Brain Gain in the Age of Mass Migration *

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Abstract

A large body of literature has studied the interactions between migration and human capital, differently gauged. This paper empirically investigates whether emigration stimulated schooling responses - proxied by primary school dropout rate - in Italy during the first decade of the twentieth century. Many historical evidences stress that this relationship was actually at work in Italy at the turn of the XIX century. Three rationales lie at the heart of such a relationship: first, emigration or its prospects could rise the expected return to schooling and as a consequence render education more attractive; second, return migrants could fuel a reduction in school dropout rates, via monetary and non monetary channels; third, remittances can help relax the budget constraint that prevents people to invest in education. By using a new dataset at the city level, we find support that primary school dropout rates have been correlated with out- and return migration rates and the correlation, possibly, reflects causality going from the latter to the former. We also find: no evidence of positive self selection of emigrants (although indirectly); signs of convergence in the reduction of dropout rates across cities; a positive effect on schooling associated with a rough proxy of remittances; the effects are non-differentiated between the South and the North of Italy.

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1 Introduction

Migration is seen as an equilibrating force that stimulates the converging process between regions and countries with the effect of offsetting pre-existing disparities, a mechanism similar to the one predicted by Heckscher and Ohlin in their international trade theory Harris and Todaro (1970).[1] Thanks to the movements of people and goods, relative prices of goods and factors of production level off in different countries.

For several reasons, the impact of emigration on sending countries is a relatively poorly studied issues with respect to the impact of immigration in host countries. When studied, the accent is often put on the so called brain drain phenomenon: if people who move out of a country are the most skilled, migration could damage native countries because of human capital depletion. By stressing on this point, traditional literature on brain drain has long labeled the loss of human capital as a *looting* that by reducing the human capital stock in sending countries hampers the convergence in per capita income levels across countries (Bhagwati and Hamada, 1974; Bhagwati and Wilson, 1989; **?**; **?**).

In contrast with this traditional view, recent theoretical and empirical literature recognizes that the experience of migration, or only the prospects of it, can make explicit the importance of education favoring the investment of both adults and children (brain gain) and points out the channels through which migration may positively influence the human capital endowment in source countries. In particular, three main channels could be identified (Mayr and Peri, 2008; Docquier and Rapoport, 2009): the first operates through 'migration prospects'; the second through return migrants; the third through remittances. This paper is a first attempt of investigating along these lines. The analysis proceeds as follows. In section 2 we make a short review of the existing literature. In section 3 we describe the three information pillars on which our analysis is built: a solid qualitative and historical evidence that tell us about the possible mechanisms at work; the description of the structure of Italy's public education system; a new dataset that reports figures at the city level. We also present some descriptive evidence on the patterns of outflows (inflows) from (to) Italian cities as well as of school dropouts.[2] In section 4 we describe our identification strategy and we get to an empirical model in reduced form to be estimated. We divide this section in three subsections: in the first we test the relationship between non-dropout rates and emigration (returns) in a specification where in-and out-migration are used as the only predictors for non-dropouts. Then, we try to deal with endogeneity issues by using an IV approach. Last, we estimate a multivariate model with a GMM technique.

The main results are the following: 1) for the first decade of the twentieth century emerges a negative correlation between emigration and primary school dropouts and our exercise suggests that emigration and return migration could have caused part of the rise in the attendance; 2) almost indirectly, we find no evidence of positive self selection among Italians (as long as selection is proxied by education. **??**; 3) there are signs of convergence in the reduction of dropout rates across cities; 4) we detect a positive effect on schooling associated with a rough proxy of remittances;) we did not find differential effects between the South and the North of Italy. In Section 5 we transform the elasticities obtained from estimates, into absolute numbers that tell how many people migration kept at school. Section 6 concludes with some final remarks.

2 Some literature

The strand of migration literature that investigated the possibility of a brain gain

[1] Heckscher and Ohlin predictions were fomalized by Stolper and Samuelson (1941).

[2] Actually, will use the non-dropout rate in all the elaborations that follow.

dates at least as far back as Mountford (1997): he emphasizes the emigration prospects trasmission mechanism, i.e. the possibility to emigrate may rise the expected return to schooling and as a consequence render education more attractive. Theoretically and from the point of view of the source country, if return to education is greater in the latter than in the host country, then negative selection might be the result; viceversa the greater the gap between incomes in the sending and receiving economies, the more plausible the hypothesis that the more skilled will leave[3]. Brain gain will come forth to the extent that the probability to migrate is large enough to activate the channel and sufficiently low to avoid a substantial escape of brains (Stark et al., 1997, 1998; Beine et al., 2001; Lucas, 2004; Docquier and Rapoport, 2003, 2009; Egger and Felbermayr, 2009)[4].

The education incentive effect results not only in a theoretical curiosum but it has empirical relevance (Mayr and Peri, 2008). For example Beine et al. (2001) find a positive and significant effect of migration prospects on human capital formation in a cross-section of 37 developing countries. This is confirmed by other macroeconomic studies such as Beine et al. (2011) who use a panel analysis to control for unobserved heterogeneity and for the endogeneity of emigration rate. They show that the channel works and it is stronger in low-income countries. Lucas (2004) shows that the brain gain caused by the possibility to leave exists at micro-level too. By observing the very high rates of enrollment in higher education in the Philippines, although the low domestic return to human capital, he argues that higher education is almost certainly induced to a significant extent by potential for emigration.

Even though this literature focus heavily on skilled migration, in particular on tertiary educated migrants, there are strong parallels with historical studies which refers inevitably to primary educated, or literate, leavers.(Williamson, 2007). As regards return migration, part of the economic literature views migration as a permanent phenomenon, particularly if referred to highly-skilled individuals (Becker et al., 2004; Monteleone and Torrisi, 2010; Biondo et al., 2012). Differently, Lalonde and Topel (1993) found that about one third of immigrants to the US between 1890 and 1957 returned home. When migration is a transitory event, return migration can have a positive influence on sending regions (Borjas and Bratsberg, 1996; Dustmann and Weiss, 2007; Mayr and Peri, 2008; Dustmann et al., 2011).

Dustmann and Weiss (2007) and Mayr and Peri (2008) suggest that the experience abroad increases the amount of individual human capital and therefore the level of productivity of the agents; as a result return migration can lead to a mitigation of the brain drain, or even the creation of a brain gain, to the extent returns bring into the home country raised skills. Furthermore Dustmann et al. (2011) extend the seminal work of Borjas (1989), introducing the idea that some countries can be seen as learning headquartes

[3]The economic theory suggests, moreover, that the higher the fixed costs of migration the more plausible the hypothesis of a selective migration because skilled individuals will be able to amortise costs more quickly. In the age of mass migration the cost of voyage from Italy to U.S., included the cost to reach the port of embarkation, was not negligible at all, although affordable. See Commissariato Generale dell' Emigrazione (1927), Fenoaltea (2002), Gomellini and Ó Gráda (2011) for a more detailed analysis

[4]The first laws on migration issued by the government of the Kingdom of Italy were inspired by a deliberately repressive philosophy, strongly limiting the possibility of leaving (The Menabrea law 1868; The Lanza law, 1873). These limitations were supported by industrial groups in the North of the country and by the big landowners in the South concerned that the large number of expatriates could create a shortage of cheap labour and, therefore, stimulate the growth of minimum wages. Other restrictions were introduced later to avoid the emigration as a practise to escape the conscription introduced immediately after the Unification (The Crispi law, 1988). It was only with the 1901 law, backed by Luttazzi and Pantano (two Italian politicians), that emigration became finally a free choice of the individual. See Einaudi (2007) for more details.

where individuals can acquire specific skills expendable in the native area. Under this assumption each return generates a human capital gain with beneficial impact on income.

In the age of mass migration, though most of migrants were away a long time, a significant proportion returned. According to Giusti (1965)[5] during the period 1811-1911 net migration was about one third of the gross flow. Hatton and Williamson (1998) suggest that the big surge in gross emigration after the 1890s was not matched by a big blood in net migration but was mainly spurious result due to a change in passport regulation, with the result that .Bandiera et al. (2012), using the Ellis Island archive, points to an underestimation of returnees figures in official data. Gomellini and Ó Gráda (2011) show the relative importance of return migration in the cases of the United States and Argentina by comparing gross migration flows and the number of Italian-born residents as recorded in the census. They find that a gross migration of over 0.6 million Italians during the 1890s led to an increase in the number of Italian-born of only 0.3 million in the U.S. between 1890 and 1900 while a gross outflow of 1.2 million in 1896-1914 yielded increases in the numbers of Italian-born of about 0.4 million in Argentina in the same period. In the wake of previously cited papers, Del Boca and Venturini (2003) argue that Italian emigrants did not settle permanently abroad. If during the first period of prevailingly transoceanic emigration (until 1895) the proportion of returns was relatively small, in a second phase (1896-1921), returns tended to be of sizable number. Yet, according to Coletti (1911) in the two-year period 1905-1906 the proportion of returns in Italy was, on average, 46 percent (41 and 52 percent respectively in the South and in the North) with respect to migrants left four years before.

This work focuses on the three key channels that have been the subjects of both historical and contemporary analysis and have stressed on the association between migration and education:

1. emigration or simply the prospects of emigration boosts the incentives for education in the source country. This happens because the usefulness of basic education is rightly perceived as having a great importance for different reasons (necessity of writing home, remittances bookeeping, expected school-premia in wages);

2. return migrants could foster education to the extent the returnees, thanks to their experience abroad, are more sensitive to the importance of schooling.

3. remittances can play an important role in relaxing the budget constraint that prevents people to invest in education.

