convergence

Over time, wages have risen relative to those of its main trading partner, the United States. A process of convergence can be ascertained in Table 1, where focus is placed on a population with as strong labor market attachment as possible: prime-aged, full-time, full-year wage earning males, where the definition of full-year is set at 48 weeks and that of full-time at 30 hours per week. Given the earlier retirement observed on the Island relative to the US, prime age is set at 25 to 44 rather than the more commonly used 25 to 54 age range.

Table 1
Puerto Rican and US earnings by percentiles in their distributions

	1970 Census			1980 Census		
Percentile	PR	US	Ratio	PR	US	Ratio
10th	6,462	18,994	.34	7,576	18,588	.41
25th	9,595	26,043	.37	10,602	25,229	.42
50th	13,903	34,267	.41	15,142	36,535	.42
75th	19,777	43,274	.46	22,886	48,346	.47
90th	31,526	56,981	.55	35,737	62,741	.57
	1990 Census			**2000 Census**		
Percentile	PR	US	Ratio	PR	US	Ratio
10th	6,754	16,630	.41	9,200	16,900	.54
25th	9,211	24,306	.38	11,600	24,700	.47
50th	13,816	35,179	.39	16,700	35,000	.48
75th	21,747	48,612	.45	26,000	50,000	.52
90th	36,151	65,242	.55	42,000	75,000	.56
	2005-07 ACS/PRCS			**2008-10 ACS/PRCS**		
Percentile	PR	US	Ratio	PR	US	Ratio
10th	8,532	15,776	.54	8,367	14,984	.56
25th	10,955	22,787	.48	10,932	22,508	.49
50th	16,611	34,130	.49	15,205	33,762	.45
75th	25,597	51,195	.50	24,116	52,251	.46
90th	40,956	76,792	.53	37,855	78,037	.49

Note—Samples are composed of full-time full-year wage earning males between the ages of 25 and 44. Earnings are expressed in 1999 dollars.

Data from the 1970 Census, the earliest with available microdata, place Puerto Rican to American wage ratios at 0.34, 0.41, 0.55, at the bottom decile, median, and top deciles of the distributions, respectively. The 1970s and 1990s were periods of strong relative wage growth at the bottom, and data from the 2000 Census, the last to provide labor market information, reflect a transition to a u-shaped relationship between ratios and position in the distribution. In that Census, Puerto Rican to US earnings ratios at the 10th, 50th, and 90th percentiles stood at 0.54, 0.48, and 0.56.

The convergence process partly reflects strong wage growth in the Island. Median earnings rose 20% but growth at the bottom was strongest, at 42%. It also reflects modest US growth at the middle and a retreat at the bottom of the distribution. That is, the

median US wage grew 2% while first decile earnings fell 11%. Large advances in American earnings register only at the top decile, where they rose 32%. Developments certainly proved positive for many working Puerto Ricans, but their effect on the economy's competitiveness depends on whether the gains were achieved through higher productivity or through other means.

5 Method

To gain insight on the source of convergence, earnings trends are decomposed into worker attribute and skill price contributions. Machado and Mata (2001, 2005) provide an analogue to a Oaxaca-Blinder decomposition that is not restricted to central tendencies in wages, human capital, and its returns. Rather than mean wages, the unit of observation becomes the wage distribution, and impacts of skill prices and worker attributes can likewise vary across their distributions. Denoting $Q_\Theta(y|\ x)$ for $\Theta \in (0,1)$ as the Θth percentile of the distribution of y given x, and $\beta(\Theta)$ as a vector of quintile regression coefficients, the approach is based on two foundations. First, in the same manner that percentiles characterize the marginal distribution of a variable y, conditional percentiles do the same to the distribution of y given x. Second, by the probability integral transformation theorem, if $\Theta_1, \Theta_2, \Theta_3 ... \Theta_m$ are drawn from a distribution U(0, 1), the corresponding m estimates of the conditional quantiles at x $\{x'\widehat{\beta}(\Theta_i)\}_{i=1}^m$ are distributed as the estimated distribution of y given x. Given estimates of conditional quintiles, extracting a sample from the marginal distribution of y involves integration over a random sample of covariates x.

Defining y(t) as log earnings and x(t) as a vector of personal attributes at time t, the construction of a sample from a marginal distribution of earnings is carried out in four steps. The first involves the generation of a random sample of size m, $u_1, u_2, u_3 \dots u_m$, from a distribution U(0, 1). Secondly, for each $u_1, u_2, u_3 \dots u_m$ a quintile regression is estimated to arrive at the corresponding $\widehat{\beta}^t(u_i)$ using covariates from a sample X at time t. Third, a random sample of size m is generated with replacement from the rows of X at time t, represented by $x_i^*(t)$, i=1, 2, 3 ... m. Finally, $\{y_i^*(t) \equiv x_i^*(t)'\widehat{\beta}^t(u_i)\}_{i=1}^m$

constitutes a random sample of size m from the distribution of y(t).