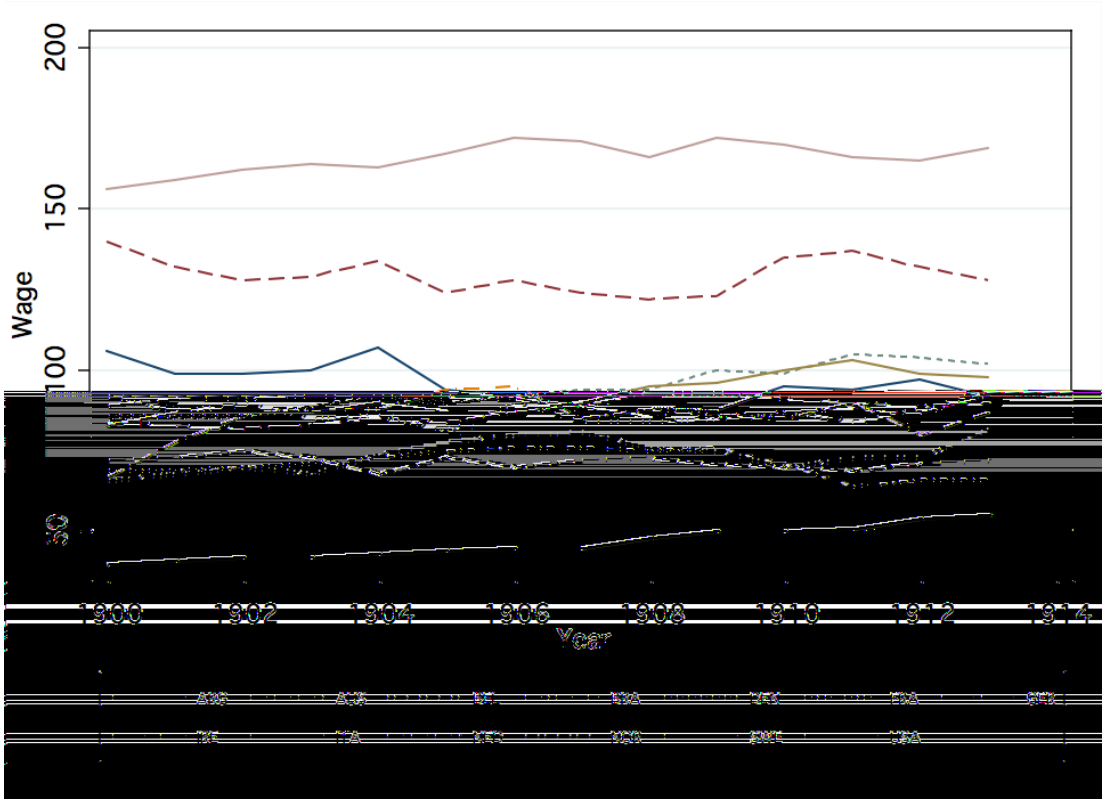
The first mechanism emphasizes the fact that potential migrants base their decision to leave on the comparison of future expected incomes abroad and at home (among other push and pull factors)[6]. Historical and contemporary literature seems to agree that the magnitude of this incentive depends mainly on the income and /or wage gap between source and destination countries; the greater the gap, the stronger the motivation to leave. What was the magnitude of this gap? Figure 1 plots the average agricultural salary in Italy, between 1900 and 1913, compared to that of some European and transoceanic countries which at the time were the preferred destinations of Italian migrants.[7] In Italy, the average wage was the lowest one and the gap between Italy and the U.S. (Austria) overcame 100 (85) points. Furthermore, the skill premium, i.e. the

[5]For a close examination see Gomellini and Ó Gráda (2011).

[6]See Hatton (2010) for a complete survey on the cliometrics of international migration. Gomellini and Ó Gráda (2011) propose an estimate of the determinants of emigration.

[7]Agricultural wage are measured in current prices and in purchasing power parity.

Figure 1: Agricultural wage in Italy: international comparison. Source: see text.



ratio between skilled and unskilled wages, was in Italy very low (Betran: 2004). In this respect, potential leavers commitment to acquire basic education was in order to get this possible wage increase once arrived at destination. In doing so, they could generate a brain gain since the probability to emigrate (for the most educated) is likely to be less than one, i.e. a perfect selection among migrants does not occur. In early 20th century Italy, migratory outflows differed from those of the other European countries chiefly because of a lower literacy rate among emigrants due to the large number of poor Southerners. This paper adds to existing literature new insights of the effects of migration on schooling in Italy in the first decade of the twentieth century, a period often referred to as the 'Age of Mass Migration'. Firstly we embrace the hypothesis according to which the prospect of emigration rises the expected income to schooling and as a consequence renders education more appetible. In second place we test the return migration transmission mechanism. Here the idea is that who returns could reduce dropouts, to the extent the returnees are more sensitive to the importance of education.

Differently from the official sources commonly used to empirically evaluate the role of migration on Italy's development,[8] we use a unique dataset at the city level which collects statistics on the social and economical life of the cities with more than 10,000 inhabitants at the time. The detailed records on the population and on education allows us to overcome many shortcomings of the existing historical studies. For example these studies fail at capturing the unobserved heterogeneity between units of analysis because of the use of cross-section regressions.

[8]For example The Annuario Statistico della Migrazione Italiana dal 1876 al 1925 and IPUMS dataset.

3 A three information pillars based investigation

At the core of our analysis there is the attempt of evaluating the effects of outward and return migration on primary school dropout rate in Italy during the first decade of 20th century. Our strategy is based on the following three pillars of information.

3.1 Qualitative historical evidences

From a qualitative historical perspective, the evidences given by Coletti (1911)[9] are striking. He argues that the migratory experience made explicit the usefulness of schooling to achieve higher salaries or reach better quality of life. Analyzing the overall impact of migration on Italy's development in the liberal age, he highlighted that *\Migration is the best friend of literacy [...]. It is migration experience that has provided strong evidence about the utility of primary education as a powerful tool of an upward social mobility and it is undoubtedly the most persuasive deterrent to dropping out of primary school. [...] Migration is the main cause of the school attendance rate rise".*[10] The endogenous schooling hypotesis is stressed by Jarach (1877)[11] and Cipolla (1969) who argue that, notwithstanding the countless factors which hamper pupils of getting school, literary knowledge is crucial because of the need, once crossed the ocean, to send news on health and on the accumulation of savings to own family at home.

There are qualitative evidences about the relationship between migration and education also at sub-national level.

A clear example can be made with respect to the Italy's region Abruzzi which, at the time, recorded high emigration rates and contemporaneously recorded notable advancements in fighting against illiteracy. Jarach (1877) writes: *\The helpfulness of literacy is penetrated into the consciousness of the population. It has rapidly conquered the minds of farmers and shepherds because of the need, once crossed the ocean, to send news on health and on the accumulation of savings to own family, at home, without relying on a stranger. From the U.S. come incitements to the wives to send children to school. [...].These facts are neither isolated nor rare".*

In Sicily, the number of enrollments in the primary school increased remarkably in the first decade of 20th century. The enrollment rate raised from 54.5 per thousand inhabitants in 1902 to 73.5 in 1907. Coletti (1911) writes:*\Since there are no other causes being able to explain the event, the reason must be sought in the consciousness of people. Despite the hostility of the environment in which people live and their nancial straits, nally individuals make themselves more con dent that literacy may be an e ective weapon against poverty. This rm conviction emerges thanks to emigration. It is emigration the main cause of the growing attendance rate".*

Lucania was, at the time, the region with the highest emigration rate. The following words are drawn by Coletti (1911). *\In most municipalities there is a new common sense among peasants. They have a keen desire to send their children to school. To this end and very frequently, emigrants exhorted their own relatives, at home, so that their brothers (sisters), nephews (nieces) in order to go to school".*

In Calabria, where outflows were soaring, schools were becoming increasingly populated by pupils. *\mothers clean up their children, take them to school and ask the teacher for their children to learn as much as possible. This is because fathers write from the U.S. that their children have to be educated. Only through the migratory experience*

[9] Francesco Coletti (1866-1940) was an Italian statistician and economist.

[10] Authors' translation.

[11] C. Jarach was one of the technical supervisors commissioned by the Ministry of Agriculture, Industry and Business to carry on the inquiry on the agriculture conditions in the South. C. Jarach was in charge of the Italy's region Abruzzi.

fathers realize the damage from being illiterate" (Coletti, 1911).

As regards northern Italy, Cipolla (1969), analyzing the high literacy rate among the population living in the Alpine areas on the border with Austria, Switzerland and France, argues that literacy is triggered off by emigration which forces potential migrants to become literate in order to keep in touch with relatives.

The second mechanism we investigate, stresses on the fact that return migrants, having acquired in their experience abroad augmented skills, are more capable of perceiving education as a tool to achieve success and prosperity; as a result they may foster school attendance. The returnees channel is well documented by qualitative literature too. Coletti (1911) writes: *\who returns from America is a human being transformed and able to transform [. . .]. He embodies the old village-like soul which was renewed by the American economy and society so he can bring a new energy in the country to which he returns. The depth of the trasformation that emigration will be able to cause in Italy will strongly depend on his physical and mental conditions".*[12]

Coletti (1911) 's testimony clearly shows migrants' ability to learn from abroad experiences: *\Emigration is a great school; it embodies [. . .] thousands of thousands of scholarships. It gets rid of the old rust from the mind, it inculcates ideas that otherwise would not be able to penetrate".*

With respect to return migrants he writes about these persons that were psychologically changed with respect the time they left. Ease, fluency and manner of speaking, style of dress, greater awareness of their own dignity and their rights, no awe of the old employers, the desire to deal with municipal affairs, political and general interests are just a few traits of people who came back from abroad. *\It is a miracle occurred thanks to migration. [...]. The awakening of the consciences promote the di usion of literacy amongst peasants"* (Coletti, 1911).

As evident, the social life of a community is so closely tangled within its components that is extremely difficult to isolate the determinants of a certain phenomenon from other possible causes. For this reason we need some additional clarifications to better identifying our trasmission channels. According to the first channel, the prospects of emigration are incentives for both adults (parents) and children to go to school. This does not mean that children were able to make decisions on their own, but simply that parents, or somebody else, made decisions on behalf of children. We try to separate the impact of migration on children and on adults education by distinguish the effect of migration on the non-dropout rate of public schools and the enrollment rate of evening classes (public primary school was entirely attended by children while evening schools were mainly attended by adults). More important: following the literature on brain drain quoted above, we argue that the agent's conjecture to emigrate in the future relies on what he or she observes (and has observed), i.e. the present (and past) outflows.

As far as the second channel is concerned, it hides at least two mechanisms. The first relies on the returnees that are richer than they were at the time they left: thanks to accumulated savings they can afford the cost of sending children to school. The second is based on the 'awareness' rationale (Coletti, 1911) that induce returnees to send their children at school. We will not try to disentangle the two mechanisms in our empirical model.

[12] Clearly the effect of returns on the sending country depends on health of returned migrants, investments they implement in the native country and on amount of savings accumulated abroad. For example Cerase (1967), in his research on returns from USA, shows a discouranging scenario in the South. He finds out that 19 per cent returned because their migratory project failed, 40 per cent because their savings plans were reached, 26 per cent for retirement and only 16 per cent to invest in the area of origin. See Del Boca and Venturini (2003) and Bevilacqua et al. (2001). Authors' translation.

3.2 Italy's education system (1860-1911)

Analysing the structure and the working of Italy's education system is a necessary step in our investigation. A very recent study on the topic have been done by Bertola and Sestito (2011).

The first law issued in the new Kingdom of Italy (founded in 1861), the Casati Law, was issued in November 1859. It was inspired by the German system of nationally directed education and shaped Italy's education system up to 1877 (Zamagni, 2002; Bertola and Sestito, 2011). The law envisioned for free and compulsory primary school (for children from 6 years old) which was made up in two grades (high and low) each lasting two years. Funding of primary education was left to municipalities and the obligation to establish the high grade was limited to municipalities with over 4,000 inhabitants. De facto, only the low grade was mandatory. Privately organized establishments would be allowed to coexist with public ones, but all would have been subject to a common regulatory framework. Matteucci (1867) about the new-born education system, illustrated that the claim of a national mandatory school ended up in an unavoidable failure because the Italian liberal State exempted from providing constructions and teachers remuneration by shifting both charges to cities without making sure of their disposable funds (Genovesi, 2010; Vecchi, 2011).

In 1877 the Coppino Law extended compulsory schooling from two to three years and introduced a 5-year primary school curriculum, with provisions for enforcement and fines for non-compliant parents (Bertola and Sestito, 2011; **?**).Buonazia (1873) highlighted both delays on the supply side of the education system and insufficient demand for schooling by households.[13] The investigation thus showed that primary school was still heavily dependent from income (this is one of our key indentifying assumption on which our instrumental variable exercise presented in paragraph 4.2 is based). The situation turned up in huge disparities in primary education performances and even in the quality of teaching throughout the country.[14] Therefore, in the first decades after Unification the strong dependence of primary school on local resources froze the huge territorial differencies inherited from the pre-unitary period (Bertola and Sestito, 2011).

Between November 1903 and March 1914, part of the period known as *Giolittian Age*, the political climate shifted in more progressive directions. In 1904, the Orlando law extended compulsory education to twelve years, reduced the primary school curriculum to four years and contemporaneously established the two-year professional training course (fifth and sixth grade). Actually mandatory education could be accomplished by successfully completing the four-year program. The law also envisioned for the establishment of the evening classes for illiterate adults and in 1906 in the South was set up the *\Commissione Centrale per il Mezzogiorno"* to put up a fight against illiteracy.

[13] In northern Italy, in rural areas, there was a widespread practice of dropping out of school because of the use of children in farming and textile industries (Vecchi, 2011). Between 1870 and 1900, in Piedmont, at the beginning of the harvest season, schools were deserted. In Liguria there was no reluctance of farmers to the school, rather, as Cipolla (1969) stresses, it is the school that does not fit the needs of rural life.

[14] The quality of education does not depend only on the number of teachers and on the percentage of population attending school but also on what is taught and on the effectiveness of teaching as well (Cipolla, 1969). Because of their very low salaries, teachers were culturally and technically inadequate. In 1897, 4,009 teachers out of 17,940 did not have the legal authorization, many of them worked as tailors, sacristans and bell-ringers. In such an enviroment pupils dropped out of school, attended it listlessly or with great difficulty, anyway without being able to draw large payoffs from attending classes (see Genovesi (2010) for a detailed analysis on the economic conditions of teachers).

The ministerial inquiry carried out by Corradini (1909)[15] showed that the main problem of primary education system was the unsatisfactory actions realized by municipalities due to the lack of local resources (Cives, 1990; Vecchi, 2011). The final judgment on the reforms implemented is clear: they had little or no effects on the attendance rate of primary school (still, in the econometric exercise that will follow, we add controls for the possible effects of reforms).

The Corradini report significantly influenced the 1911 Daneo-Credaro law which finally bore the cost of all personnel and materials for primary education to the central State budget, *\leaving local governaments in charge only of providing adequate buildings"*[16](Bertola and Sestito, 2011). This choice marked a substantial step forward in the fight against illiteracy (Genovesi, 2010; Felice, 2011)

3.3 A new dataset on italian cities

Core to our analysis is the *Annuario Statistico delle Citta Italiane* from 1906 to 1914, published every two years by the *Unione Statistica delle Citta Italiane* and inspired by the *Annuario delle Citta Tedesche.*[17] The *Annuario* collects records on the social, political and economical life of the largest municipalities (with more than 10,000 inhabitants) by breaking down data in the following categories: territory and population, education, hygiene and health, industry and employment. As argued by Niccolini (1906)[18] the choice to sample more important municipalities was taken to guarantee the comparability among the Italian cities and then minimize measurement errors as well as to tackle funds shortage.[19]

The section "Public Education" includes information on the number of schools (public, private and evening classes), number of teachers and pupils as well as on attendance and learning results. Data on public spending on education are available too. The chapters "Taxes" and "Main Consumptions" contain, instead, details on council public finance and data on consumptions (in kilograms) carefully divided into many product groups from fish to coffee, from meat to beer. The goods' current prices are also reported. Most relevant for this study is that available information allows us to measure abroad migration outflows (inflows) from (to) each municipality collected in the *Annuario*. Record keeping, however, became less detailed from 1914 onwards, then inadequate for our purpose: it contains only the net migration rate and no more previous disentanglement.

Since our thesis is that in-and out-migration was correlated with higher levels of

[15]Camillo Corradini (1867-1928) was an Italian politician.

[16]Actually Genovesi (2010) argues that the Daneo-Credaro law was not applicable to the provincial and district capitals. Therefore these cities have continued to hold up the primary

Figure 2: Cities Distribution across Italian Territory. Source: see text.

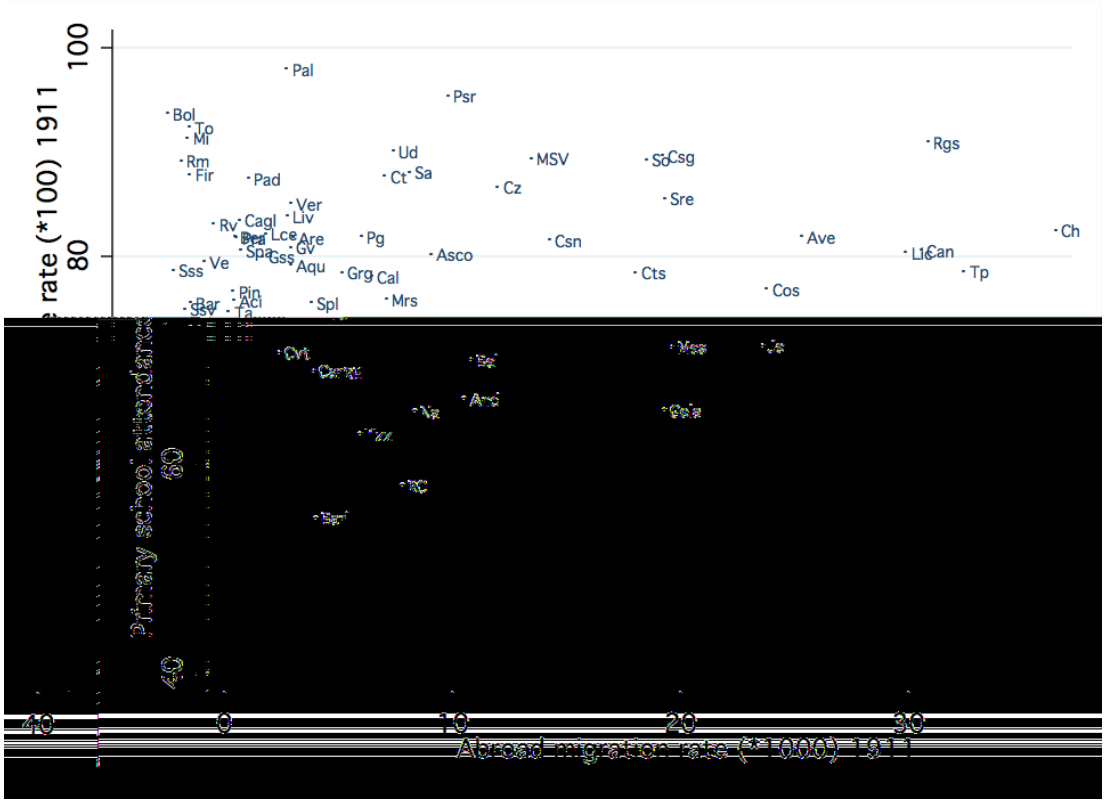
education, to begin with we present some wide empirical evidence on migration and schooling patterns from our municipalities dataset.
Figure 2 illustrates the cities distribution throughout Italy and shows that the municipalities in the sample are almost uniformly spread across national territory: out of roughly 110 cities detected, 47 belong to the South and 63 to the North. Hence a potential distorsion stemming from an over-represented area is avoided. In Figure 3, we plot data on migration in 1911 against the data on people attending primary school in the same year. More precisely Figure 3.a (3.b) displays that cities with a larger share of leavers (returns) had on average a more educated population than cities with a larger share of stayers. The correlation coefficient is .2 in the case of abroad emigration and .33 in the case of returns (statistically significant at the 5 percent level and 1 percent level respectively).

Descriptive statistics are reported in Table 1. The values for *non-Dropout* are the percentage of pupils (of those enrolled) who did not drop out primary school. On average this non-dropout rate is about 81 percent but it results from the significant heterogeneity between the municipalities situated in the South (76.3 percent) and those in the North (83.7 percent). *Migration* and *Returns* represent the abroad outflows and from-abroad inflows respectively, obtained by dividing the flows by the municipality population and then multiplied by 1000. Both Table 1 and Figure 3 highlight the preponderance of returns in the North with respect to the South and show that Southerners were much more likely to leave than Northerners.

Dropout depends definitely on disposable income. Unfortunately at the city level yearly estimates of disposable income do not exist. Following Ciccarelli and De Fraja (2012) and Becker and Woessmann (2009) and Mortara (1913), we proxy income with

Figure 3: The Cross-City Pattern of Migration and Primary School non-Dropout Rate, 1911. Source: see text.