However, the point of the exercise is not reproducing distributions but rather constructing counter-factuals reflecting how earnings would have evolved if only skill levels had changed over time or if only skill prices had done the same. From the preceding discussion, these can be readily constructed by estimating conditional quintiles and by drawing covariates from appropriate distributions. That is, to generate the marginal distribution of earnings that would have obtained in year t=1 if individual characteristics had remained as in year t=0, the above-mentioned steps are carried out with the exception that while estimates of conditional quintiles are derived using a sample drawn from the year 1 distribution, samples are integrated out using covariates from year 0. Likewise, to construct the counter-factual of what would have been the wage distribution in year 0 if characteristics had been as in year 1, estimates of conditional quintiles are arrived at using the year 0 distribution and the sample integrated out using covariates from year 1.

Denoting f(y(t)) as an estimator of the marginal density of log earnings of the observed year t sample, f*(y(t)) as an estimator based of the generated year t sample, f*(y(0); X(1)) an estimator of the density that would have resulted in year t=0 if covariates had been as in year t=1, and $\alpha(\cdot)$ as a function that produces a summary statistic from a density; a change in density between year t=1 and year t=0 can be decomposed as follows.

$$\begin{aligned}\alpha(\text{f}(\text{y}(1))) - \alpha(\text{f}(\text{y}(0))) = \alpha(\text{f}^*(\text{y}(1))) - \alpha(\text{f}^*(\text{y}(0);\, \text{X}(1)))\\ + \alpha(\text{f}^*(\text{y}(0);\, \text{X}(1))) - \alpha(\text{f}^*(\text{y}(0))) + \text{residual}\end{aligned}$$

As the first term holds constant the distribution of covariates at year 1 levels but allows prices to vary, it measures the effect of changing skill prices. In holding prices at their year 0 levels and allowing covariates to vary, the second measures the effect of changes in personal attributes. The third component, a residual, stems from differences between observed and estimated changes in densities. The α's underscore that comparisons can be carried out through use of any summary measure, percentiles and densities being those of interest in this study. They are henceforth omitted to simplify notation.

In a similar fashion, a change in a wage gap could be decomposed into price and attribute components by adding and subtracting $\text{f}_{US}(\text{y}(1);\, \text{X}(0)) - \text{f}_{PR}(\text{y}(1);\, \text{X}(0))$ to the

PR-US earnings gap change expression:

$$\mathrm{f}_{US}(\mathrm{y}(1)) - \mathrm{f}_{PR}(\mathrm{y}(1)) - \mathrm{f}_{US}(\mathrm{y}(0)) + \mathrm{f}_{PR}(\mathrm{y}(0)) =$$
$$\mathrm{f}^{*}_{US}(\mathrm{y}(1)) - \mathrm{f}^{*}_{PR}(\mathrm{y}(1)) - \mathrm{f}^{*}_{US}(\mathrm{y}(0)) + \mathrm{f}^{*}_{PR}(\mathrm{y}(0)) + \text{residual}$$

The result is the decomposition formula shown below, where the first right-hand side term refers to the change in the earnings gap attributable to evolving attributes, the second to changes in their prices, and the third to the residual reflecting differences between actual and generated distributions.

$$\mathrm{f}_{US}(\mathrm{y}(1)) - \mathrm{f}_{PR}(\mathrm{y}(1)) - \mathrm{f}_{US}(\mathrm{y}(0)) + \mathrm{f}_{PR}(\mathrm{y}(0)) =$$
$$\mathrm{f}^{*}_{US}(\mathrm{y}(1)) - \mathrm{f}^{*}_{US}(\mathrm{y}(1);\mathrm{X}(0)) - \mathrm{f}^{*}_{PR}(\mathrm{y}(1)) + \mathrm{f}^{*}_{PR}(\mathrm{y}(1);\mathrm{X}(0)) -$$
$$\mathrm{f}^{*}_{US}(\mathrm{y}(0)) - \mathrm{f}^{*}_{US}(\mathrm{y}(1);\mathrm{X}(0)) - \mathrm{f}^{*}_{PR}(\mathrm{y}(0)) + \mathrm{f}^{*}_{PR}(\mathrm{y}(1);\mathrm{X}(0)) + \text{residual}$$

The approach is applied to the examination of the factors behind the long-term change in earnings distribution and in the PR-US earning distribution gap, where the generated sample size (m) is set equal to the actual sample sizes. Earnings equations include 8 schooling levels, a quadratic in age, and schooling fully interacted with the age component for a total of 21 regressors. As in the case of other decomposition procedures, both earnings and gap change formulae are not unique, as they can be expressed using as reference year 0 or year 1 prices. Both are presented in Tables 2 and 3.

6 Productivity, skill prices, and the minimum wage

6.1 1970 to 2000

Results in Table 2 establish that in the US, skill price effects put downward pressure on wages at and under the median and did the opposite to those at the upper half of the distribution. Consistent with the stylized facts regarding labor market developments over the period (Juhn, Murphy, and Pierce, 1993; Autor, Katz, and Kearney, 2008; Carneiro and Lee, 2011), effects were concentrated in the very top. Their influence in Puerto Rico depends on whether initial or final year skill prices are used as reference,

but what is clear from either exercise is that convergence at the bottom of the earnings distribution was associated with changes in returns to skill that either put less pressure on Puerto Rican earnings or managed to raise them relative to those in effect in the US. Therefore, a narrowed US-Puerto Rican wage gap appears a result of skill price rather than productivity effects.