(a) *The Pattern of Abroad Emigration and the non-Dropout Rate .*



(b) *The Pattern of Returns and non-Dropout Rate.*

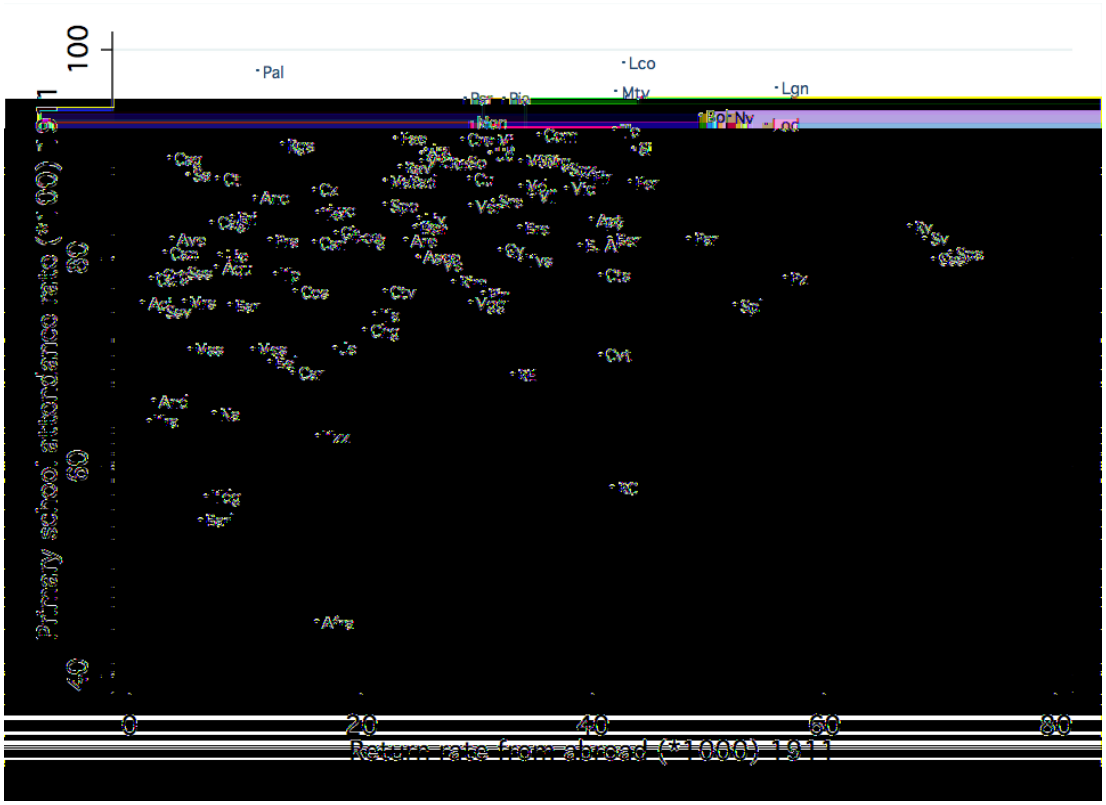


Table 1: Descriptive statistics, 1904-1911[a]

	Variable	Mean	Std. Dev.	Min	Max
Sample	Non-Dropout[b]	81.4	9.04	45.2	98.8
	Migration[c]	6.87	4.10	0.29	40.63
	Returns[d]	2.65	1.63	0.11	7.54
	Expenditure[e]	3.89	2.16	0.93	17.7
	Council taxes[f]	2.21	1.11	0.10	20.5
	Remittances[g]	13.6	8.20	0.30	41.5
	Enrollment[h]	0.94	0.74	0.00	3.53
South	Non-Dropout	76.3	10.5	45.2	98.0
	Migration	11.2	9.50	0.29	40.6
	Returns	1.23	1.07	0.11	5.66
	Expenditure	2.60	1.20	0.93	7.30
	Council taxes	2.14	0.59	0.10	4.65
	Remittances	19.4	7.98	0.83	41.5
	Enrollment	0.73	0.56	0.00	2.22
North	Non-Dropout	83.7	7.10	57.2	98.8
	Migration	4.82	4.26	1.01	25.0
	Returns	3.31	1.41	0.52	7.54
	Expenditure	4.48	2.26	1.18	17.8
	Council taxes	2.24	1.29	0.86	20.4
	Remittances	11.7	8.14	0.30	38.7
	Enrollment	1.02	0.79	0.00	3.53

[a]Descriptive statistics on municipalities are based on annual data relative to 87 cities for the years 1904, 1906, 1908 and 1911. Total number of observations is thus equal to 348. We split the sample into the cities belonging to the South and the North as well. [b]Primary school non-dropout rate; [c]abroad migration rate;[d]return migration rate; [e]per-capita public expenditure on primary education; [f]per-capita council taxes; [g]per-capita remittances (proxy); [h]evening school enrollment rate. Source: see text

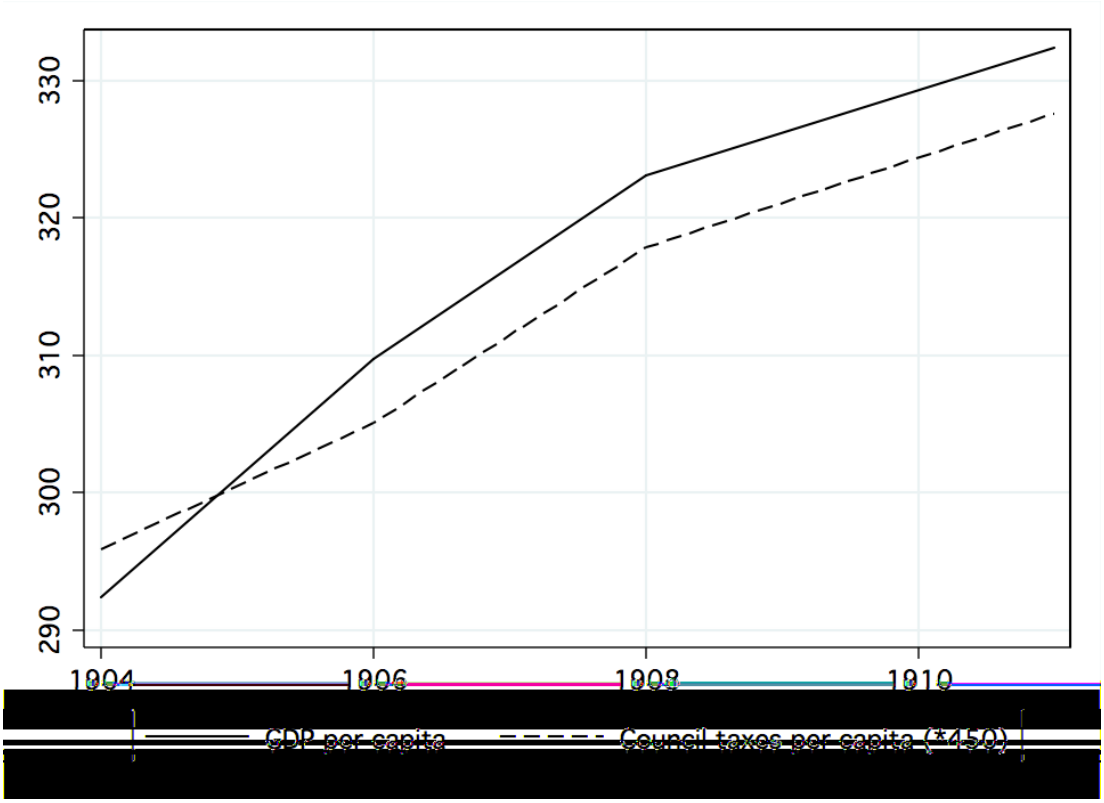
a measure of tax proceeds. We choose as our best proxy the sum of the tax revenues accruing from a large variety of council taxes. Specifically the categories are: family tax; local property and business taxes; taxes on boats, cars and velocipedes; servant tax; livestock and pet tax; hotel patent tax end tax on sparkling water production.[20] This wide range of taxes allows us to overcome two problems: the first is to avoid a possible skewness in the distribution of taxpayers going from the wealthiest households to the poorest ones so that we have a relative broad and representative basis; the second is that we do not need to account for special circumstances affecting only some municipalities, for example by distinguishing those with the city gates or as Ciccarelli and De Fraja (2012) suggest, those that had a major port.

Figure 4.a displays the patterns of the real GDP per capita (estimated in Baffigi (2011)) and real council taxes per capita in the years 1904, 1906, 1908, 1911.[21] The correlation coefficient between the two variables is .9874, statistically significant at the 5 percent level. *expenditure* is the variable that proxies the education supply-side: it

[20]For more details see the *Annuario Statistico delle CittaItaliane*, from 1906 to 1914 and Villani (2011).

[21]We use the cost of living index proposed by Fenoaltea (2002).

Figure 4: Council taxes and GDP. Source: see text.



is the per capita public spending in primary education at the municipality level. By including this variable in equation 1 we catch the effect of different education policy decisions made by municipalities. Finally, *Remittances* are a rough proxy: the ratio between consumption tax proceeds and income tax proceeds, with the idea that an important part of not officially traced remittances is used for consumption although does not appear in official income.

4 Identification strategy and empirical findings

The three pillars of information just described (qualitative literature, structure of primary education, new dataset) guide our identification strategy. By echoing Coletti (1911) 's intuition, the empirical model of endogenous schooling formation we estimate is the following:

$$dr_{i,t} = \alpha + \beta_1 dr_{i,t-1} + \beta_2 m_{i,t} + \beta_3 ret_{i,t} + \beta_4 exp_{i,t} + \beta_5 tax_{i,t} + \upsilon_{i,t} \qquad (1)$$

where $dr_{i,t}$ is the log of public primary school non-dropout rate in year t, $t = 1904, 1906, 1908, 1911$ in the city i, $i = 1, \ldots, 87$;[22] $m_{i,t}$ and $ret_{i,t}$ are the logs of abroad migration rate and return migration rate, respectively, in year t in the city i; $exp_{i,t}$ is the log of the per capita public expenditure on primary education, measured in current lire; $tax_{i,t}$ is the log of the per capita proxy of income in year t in the city i.

[22]Using the dropout rate rather than the enrollment rate allow us to overcome some problems: a) higher enrollment rate does not imply higher attendance rates (see footnote 11), so: b) the use of enrollment rates tends to bias upward the education level of a given population: Cipolla (1969) (Vecchi (2011) suggest that the attendance rate is the best indicator to investigate the literacy rate of Italian population)

The lagged dependent variable in the right-hand side of equation (1) tries to control for:

- urbanization process. It is likely that large cities were attractive poles rather than repulsive ones as population relocates over the national territory in search of the best work opportunities (Accetturo et al., 2012); if so, the dropout rate could be altered abruptly if a large number of people and their families moved on to the nearest city from the countryside. Thus attendance rate would pick up effects that would have nothing to do with the abroad migration or return migration;

- natural dynamics of population. As before, it is clear that the natural increase may be a common driver of both migration (Hatton and Williamson, 1998) and attendance rate: the larger the shock on newborns (with respect to deaths) the larger the probability that primary school dropouts will change in the future;

- conditional convergence of schooling among Italian cities. Technically we estimate equation (1) by first differencing it, so according to the sign of the coefficient of $ar_{i,t-1}$ can emerge a converging process (if negative) or diverging one (if positive).

As in Arellano and Bond (1991), the error term $\upsilon_{i,t}$ is a two-way error-component:

$$\upsilon_{i,t} = \lambda_t + \eta_i + \varepsilon_{i,t} \qquad i = 1, \ldots, I \qquad t = 1, \ldots, T \tag{2}$$

In (2), λ_t represents the municipality-invariant time-specific effect, η_i represents the time-invariant municipality-specific effects and $\varepsilon_{i,t}$ is a white noise, normally and independently distribuited across cities and periods.

Hence, the proposed formulation in equation (1) has the substantial advantage of reducing the burden of omitted variables by including the dependent lagged variable as explanatory one as well as time and cities' fixed effects. Their inclusion guarantees the coefficients of $m_{i,t}$ and $ret_{i,t}$ are likely to capture the vigor of trasmission channels we are interested in.

To investigate the idea that sees emigration and returns as drivers of schooling in Italy in the age of mass migration, we split this section into three parts: in the first part we test the relationship in the simplest way possible, namely, by testing a model with abroad outflows and from abroad inflows, as the only regressors (dummies are included). Then we try to deal with potential endogeneity issues between emigration and dropouts. In the second part we adopt an instrumental variable (IV) approach while in the third part we estimate equation 1 in a multivariate framework using a GMM technique.

4.1 Migration and Schooling: basic formulation.

The basic equations that we use to gauge our 'incentive channels', are the following:

$$dr_{i,t} = \alpha_{0,i} + \alpha_1 m_{i,t} + \phi_1 \lambda_t + \varepsilon_{i,t} \tag{3}$$

$$dr_{i,t} = \beta_{0,i} + \beta_1 ret_{i,t} + \delta_1 \lambda_t + \varepsilon_{i,t} \tag{4}$$

where λ_t is a set of time dummy variables capturing shocks common to all cities (for instance the influence of educational reforms), while cities' fixed effects catch unobservable time-invariant heterogeneity across municipalities.

The first column of table 4 gives evidence of a positive relationship between the

abroad emigration rate and the non-dropout rate of public primary schools. A significant association between return migration and schooling comes to light as well. On average, a 1.0 percentage point increase in the outflows and inflows raises the non-dropout of 1.9 and 3.7 percent respectively.

To control for the possibility that results are biased by geographical differences at higher level of aggregation than the city level, column (2) adds a complete set of interaction terms between geographical dummy variables at macro-area level and time dummy variables. More precisely we classify our cities as belonging to the North-West, the North-Est, the Center and to the South and we make time dummies interact with geographical ones. To the extent that there is unobserved macro-regional time-variant heterogeneity, these interaction dummies should be able to capture most of its essence. Hence, the equations we estimate are the following:

$$dr_{i,t} = \alpha_{0,i} + \alpha_1 m_{i,t} + \phi_1 \lambda_t + \phi_2(\lambda_t * \vartheta_{macro-areas}) + \varepsilon_{i,t} \tag{5}$$

$$dr_{i,t} = \beta_{0,i} + \beta_1 ret_{i,t} + \delta_1 \lambda_t + \delta_2(\lambda_t * \vartheta_{macro-areas}) + \varepsilon_{i,t} \tag{6}$$

The estimated association between in-and out-migration and schooling remains is robust.

Column (3) of table 2 probes the robusteness of the relationship between migration and the non-dropout rate for a specification where outflows and inflows are jointly plugged into the same model. The stability of the coefficients suggest that abroad emigration and returns are not correlated in the same year.

Table 3 reports the results obtained using the evening school enrollment rate as dependent variable. As in Table 2, the results are quite robust across different specifications although the values of the elasticities tends to be much higher both for out-migration and for returns (in the final paragraph we'll resume this point related to the values of the elasticities).

Several worries may emerge in evaluating the association between emigration and schooling in a causal sense where endogeneity (a possible two-way relationship between the dependent and independent variables, or the existenc of omitted variables) is not properly considered. Borjas (1987) argues that migrants are not randomly selected from the population of native countries. According to the literature described, migration is likely to be one of the causes for people to go to school but at the same time the probability of migration depends on the achievement of a given educational requirement, at least for adults. Under perferct positive selection the most educated individuals will emigrate with probability one (zero probability of leaving for the less able) and a brain gain would be impossible because, in this case, all the people that invest in schooling will leave. Hence a necessary condition for a brain gain is that the less educated persons have a positive (but lower than 1) probability of emigration (Docquier and Rapoport, 2009; Beine et al., 2011).
Williamson (2007) gives an interesting piece of evidence supporting selective migration, using Swedish clergymen's evaluations of the intellectual abilities of their parishioners. From reverends' testimonies emerge that by comparing people who subsequently emigrated with those who remained, the former *\had a higher intellectual level, did better at school, and had a wider view of the world".* Can the enormous number of migrants leaving Italy in the early twentieth century be viewed as exogenous with respect to the level of education attained? Williamson (2007) compares literacy rates for five European countries (France, Britain, Italy, Spain and Portugal) among adult immigrants to the United States between 1899 and 1909 to the literacy rates of the adult home populations in 1901 (those who stayed left). He finds that literacy rates among immigrants were

Table 2: Brain gain model, 1904-1911.[a]

	(1)		(2)		(3)	(4)
	FE	FE	FE	FE	FE	IV2SLS
Migration$_t$	0.0190*		0.0200*		0.0200*	0.0224*
	(1.739)		(1.866)		(1.785)	(2.057)
Returns$_t$		0.0373**		0.0346**	0.0346**	0.0406**
		(2.306)		(2.114)	(2.125)	(2.151)
Fixed e ect city	yes	yes	yes	yes	yes	yes
Fixed e ect year	yes	yes	yes	yes	yes	yes
9 interaction terms (year*macro-regions)			yes	yes	yes	
F-stat rst stage						50.77
R-squared	0.157	0.167	0.200	0.206	0.219	0.222
Observations	337	337	337	337	337	318

[a] The dependent variable is the primary school dropout rate (inverse). Numbers in parentheses denote values of robust t-statistics. *** p<0.01, ** p<0.05, * p<0.1. Stillbirth rate used as instrument for migration in column IV2SLS.

Table 3: Brain gain model, 1904-1911.

	(1)[a]		(2)[a]		(3)[a]	(4)[a]	(5)[b]
	FE	FE	FE	FE	FE	IV2SLS	FE
Migration$_t$	0.1620*		0.1490*		0.1610*	0.1600**	0.119
	(1.900)		(1.775)		(1.690)	(2.170)	(0.830)
Returns$_t$		0.2610*		0.2860**	0.3000**	0.3100*	0.250
		(1.870)		(2.04)	(2.155)	(1.650)	(0.790
Fixed e ect city	yes	yes	yes	yes	yes	yes	yes
Fixed e ect year	yes	yes	yes	yes	yes	yes	yes
9 interaction terms (year*macro-regions)			yes	yes	yes	yes	yes
F-stat rst stage						35.14	
R-squared	0.123	0.132	0.182	0.195	0.206	0.380	0.035
Observations	296	296	296	296	296	172	172

[a] The dependent variable is the evening classes enrollment rate. [b] The dependent variable is the private schools enrollment rate. Numbers in parentheses denote values of robust t-statistics. *** p<0.01, ** p<0.05, * p<0.1. Stillbirth rate used as instrument for migration in column IV2SLS.

on average higher with respect to source population, implying a positive selection.[23] Further he shows that Italy appears to be an exception to this rule. Clearly,the observed lower literacy rate among immigrants relative to the Italian population reflects the dominance of poor southern Italians in the immigrant inflow. Nonetheless, the seemingly negative selection among Italian emigrants measured in terms of education and literacy, does not imply the absence of a selection based on unobservable (best and brightest characteristics). Gomellini and Ó Gráda (2011) suggest that in the past the presence of selection bias is clear: emigrants tended to be disproportionately young and healthy and the authors give also some clues about positive selection showing two indicators that militate (non conclusively) in favor of this thesis.The other source of potential endogeneity that challenges our attempt of measuring the casual relationship between migration and schooling, may arise from unobserved variables that affect both the independent variable and its covariates. At this stage we focus on income. In poor families, very often economic conditions forced the head of household to leave in order to look for best opportunities abroad; at the same time this could increase the school dropout rate because of child were required to work in place of their fathers. [24]
In the next paragraphs we try to give a (preliminary) answer to this potential sources of endogeneity, by first exploiting the stillbirth rate as an instrument for abroad emigration and, second, by estimating a multivariate model with a GMM technique.

4.2 The Stillbirth Rate as a source of exogenous variation

To deal with potential concerns about reverse causality and omitted variables biases, we first make use of an instrumental variable. Namely, we use the *stillbirth rate* (as a proxy of well-being, of how people are better off) as a source of variation for migration. The key conditions for the validity of the instrument are two. First, the instrument must be correlated with the variable to be instrumented (we will see this correlation in the F-stat of the first stage); second, the instrument must be uncorrelated with the dependent variable. i.e., in this context, the stillbirth rate must be uncorrelated with the school dropout rate. This is the first element of investigation.

The graphs show that the correlation between our measure of schooling and our candidate instrument is absent. If we estimate the correlation of the two variables controlling for a complete series of fixed effects, we get to the same conclusion: non-dropout and stillbirth rates are not correlated one to each other.