Table 2
Skill and skill price contributions to earnings changes

Percentile	Earnings Change	Change due to: Skill	Prices	Earnings Change	Change due to: Skill	Prices
	From Census 1970 to 2000					
	Puerto Rico			**United States**		
Decomposition evaluated using 1970 prices as reference						
10th	2,738	1,310	1,259	-2,094	2,034	-4,294
25th	2,005	1,532	225	-1,343	3,407	-5,300
50th	2,797	3,412	-536	733	4,706	-3,925
75th	6,223	5,585	331	6,726	6,678	153
90th	10,474	8,098	1,422	18,019	9,939	6,505
Decomposition evaluated using 2000 prices as reference						
10th	2,738	2,067	502	-2,094	2,206	-4,466
25th	2,005	2,245	-487	-1,343	2,684	-4,577
50th	2,797	4,360	-1,484	733	3,192	-2,411
75th	6,223	7,523	-1,607	6,726	4,167	2,665
90th	10,474	10,026	-506	18,019	5,812	10,632
	From PRCS/ACS 2005-07 to 2008-10					
	Puerto Rico			**United States**		
Decomposition evaluated using 2005-07 prices as reference						
10th	-166	66	-146	-791	194	-959
25th	-23	75	-215	-279	376	-882
50th	-1,406	219	-1,384	-340	616	-571
75th	-1,482	213	-1,744	1,056	833	-178
90th	-3,101	408	-3,297	1,245	909	-346
Decomposition evaluated using 2008-10 prices as reference						
10th	-166	68	-148	-791	197	-962
25th	-23	116	-255	-279	329	-834
50th	-1,406	268	-1,433	-340	574	-529
75th	-1,482	313	-1,844	1,056	858	-203
90th	-3,101	445	-3,335	1,245	981	-419

Note—Samples are composed of full-time full-year wage earning males between the ages of 25 and 44. Earnings and their component changes are expressed in 1999 dollars. The decompositions generate a residual that is equivalent to the difference between the observed change and the productivity and skill price components.

Table 3
Skill and skill price contributions to Puerto Rican-American earnings gap change

Percentile	Gap Change	Change due to: Skill (1)	Change due to: Prices (1)	Change due to: Skill (2)	Change due to: Prices (2)
Change from Census 1970 to 2000					
10th	-4,832	724	-5,553	139	-4,968
25th	-3,348	1,875	-5,224	439	-4,089
50th	-2,064	1,294	-3,389	-1,168	-927
75th	503	1,093	-178	-3,356	4,272
90th	7,545	1,842	5,082	-4,215	11,138
Change from ACS/PRCS 2005-07 to 2008-10					
10th	-626	128	-813	129	-814
25th	-256	301	-667	213	-579
50th	1,066	397	814	306	905
75th	2,538	620	1,566	546	1,641
90th	4,346	501	2,951	536	2,916

Note—Samples are composed of full-time full-year wage earning males between the ages of 25 and 44 and earnings and their component changes are expressed in 1999 dollars. Decompositions estimates arrived at using initial (1) and final year (2) skill prices and generate a residual that is equivalent to the difference between the observed change and the productivity and skill price components.

A decomposition of the change in the earnings gap contained in Table 3 confirms that convergence at the bottom of the earnings distribution was not the result of a catch up in productivity. In fact, at that point in the distribution the skill component served to widen the gap. Earnings convergence can be entirely associated with a price equalization process between low-skilled American and Puerto Rican labor. Of an earnings gap that fell by $4,829 at the 10th percentile, $4,968-$5,553 can be attributed to the price component. Of an earnings gap that fell by $3,650 at the 25th percentile, $4,089 to $5,524 can be attributed to price convergence, with estimated contributions depending on the price reference. Relative to gaps evident in the 1970 Census, the phenomenon reduced the earnings differential by 40% to 44% at the lowest decile, and by 25% to 34% at the 25th percentile.

Price equalization could be the natural result of a process whereby wage differences are arbitraged away across regions. This was in fact a core idea behind the country's industrialization drive, at least initially. Alternatively, the closing gap could have been driven by institutional factors and an obvious suspect is wage floors.

Minimum wages played a central role in the country's industrialization drive, and probably more so than in any other country in the world. The 1938 Federal Labor Standard Act and the legislated minimum of 25 cents per hour automatically applied to Puerto Rico. Equivalent to about 40% of the average hourly manufacturing wage in the US, it was above the mean manufacturing wage in the Island, was twice as high as the sugar cane sector's mean wage, and five times that in coffee and tobacco (Perloff, 1950: 154). As its dis-employment effects became evident, the US Department of Labor was authorized to set lower wage floors on advise from committees representing labor, industry, and the public sector. A 1940 FLSA amendment gave it the following directive: to set "the highest minimum wage rate" that would not "substantially curtail employment" and "not give a competitive advantage to any industry group" over Mainland sectors (Reynolds and Gregory, 1965: 43). With this rather difficult guide, it set minima by occupation, region, and firm size.[7]

The set of real minima rose quickly, by about 6% per year during the high-growth 1950s and 1960s, and drove real wage advances of 7% per year (Santiago, 1989; Reynolds and Gregory, 1965:60). Their dis-employment effects were moderated by a "shock effect" whereby rising minima led to more efficient use of the management input (Reynolds, 1965). As a result, productivity rose through reduced use of labor with respect to capital and output, rather than through rising capital labor ratios (Reynolds and Gregory, 1965: 296).

[7]Shortly thereafter, the local legislature passed a minimum wage law directed at sectors not covered by the FLSA. Reynolds and Gregory (1965: 51) observed that "[i]n its determination to assert independent authority over wage matters the insular government became directly competitive with federal procedures, a situation which created considerable difficulty and uncertainty for employers on the island. Not only were employers faced with annual review of wage minima by federal industry committees, they also had to face insular committees, often only a few weeks or months after undergoing federal review." Locally legislated minima were at times higher than federal ones.

In 1974, the FLSA was amended to provide for convergence of the local minima to the Federal standard that would eventually be achieved in the early 1980s. The timing was most inauspicious, as the Island battled the two oils shocks of the 1970s as well as the early 1980s Fed recession. Unemployment grew from close to a record low of 10.7% in 1970 to 18% in 1975, and a historic high of 23.4% in 1983. Santiago (1989) and Castillo-Freeman and Freeman (1991) conclude that the minimum wage had a sizable negative impact on employment as it moved to the US level, but little effect before that point. While not disputing the basic finding, Krueger (1994) concludes that it rests on fragile evidence.

Time series evidence is suggestive, but contingent on stationarity conditions and on a minimum wage variable that does not look obviously exogenous, since the FLSA amendment directed policymakers to guard against dis-employment effects. If the directive was heeded, wage increases would then be more likely to occur in sectors, occupations, or periods with rising labor demand. In absence of variables modeling the decision-making process, a positive statistical relationship between employment and the wage floor could be manifested, providing an explanation for the positive coefficient that Krueger (1994) finds for certain model specifications. It is only when convergence was scheduled in 1974 that the variable becomes less endogenous. It is also when substantial dis-employment effects become evident (Santiago, 1986).

Even statistical evidence pointing to weak dis-employment effects should be placed in the context of Lloyd Reynolds and Peter Gregory's own estimations. In absence of rapid minimum-wage increases, they estimate that employment would have been a third larger (Reynolds and Gregory; 1965: 101). This is perhaps a small price to pay for 7% wage growth, but it is not trivial. The authors also cautioned that the calculation was restricted to and based on the manufacturing sector, where productivity improvements could obtain more easily than elsewhere in the economy. Over time, possibilities for further productivity advances could also become more limited (Reynolds and Gregory, 1965:103).

An assessment of the legislation's employment effects can also be incomplete without accounting for the fate of two occupations where almost two-thirds of female employment was found in 1940: home needlework and domestic service. By 1970, the drop in employment in the latter occupation reached 75%. Some of it could have reflected substitution of household for market goods, but as a point of reference the corresponding US decline was only half as large. Needlework exports fell by 75% until the local exemption from the FLSA was granted in 1940 (Perloff, 1950:152). Employment recovered briefly, but largely disappeared in the 1950s, with most unemployed women leaving the labor force (Reynolds and Gregory, 1965: 33). The minimum wage's impact on Puerto Rican employment is therefore a matter of debate, and can range from minimal to severe depending on the weight placed on the various strands of evidence.