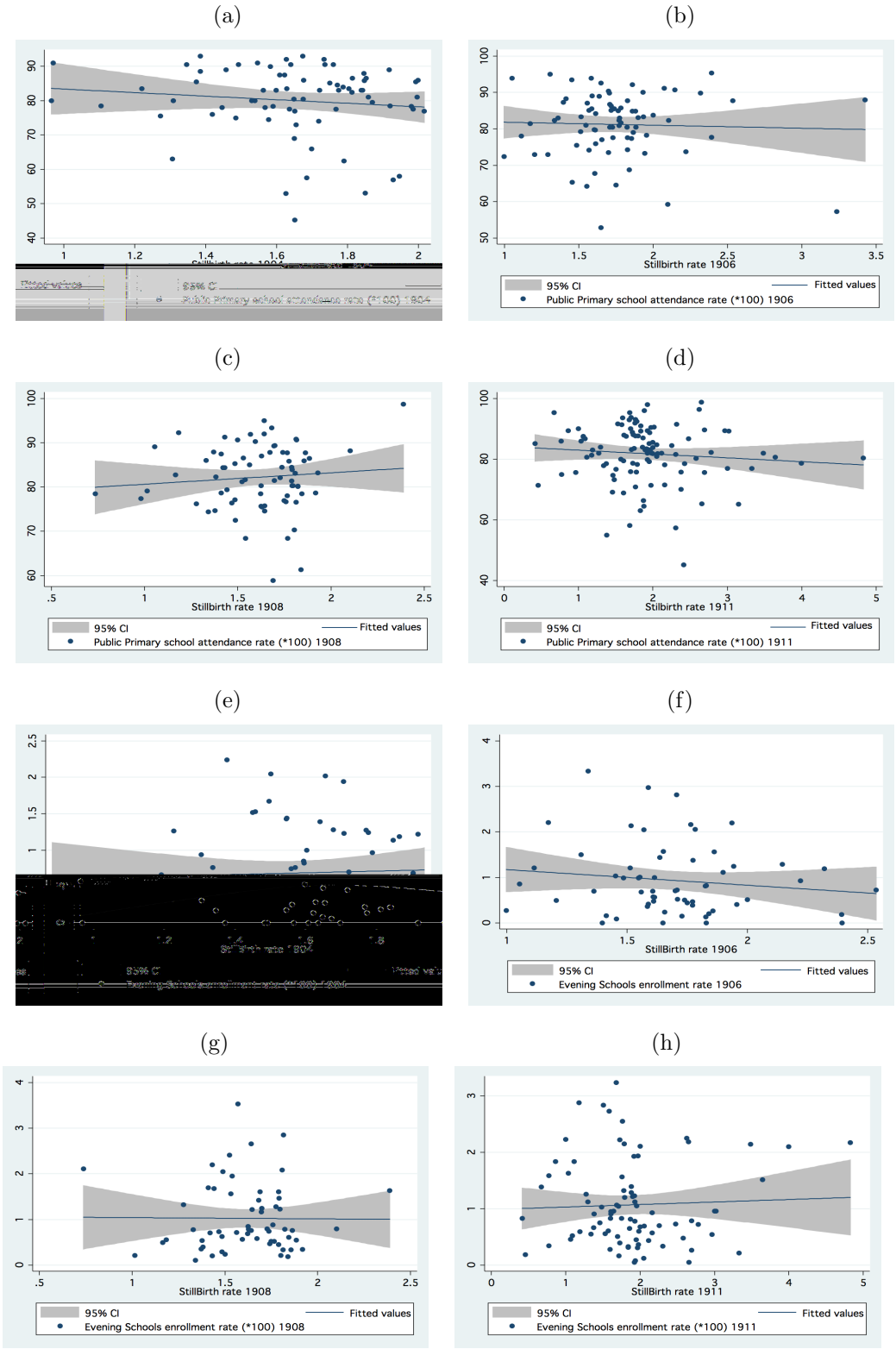
So, as far as statistics is concerned we are on the safe side. But what about economics? What are the economic rationales at the basis of this uncorrelation? The logic that supports this evidence can be the following: 1) the idea already quoted that schooling at the turn of the XIX century in Italy, mainly depended from economic conditions; 2) the disconnection, stressed by many authors, between income and other indexes of well-being (**?**European Commission, 2010); [25] 3)hence, as a corollary, the

[23] Williamson (2007) argues that a positive selection was inevitabile. Immigrant were younger adults than the source adults population and, as there was a schooling revolution taking place in late nineteenth century in Europe (Cipolla, 1969), literacy soared among the young movers compared with the old stayers. Moreover he adds that while there was certainly some positive screening, it probably did not translate into a big brain drains from Europe.

[24] This is the main mechanism that could affect the relationship between migration and schooling in a negative way. Contrary, as argued by Cipolla (1969), literacy could be triggered off by poverty which pushes individuals to emigrate to search for a job and simultaneously forces them to learn letters to keep in touch with relatives or to take advantage from their knowledge as traveling teachers.

[25] This disconnection was analysed als recently in a study commissioned in 2008 by Nicholas Sarkozy to J. Stiglitz, A. Sen and J.P.Fitoussi. They stress on many limitations of GDP as a measure of social progress, including the problems with its measurement. The report is available

Figure 5: Correlations graphics. Stillbirth and non-dropout rates in primary and evening schools (1904, 1906, 1908, 1911). Source: see text.



still-birth rate can be uncorrelated with a schooling attendace measure.

The stillbirth rate that can be defined as follows:

to http://www.stiglitz-sen-fitoussi.fr

Table 4: Instrument exogeneity: correlation tests

	(a) FE	(b) FE
Stillbirth rate$_t$	0.009	0.209
	(0.710)	(1.270)
Fixed e ect city	yes	yes
Fixed e ect year	yes	yes
9 interaction terms (year*macro-regions)	yes	yes
R-squared	0.08	0.09
Observations	337	255

(a) The dependent variable is the public primary school attendance rate. (b) The dependent variable is the evening school enrollment rate. Numbers in parentheses denote values of robust t-statistics. *** p<0.01, ** p<0.05, * p<0.1.

$$SB_{i,t} = \frac{fetal-deaths_{i,t}}{births_{i,t}} * 1000$$

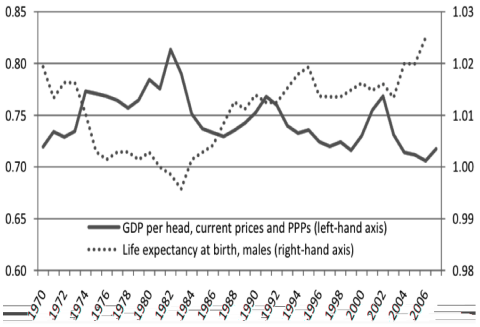
where i denotes the $i-th$ municipality and $t = 1904, 1906, 1908, 1911$.

Far from contributing to the debate whether GDP is a good indicator of the economic activities of a country, how improving this measure and looking for better metrics, we simply borrow the idea that there is a gap between the information contained in aggregata GDP data and what counts for common people's well-being. Put differently, European Commission (2010) emphasizes that most of dimensions shaping people's well-being are missed by conventional income measures and as a consequence there is low correlation between GDP and indicators of living standards: *"con ating the two can lead to misleading indication about how well-o people are and entail the wrong policy decisions"*.[26]

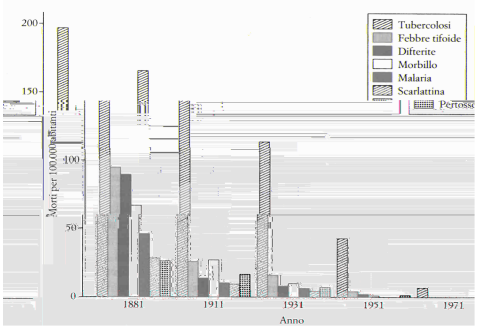
Figures 6 shows how non-monetary indicators of the population well-being can diverge from conventional economic measures. The dynamic of life expectancy at birth tells us something different from GDP: the improvements in facilities, medical advances, hygiene practices and enviromental reclamation are essential factors (but missing in the GDP indicator) determining longer life span of a population (Vecchi, 2011). This, although possibly unrelated to GDP, could affect the decision of migration.

Academic literature agrees with the idea that mortality statistics by age mirror the health state of a society. In post-unification Italy contagious diseases provoked about 30 percent of all deaths (Caselli, 1991; Vecchi, 2011). Vecchi (2011) notes that mortality becomes almost zero in conjuction with the WWII and in the immediate postwar period before that the average income of Italians took off. Therefore, at least there is no synchrony between the increase of income and the reduction of mortality caused by infectious deseases since the latter depended on other variables (e.g. hygiene); rather the latter seems to anticipate the former. Further, if we focus on the period 1881-1911, the trend of GDP seems to grasp little (or not at all) the progress highlighted in mortality decrease. This suggests that the reduction in infectious deseases is likely to be found not only in the general improvement of health conditions related to income,

[26]Report by the Commission in The Measurement of Economic Performance and Social Progress, chapter 1.



(a) *Gaps in life expectancy at birth and GDP per-capita between the US and France. Source: European Commission (2010).*



(b) *The defeat of mortality caused by contagious diseases. Source: Vecchi (2011).*

Figure 6: The disconnection between GDP per capita and well-being indicators. Source: see text.

but also in the spread of knowledge in medical science and in the diffusion of vaccines and drugs; factors, the latter, substantially uncorrelated with economic growth.

The infant mortality rate is widely recognized as an important indicator of how a society is better off and allows to associate mortality with the dynamics of the development and living standards of a given population. Vecchi (2011),shows that analysing Italy, France and Spain and comparing the evolution of their GDPs with the evolution of their mortality rates, the two measures emerge as disconnected.

Gatti (2002) shows that in the post-Unification Italy, Sardinia although was a less-developed territory according to income indicators reported the lowest infant mortality rate (and actually, also the lowest emigration rate)if compared to all the other Italian regions According to Gatti (2002) and Coletti (1908) the privileged condition of Sardinian babies relied on both the mild climate and a number of cultural elements ranging from the low participation of Sardinian women as farm-workers to the childbirth care, to the habit of a prolonged breastfeeding; practise the latter that avoided newborns came in contact with water, at the time the most dangerous conductor of disease-spreading. These conditions made the environment conducive to early childhood, offsetting the effects of poverty and lack of hygiene.

Our dataset allows us to provide also additional evidence about the missing association between mortality indicators and GDP per head at the city level. In Figure 7 we plot data on GDP per capita (proxied by council taxes) against data on infant mortality in 1908.[27] The correlation coefficient is -.08 and it is not statistically significant at all.

So, the literature support the idea that statistics referred to pre-natal and neonatal mortality, are little or not correlated with income measures. At the city level we don't have (at now) yearly estimates of mortality in the first year (or in the first month) of life.[28] As seen, we resort to an alternative proxy of well-being: the *stillbirth rate*. There are a number of studies from which fetal deaths emerges as a suitable (if ever such a horrible measure could be defined 'suitable') measure to our objective and it is a proxy of the neonatal mortality rate as well. As an example, Cousens et al. (2011) is a biomedical study aimed to develop more reliable estimates of stillbirth rate in 193 countries in 2009 at national and regional level. The authors use the neonatal mortality

[27]Infant mortality rate is defined as the number of deaths in the first year of life out of the number of births. Data are restricted to the largest cities.

[28]The sole exception are those we have shown in 6.b available only for the largest municipalities in 1908.