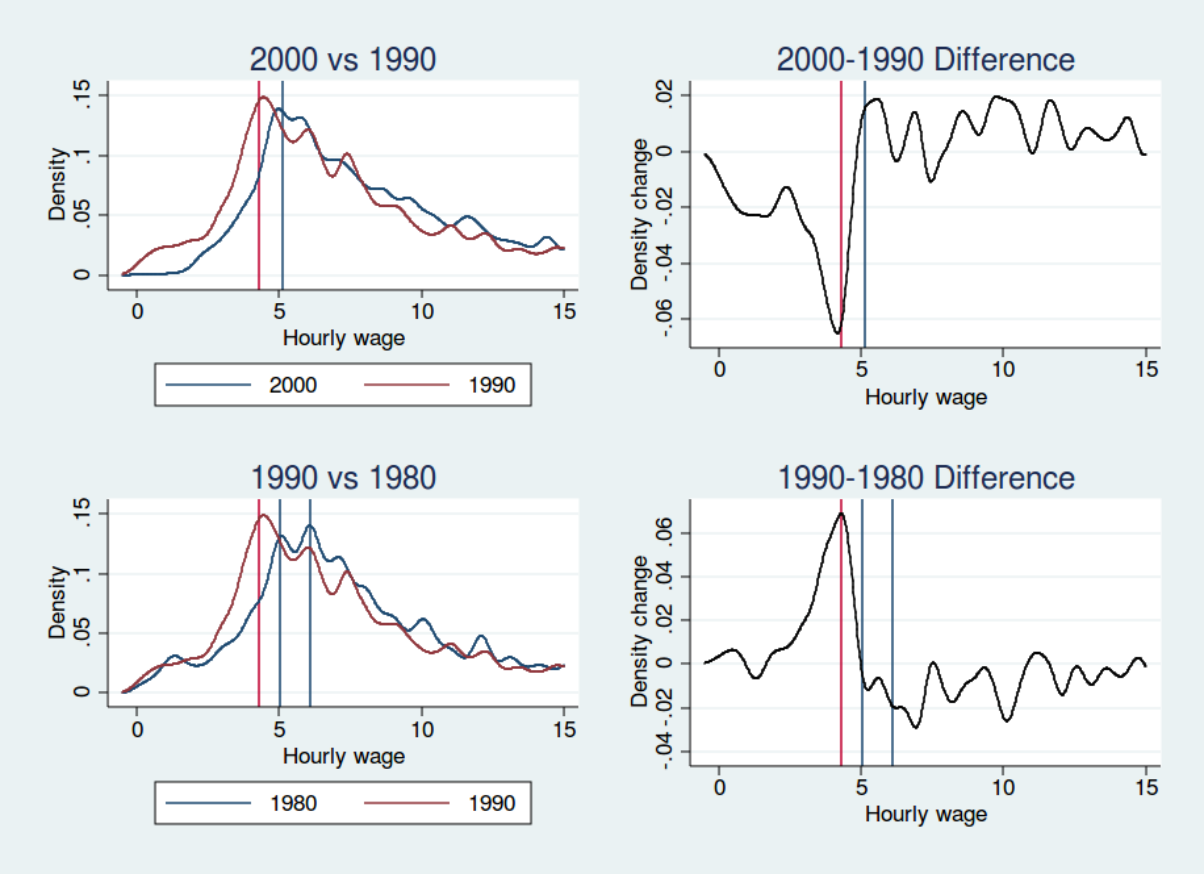

Figure 5: Puerto Rican hourly wage densities and changes over time

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Note—Vertical lines refer to real minimum wages. The real minimum wage reflected in 2000 Census data is to the right of that in effect in 1990. The real minimum in 1990 is to the left of two minima still in effect in 1980.

The degree to which it contributed to higher relative prices to labor may not be as difficult to pin down as its dis-employment effects, with substantial insight garnered from hourly wage distributions.[8] Densities derived from 1990 and 2000 Census data and depicted in the top left panel of Figure 5, show that even in a sample of prime age, full-time, full-year working males, the wage floor sets a very high lower bound. In fact, in both dates it *is* the modal wage. The median is not far to the right, being only 50% higher in 1999. The wage floor has lost some of the "bite" highlighted in Castillo-Freeman and Freeman (1992), but this is due more to its loss of real value than to rising wages in the Island. That is, the median in 1979 was 40% above the 1999 minimum wage.

Its ability to effect change can be evaluated through Figure 5's right panels, where density differences are depicted to show how distribution changed over time. In the top right panel, the 1999 and 1989 densities are differenced, with mass in positive territory signaling increases in the prevalence of wages within that range. The differenced densities show that the decade of the 1990s was one of wage growth. What is however striking is the degree to which the development can be associated to the revision of the minimum wage that took effect in 1997. That is, just about the entire decline in density mass occurs at and under the old minimum wage of \$3.35 (\$4.90 in real terms).

In contrast, the 1980s witnessed a substantial erosion in the real value of the wage floor. As it declined, so did overall wages, as can be appreciated in the bottom right panel of Figure 5. Wage density falls around the two minimum wages in effect in 1979. A corresponding and very large increase can be observed centered around the eroded minimum wage to the left. The result is even more impressive, as nominal or real wages are generally assumed to be "sticky" on the down side. In Puerto Rico, however, they appear responsive to either upward or downward movements in the wage floor.

The importance of the minimum wage in determining earnings density changes in Puerto Rico can be further explored through use of the Machado and Mata decomposition procedure. To that end, counter-factuals of how densities would have evolved in absence

[8]Census earnings and hours worked variables need not correspond—the former referring to earnings over the year that preceded the survey, while the latter either to usual hours of work or hours worked in a reference week. Some error is introduced (Bound, Brown, and Mathiowetz, 2001), but the conversion allows easier comparison with a minimum wage set in hourly terms.