Figure 7: The Cross-City Pattern of Infant Mortality GDP per-capita, 1908. Source: see text.

rate as the main predictor of the stillbirth rate since the neonatal mortality rate is closely associated with factors affecting stillbirth, namely, care during pregnancy and close to the time of birth.[29] In the analysis that follows we consider fetal deaths as a proxy of well-being and as a source of variation for migration that is exogenous to economic and educational patterns. Thus, we use the stillbirth rate as an instrument for the abroad emigration rate in cities in the early twentieth-century Italy.

Column (4) of Table 2 4 reports the IV estimate of the effect of abroad migration (and returns) on schooling, where migration is instrumented with the stillbirth rate.From the first stage F-statistic, stillbirth rate results a good instrument for migration at the city level. In order to estimate the non-dropout rate, the second stage uses only the part of migration that could be attributed to the stillbirth rate and so exogenous to dropouts. The positive effect of outflows on schooling is highly robust in the IV model. Indeed the point estimate (.022) equals the coefficient we obtained in the previous specifications. This can be considered as an indication that the emigration rate can be treated as exogenous; we therefore proceed consequently in the analysis that follows.

[29] Among other things, the inputs Cousens et al. (2011) use in their model are: source population (urban vs rural vs mixed), birthweight, health-service-related indicators, total fertility rate, gross national income in purchasing parity power per person and female literacy rate. Although female literacy rate is removed from the model because of its low predictive power when accounting for country-fixed effects, the researchers retain into the model the gross national income per person together with the neonatal mortality and birthweight. Cousens et al. (2011) do not report in the paper the magnitude of the coefficient associated with each regressors; anyway we can argue, by confronting the lines' slopes in Figure 3 (in their study, p. ??), that the predicted power of GNI is neglibible (although statistically significant) if compared to neonatal mortality; result, the latter, in line with the literature cited above.

4.3 The Multivariate Model

In this section we test a multivariate version of the empirical model proposed in equation 1. The model has a dynamic panel structure, so, we can use the GMM estimation procedure. Table 7 reports our results: each column reports the results of an alternative specification for the estimation of equation 1. The third and the fourth columns are our benchmark specifications (so we rule out the other specifications in the description that follows). They estimate equation 1 by using the difference GMM method (GMM-dif). Namely, we use both one-step and two-step GMM-dif estimators (column headed GMM1 and GMM2 respectively).[30] GMM-dif (Holtz-Eakin et al., 1988; Arellano and Bond, 1991) treats the model as a system of equations, one for each time period. The equations differ only in their moment condition sets. The predetermined and endogenous variables in first-difference are instrumented with suitable lags of their own levels. Strictly exogenous regressors enter the instrument matrix in first differences, with one column per instrument. Compared to GMM-dif, the Anderson and Hsiao (1982) estimator (IV2SLS in table 6) is consistent but it is not efficient because it does not exploit all the moment conditions and its instrument matrix; it uses the second lag of the dependent variable as instrument for its first differences.[31] The instruments proliferation (over-identification) and overfitting are the main drawbacks of GMM methods. S-test of Sargan (1958, 1988) and J-test of Hansen (1958) provide guidance on possible excess of instruments .[32] We use this approach in the following analysis.

As a first finding, our result support the view of a national convergence process in the primary school non-dropout rates over the period 1904-1911. This evidence is in line with Felice (2011)'s estimates and Cerrito (2011)'s studies. In table 5 abroad migration and returnees contributions are statistically significant in most of the proposed specifications and the associated coefficients are in general robust with some exceptions. An increase in the outflows has a positive impact on non-dropouts in primary schools; return migration effects match the qualitative literature claims. The magnitude of their elasticities ranges from 2.5 to 3.3 for migration and from 4.4 to 5.8 for returns (not far from the values found in other studies focused on present time (Beine et al., 2003; Docquier and Rapoport, 2009; Fratesi and Percoco, 2009)).

The positive and significant council taxes coefficient (our proxy for income) is a sort of confirmation of the hypothesis of a relationship between education and income (key in our IV exercise in previous paragraph). Note that we treat taxes as an endogenous

[30] As GMM estimators, we have one and two-step variants with two-step estimates asymptotically more efficient, although simulation studies suggest very modest efficiency gains from two-step, even in presence of heteroskedasticity (Blundell et al., 2000). In two-step GMM estimator there is an extra variation because the optimal weight matrix depends on estimated parameters. Asympototic standard errors do not take into account of this extra variation in small sample; as a result inference in small sample is unreliable. Thus the two-step asymptotic standard errors are too small and t-statistics too big; in other words there is an overfitting bias in small sample (this extra variation is negligible in large sample). In this sense the t-tests based on the one-step procedure are more accurate. Anyway, Windmeijer (2005) provides corrected standard errors and t-tests that are reliable as those based on the one step GMM estimator.

[31] Anderson and Hsiao (1981) use the first difference second lag of the dependent variable as instrument for its first differences. The Anderson and Hsiao (1982) method is recommended because it allows for saving degree of freedom if compared to Anderson and Hsiao (1981).

[32] S-test of Sargan (1958, 1988) in the homoskedastic case and J-test of Hansen (1958) in the heteroskedastic case test the validity of the instruments set. The statistics is distributed as a chi-square with degree of freedom equal to the number of moment conditions (five in the specifications in table 6). Under the null over-identification restrictions are valid. We fail to reject it (p-values are reported in the table 7) so our instruments set is valid. Note also that in the command *xtabond2*, used to carry out the estimations in Stata, the R-squared is not available. We compute it as the squared correlation coefficient between actual and fitted values.

Table 5: Endogenous Schooling model, 1904-1911; Alternative estimates.[a]

	ENDOGENOUS SCHOOLING							
	(1) FE	(2) IV2SLS	(3) GMM1	(4) GMM2	(5) GMM1	(6) GMM2	(7) GMM1	(8) GMM2
Dropout$_{t-1}$	-0.27***	-0.536	-0.42**	-0.51***	-0.44**	-0.51***	-0.524***	-0.61***
	(-4.16)	(-1.53)	(-2.06)	(-3.34)	(-2.18)	(-3.45)	(-2.66)	(-3.14)
Migration$_t$	0.028**	0.040	0.026**	0.030***	0.024**	0.028***		
	(2.324)	(1.610)	(2.380)	(2.73)	(2.266)	(2.692)		
Migration$_{t-1}$					-0.012	-0.013	-0.015	-0.132
					(-1.374)	(-1.452)	(-1.532)	(-1.061)
Returns$_t$	0.089*	0.163**	0.044*	0.050**	0.042*	0.047**	0.043*	0.060**
	(1.753)	(2.283)	(1.875)	(2.300)	(1.789)	(2.070)	(1.803)	(2.227)
Expenditure$_t$	-0.014	0.100	-0.018	0.005	-0.022	0.002	-0.017	-0.023
	(-0.423)	(0.729)	(-0.520)	(0.161)	(-0.665)	(0.010)	(-0.500)	(-0.721)
Council Taxes$_t$	-0.001	0.083	0.059***	0.057**	0.066**	0.067**	0.069**	0.076
	(-0.050)	(0.626)	(2.670)	(1.97)	(2.501)	(2.082)	(2.271)	(1.617)
Remittances$_t$	0.043*	0.029	0.040*	0.038*	0.041*	0.040**	0.047**	0.060**
	(1.790)	(0.480)	(1.850)	(1.845)	(1.870)	(1.962)	(2.080)	(2.32)
Fixed e ects city	yes	yes	yes	yes	yes	yes	yes	yes
Fixed e ects year	yes	yes	yes	yes	yes	yes	yes	yes
R-squared	0.3022	0.008	0.390	0.377	0.285	0.263	0.215	0.263
J-statistic (p-value)	-	-	0.703	0.703	0.752	0.752	0.221	0.221
Observations	201	104	104	104	104	104	104	104

[a] The dependent variable is the public primary school non-dropout rate. Numbers in parentheses denote values of robust t-statistics. *** p<0.01, ** p<0.05, * p<0.1 Past values of non-dropout rates, taxes and remittances used as instruments in column FE2SLS, and in whatever specification headed GMM1 or GMM2. Migration is treated as exogenous. We use the finite sample correction for the asymptotic variance of the two-step GMMestimator suggested by Windmeijer (2005). J-stat $\sim \chi^2_8$; p-value is reported. R^2 is computed as the squared correlation coefficient between actual and fitted values. Source: see text.

Table 6: Endogenous Schooling model, 1904-1911; Alternative estimates.[a]

	ENDOGENOUS SCHOOLING							
	(1) FE	(2) IV2SLS	(3) GMM1	(4) GMM2	(5) GMM1	(6) GMM2	(7) GMM1	(8) GMM2
Enrollment$_{t-1}$	-0.07	0.149	0.215	0.226	0.190	0.220	0.100	0.130
	(-0.92)	(0.79)	(0.790)	(0.780)	(0.690)	(0.66)	(0.380)	(0.31)
Migration$_t$	0.377*	0.472	0.240*	0.200*	0.244**	0.205*		
	(1.78)	(1.22)	(1.820)	(1.68)	(1.77)	(1.71)		
Migration$_{t-1}$					-0.087	-0.046	-0.101	-0.085
					(-0.730)	(-0.280)	(-0.840)	(-0.430)
Returns$_t$	0.44	1.450	0.237	0.206	0.311	0.250	0.254	0.265
	(1.41)	(0.850)	(0.92)	(0.650)	(1.230)	(0.670)	(1.050)	(0.650)
Council Taxes$_t$	0.377***	0.756	0.616*	0.965**	0.586*	0.905*	0.520*	0.840*
	(2.560)	(0.380)	(1.670)	(1.97)	(1.65)	(1.77)	(1.650)	(1.71)
Remittances$_t$	0.07	-0.503	-0.060	-0.012	-0.068	-0.026	-0.041	-0.012
	(0.870)	(-0.690)	(-0.360)	(-0.070)	(-0.410)	(-0.150)	(0.260)	(-0.32)
Fixed e ects city	yes	yes	yes	yes	yes	yes	yes	yes
Fixed e ects year	yes	yes	yes	yes	yes	yes	yes	yes
R-squared	0.225	0.296	0.276	0.277	0.295	0.288	0.283	0.293
J-statistic (p-value)	-	-	0.261	0.261	0.254	0.254	0.222	0.222
Observations	207	85	85	85	85	85	85	85

[a] The dependent variable is the **evening school** enrollment rate. Numbers in parentheses denote values of robust t-statistics. *** p<0.01, ** p<0.05, * p<0.1 Past values of enrollment rate, taxes and remittances used as instruments in column FE2SLS, and in whatever specification headed GMM1 or GMM2. Migration is treated as exogenous. We use the finite sample correction for the asymptotic variance of the two-step GMMestimator suggested by Windmeijer (2005). J-stat $\sim \chi^2_9$; p-value is reported. R^2 is computed as the squared correlation coefficient between actual and fitted values. Source: see text.

explanatory variable in all specifications in table 6 (with the exception of FE model); namely we use past value of taxes as instruments. In contrast, we fail to find any evidence on the contribution of per capita municipal expenditure (this fits with different hypothesis: the ineffectiveness of expenditure; the lack of an adequate variable to proxy public policy; correlation with income).[33]

In the fifth and in the sixth columns, equation 1 is modeled by introducing the log of the lagged abroad migration rate, while the last two columns report the estimation of the model obtained by simply excluding current migration as regressor but keeping up lagged outflows. The log of lagged emigration rate is never significant even when we remove current emigration. This may be due to two reasons. The first is that the time span, between subsequent surveys in the panel structure we use, is large enough to allow the coefficient of $m_{i,t}$ to pick up past shocks on migration;[34] the second is that the influence on schooling we have come to expect from lagged migration is gathered up by the $ar_{i,t}$ coefficient. The latter hypothesis is very plausible because in an unreported regression we estimate a model by excluding the lagged dropout rate. The abroad migration and the lagged abroad migration rate coefficients are both positive and significant.