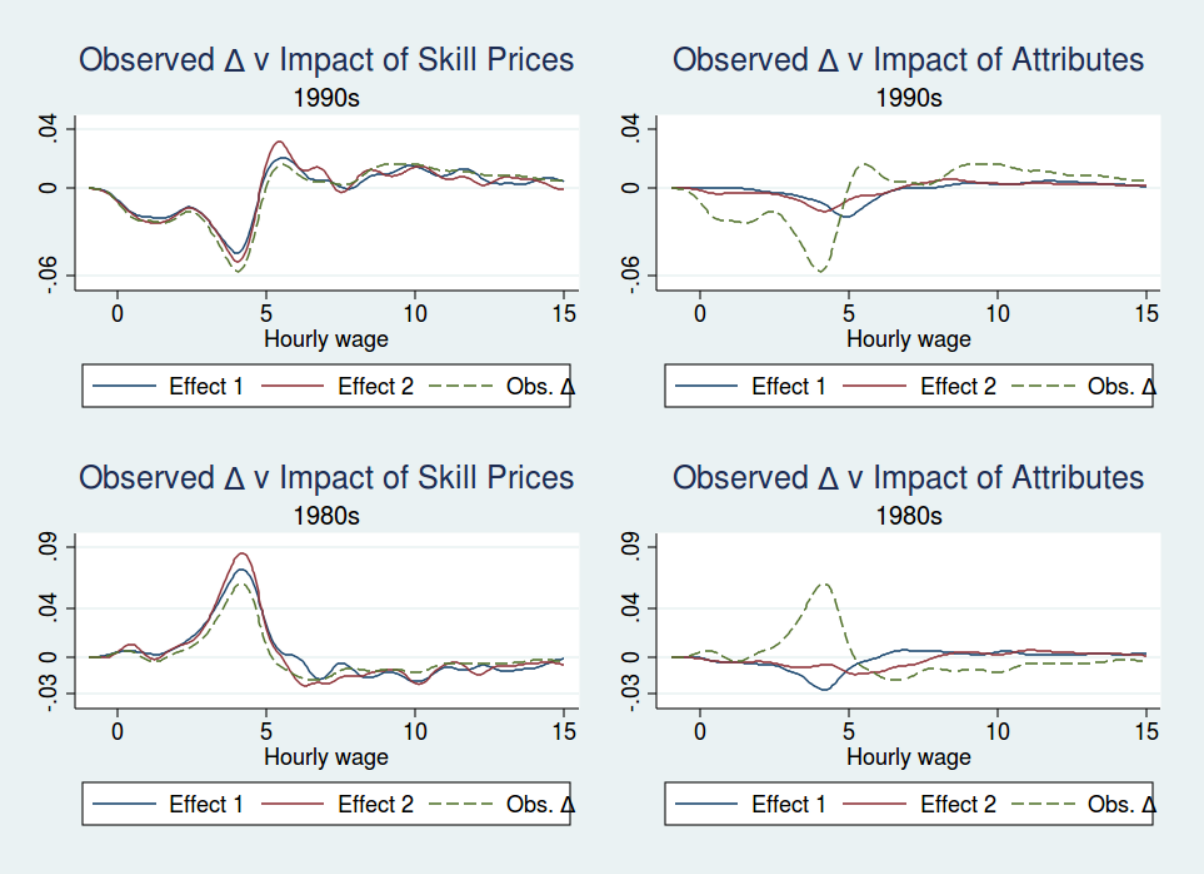

Figure 6: Observed change in wage density and skill price and worker attribute contributions to change

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Note—Effects 1 and 2 refer to price and attribute impacts estimated using initial or final year skill prices.

of changes in worker attributes and skill prices are constructed and used to arrive at productivity and skill premia effects. In Figure 6, observed density changes are presented alongside contributions attributable to skill price and productivity components, where effects 1 and 2 refer to impacts arrived at using initial or final year skill prices as reference. The influence of worker attributes can be ascertained in the right panels of the figure where it is found associated to small declines in the incidence of very low earnings levels, likely reflecting a falling share of workers with inordinately low schooling achievement. While having positive effects on earnings distribution, effects however bear little resemblance to observed changes.

Skill price effects are the clear drivers of distribution trends. Shown in the left panels of Figure 6, these trace closely changes observed in the 1980s and 1990s, themselves centered

around the wage floor. Price effects are also associated with downward pressure on wages at the middle and higher segments of the distribution in the 1980s, and the opposite during the 1990s, but in both decades effects are dwarfed by developments occurring in the neighborhood of a changing minimum. As Reynolds and Gregory observed some thirty years before, not only levels but changes in wages and skill differentials are still driven by the minimum wage.

6.2 The Great Recession

The new century brought a minimum wage hike as well as the longest recession on record. Participation fell markedly and earnings receded across the entire distribution. Data from the PRCS, aggregated over 2005-07 and 2008-10 to gain precision, show that wages at the 90th percentile and median fell 8%, with smaller declines further down the distribution (Table 1). Relative to US earnings, the wage ratio fell from 0.53 to 0.49 at the top, from 0.49 to 0.45 at the median, but rose from 0.54 to 0.56 at the bottom as a result of wages that fell even more in the US. The convergence process witnessed over the preceding decades progressed to the extent of generating narrower differentials at the bottom than the top of the wage distribution, almost a full inversion of the relationship found in 1969.

Driving the change were low-skill premia that fell less than on the Mainland (Tables 2-3), perhaps due to the much more binding Puerto Rican wage floor. That was not the case at the median and above, where a process of skill price divergence can be observed. A deep recession therefore brought forth an internal devaluation process restricted to higher-skilled Puerto Ricans. While increasing competitiveness at that segment of the distribution, it could have raised incentives for migration. As labor market inequality is declining in Puerto Rico and increasing in the US, the Borjas migration model predicts a process positive selection that is supported by evidence from ACS mobility data.[9] That is, whereas in 2005-07 18% of economically active male migrants had a bachelors degree or higher, a statistically significant larger share (29%) did so in 2008-10 (Figure 7). Over the same period, the share of non-migrant males with the same level of education

[9]The 90-10 earnings ratio fell from 4.8 to 4.5 in Puerto Rico and grew from 4.9 to 5.2 in the US. For the first time in recorded history labor market inequality is higher in the US.

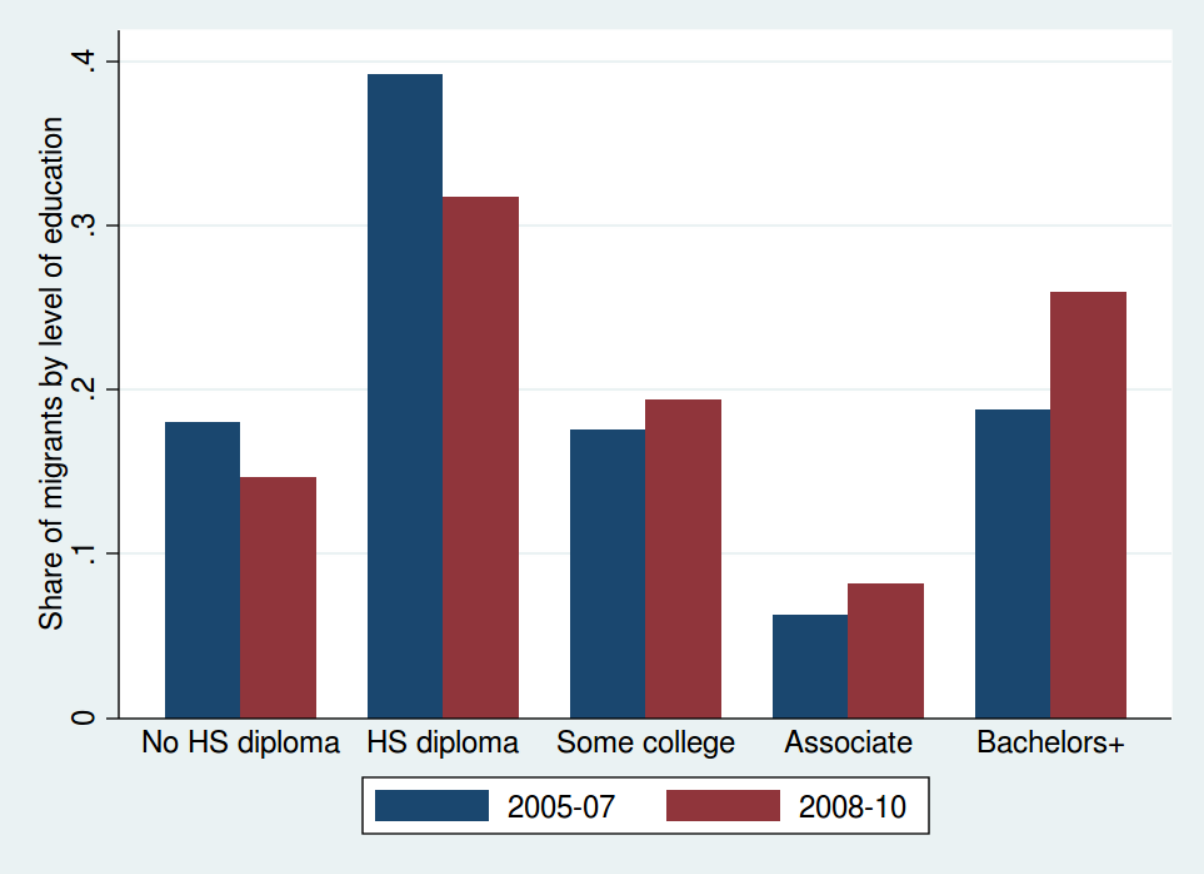

Figure 7: Schooling distribution of recent Puerto Rican migrants to the US

remained at 23%.[10] The trend represents a break from the past when migration flows were characterized by a process of intermediate selection, consistent with a Borjas model with mobility costs that decline with skill (Borjas, 1987; Rivera Batiz and Santiago, 1996; Chiquiar and Hanson, 2005; Sotomayor, 2009).

In light of the selective outflow of high-skilled migrants and the sharp output contraction, it is then surprising to find stable or falling levels of poverty and household income dispersion over the course of the downturn (Table 4). Inequality trends appear a matter of extremes, with the largest drop registering through the 90-10 decile ratio measure. Income percentiles show that the change is due largely to declining household incomes at the top and rising incomes at the bottom. The first could be an expected outcome of a recession, the second would not.

[10] As in the preceding section, comparisons are restricted to male labor force participants between the ages of 25 and 44.

Table 4
Measures of household income distribution

Measure	2005-07	2008-10	Change (%)
Gini	.531	.526	-0.9
Theil	.562	.560	-0.4
80/20	7.14	6.79	-5.0
90/10	42.3	36.7	-13.3
90th percentile	$30,674	$30,065	-2.0
50th percentile	$9,696	$9,904	-2.1
10th percentile	$727	$819	11.2
Headcount	.458	.452	-1.5
FGT(2)	.198	.191	-3.3
FGT(3)	.166	.159	-4.0

Note—The unit of observation is equivalent household income, samples exclude the population in group quarters, and monetary figures are expressed in 1999 dollars.

Measures placing emphasis on the bottom of the distribution shed light on the source of the development. Table 5 shows that poverty fell among households headed by individuals over the age of 55, among households headed by economically inactive individuals, and households headed by those with lowest levels of education. Poverty rose among the young, the highly-educated, and the foreign-born.

Table 5
Headcount ratio and distribution of the population by characteristic of the head of household

Characteristic of	Population share		Share in poverty	
head of household	2005-07	2008-10	2005-07	2008-10
Age				
18-34	18.2	16.8	56.6	61.6
35-44	22.7	20.9	46.2	45.1
45-54	20.9	21.1	38.8	40.8
55-64	18.0	18.6	40.7	39.2
65+	20.2	22.7	45.4	41.4
Gender				
Male	52.3	47.2	36.7	36.0
Female	47.6	52.8	55.0	53.1
Schooling				
Unfinished HS	32.9	30.9	66.9	64.8
High School	25.9	25.6	51.6	52.4
Some college	21.3	22.3	36.9	38.7
Bachelors +	20.0	21.3	11.3	14.3
Ethnicity				
Puerto Rican	94.3	95.1	45.9	45.4
Cuban	0.7	0.6	10.4	16.6
Dominican	2.1	2.3	46.4	49.6
Not Hispanic	1.6	0.9	35.2	32.9
Economic status				
Employed	46.8	45.2	27.4	26.8
Unemployed	5.4	6.8	80.1	80.8
Not in labor force	47.8	48.1	59.1	57.2

Note—Sample exclude the population in group quarters.

The patterns paint a consistent picture. Groups with the stronger ties to the labor market suffered setbacks while those with weaker ones did not. Social Security income and public transfers in general are the answer to the distribution puzzle, as decompositions by factor income source point in their direction. Counter-factual trends that hold constant the distribution of transfers establish that in absence of changes in this income source, poverty would have increased by 2.5% to 4.5% rather than fallen by the observed 1.5% to 4%, depending on the index used to measure the condition. Income inequality would

have risen by 1.3% to 17%, rather than fallen by the observed 0.9% to 13%. Therefore, as in the case of the decades of the 1970s, 1980s, and 1990s, public transfers have been the driving force behind positive trends in distribution.[11]

7 Conclusion

Puerto Rico underscores the benefits and downside risks of wage floors and public transfers in development policy. Transfers have sheltered large segments of the population from a deep and prolonged recession and in past decades have been important instruments of distributive change. They have also curtailed growth potential, reducing the effective workforce through retirements that occur at very early ages and through limited labor market entry among the low-skilled.

A pronounced early retirement phenomenon is consistent with evidence establishing considerable sensitivity to transfer program replacement rates that are effectively higher in Puerto Rico relative to the US. It is also consistent with more recent evidence linking poor labor market conditions to workforce withdrawals of individuals with residual work capacity. Close to a third of Puerto Rican males aged 60-64 and over a fifth of those aged 55-59 receive disability benefits, compared to respective rates of 15% and 10% in the US.

Difficult labor market conditions are associated with a binding minimum wage that during the early stages of industrialization shocked manufacturing firms into raising productivity through improved personnel and production management. In ensuing decades, however, the effect appears to have run into diminishing returns and has not manifested itself through increased labor productivity or investment in human capital. Decades after its introduction, both levels and changes in earnings distribution are still dominated by the minimum wage. Convergence to the US driven by changes in the wage floor has eroded competitiveness, and while a long recession has precipitated an internal devaluation process, it has been limited to the upper range of the distribution. Resulting changes in incentives have been associated with migration outflows of individuals with above-average skill.

[11] See Sotomayor (2004) for methodology and results over the 1970-2000 period.

Evidence from Puerto Rico points to the importance of program design in limiting social costs of wage floor and transfer policies. A minimum wage that has risen faster than productivity has resulted in high levels of unemployment and a substantial loss in competitiveness at the lower half of the wage distribution. Extremely low labor force participation appears a direct consequence of resulting poor labor market conditions that interact with high program replacement rates, early retirement age dispositions, and disability insurance that appears especially costly in social terms. In combination, program design associated with these policies has resulted in an economy with scarce jobs opportunities and one of the lowest labor force participation rates in the world.

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