Some theoretical studies on migration (Mountford, 1997; Beine et al., 2001) predicted non linear effects of migration prospects on human capital formation and as a consequence on education. More precisely, these models suggest that a greater positive brain gain should be observed mostly in the poorest countries. The idea is that in such countries the motivation to invest in schooling are extremely low unless substantial external options are offered to potential migrants (Beine et al., 2001). As regards returns, historical economic literature offers us a plausible explanation for additional effects. Del Boca and Venturini (2003) argue that the various constraints to start-up new entreprises limited the development of the local economies. Specifically only in the North-East a positive influence ot returns seems to come out because return migration was encouraged and supported. In the South returning migrants face severe difficulties in finding a job and in finding support for their investments. Cerase (1967) (ob142(50) TJ-403to)-374eopplaus2(5w)-

Table 7: Endogenous Schooling model, 1904-1911; Robustness Analysis.

	Dropout[a] (1)		Enrollment [b] (2)		Literacy[c] (3)	
	GMM1	GMM2	GMM1	GMM2	GMM1	GMM2
$Dropout_{t-1}$	-0.404*	-0.492***				
	(-1.890)	(-3.220)				
$Enrollment_{t-1}$			0.136	0.1870		
			(0.390)	(0.580)		
$Literacy_{t-1}$					-0.264*	-0.259**
					(-1.703)	(-2.435)
$Migration_t$	0.0180*	0.020***	0.170*	0.209*	0.0201	0.011
	(1.750)	(2.17)	(1.660)	(1.900)	(0.981)	(0.5497
$Returns_t$	0.065***	0.070***	0.611	0.663	0.039	0.0287
	(2.745)	(3.198)	(1.460)	(0.890)	(0.981)	(0.562)
$Expenditure_t$	-0.0130	0.050			0.048	0.047
	(-0.411)	(0.150)			(0.932)	(0.815)
Council $Taxes_t$	0.050**	0.041*	0.590*	0.872*	-0.030	-0.027
	(2.317)	(1.640)	(1.690)	(1.778)	(-0.749)	(-0.041)
$Remittances_t$	0.042 **	0.043**	(-0.122)	(-0.074)	0.020	0.0244
	(1.96)	(1.970)	(-0.750)	(-0.320)	(1.080)	(1.013)
South*$Migration_t$	0.0614	0.056	0.101	0.145		
	(1.360)	(1.540)	(0.260)	(0.360)		
South*$Returns_t$	-0.067	-0.077	-0.903	-1.090		
	(-0.990)	(-1.380)	(0.850)	0.890		
Fixed e ects city	yes	yes	yes	yes	yes	yes
Fixed e ects year	yes	yes	yes	yes	yes	yes
R-squared	0.277	0.243	0.330	0.352	0.088	0.073
J-statistic (p-value)	0.751	0.751	0.252	0.252	0.828	0.828
Observations	104	104	85	85	104	104

[a] The dependent variable is the primary school non-dropout rate. [b] The dependent variable is the enrollment rate of the evening schools. [c] The dependent variable is the literacy rate. Numbers in parentheses denote values of robust t-statistics. *** p<0.01, ** p<0.05, * p<0.1. Past values of the non-dropout rate, taxes and remittances used as instruments in whatever specification headed GMM1 or GMM2. Migration is treated as exogenous. We use the finite sample correction for the asymptotic variance of the two-step GMMestimator suggested by Windmeijer (2005). J-stat $\sim \chi^2_8$; p-value is reported. R^2 is computed as the squared correlation coefficient between actual and fitted values. Source: see text.

effects. The coefficients of migration and returns remain significantly positive and their values are quite similar to those on table 6 in the columns (3) and (4); this confirms the robusteness of the results obtained in the linear specifications.

Some historical documents emphasize the importance of private schools and evening classes in educating adults especially in the largest cities. Figures related to public schools are obviously not able to catch these possible channels.[35] In Table 7 we estimated our equation also using as a dependent variable the enrollment rate in evening schools (column 2). As we already found in Table 3, the elasticities are not significant. We take these results as a suggestion that, at least as far as the effects of retunees on evening schools are concerned, some more investigation is needed.

Finally we used the literacy rate as dependent variable rather than dropouts. Literacy data, in the *Annuario Statistico delle Citta Italiane*, derive from marriage registers (the share of brides and grooms who were able to sign their marriage certificates). Although the magnitude of the *Migration* and *Returns* coefficients are quite similar to previous estimations, in column (3) coefficients are not significant. This result may be explained by considering that literacy is a more general concept than dropout or attendance rates and it is a more informative measure of accumulated human capital rather than schooling (Becker and Woessmann, 2009); as a consequence, it is very plausible that outflows and inflows are not able to catch up the whole phenomenon. As argued, among others, by Cipolla (1969) and Vecchi (2011) lower levels of dropouts do not imply higher levels of literacy. In 1829, in Naples, out of 2,000 girls who attended the school only a fifth actually learned to read. In 1870, in the province of Turin (the most developed in tems of literacy) education meant in being able to read just a little and write incorrectly; in fact after a few years that students have completed the schools, many of these were no longer capable to understand what they read, nor to write their own name correctly.

5 Back of the envelope

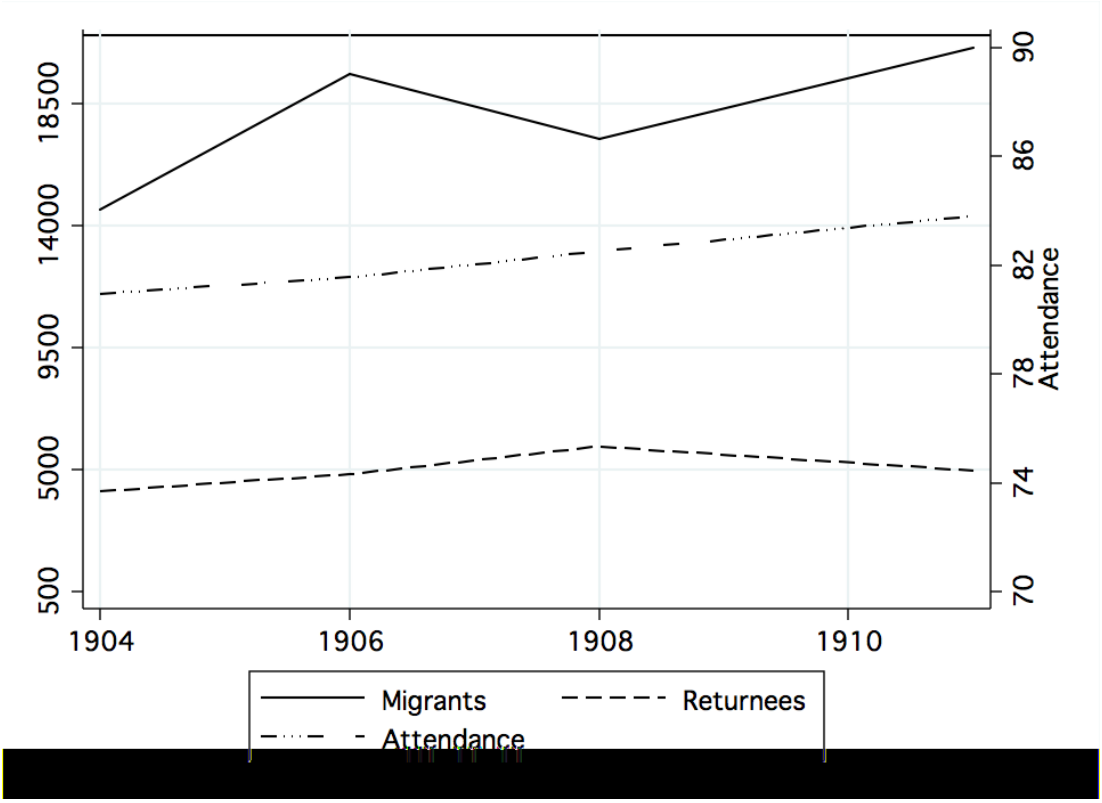
A useful way to interpret the effect of migration on education is to translate the estimates we have got so far into numbers that express the magnitude of the incentive mechanisms.

We begin with illustrating some stilized facts about migration and school dropouts which are more likely to fit this kind of exercise. Figure 8 plots the patterns of migration and the non-dropout rate from 1904 to 1911 conditionally to our dataset; on the left axis we have the aggregate number of leavers and returnees in each year; while the right axis reports the mean of the attendance rate in each year. Overall, in our sample 72,015 people left in the years 1904, 1906, 1908, 1911 (18,003 per annum on average); whereas in the same time span 19,856 individuals returned (4,964 per annum). Therefore in our sample the proportion of returnees is a bit less than one third of those who left in the same period. As we have already noted, on average, the public primary school non-dropout rate is about 81 percent. Furthermore, in the years under analysis the number of students enrolled in schools are, on average, 495,940; therefore the stock of people that did not drop out is 401,710. The average flow of the new students is instead 49,162 of which 39,821 did not drop out.

What was the actual effect of the big surge of migrants on school attendance? In particular, how many people stayed at school and did not left their classrooms, because of migration? Next we will try to give a quantitative answers to these questions.
To this end we recall equation 1:

[35] For instance in 1906 in Turin, Milan, Rome and Naples there were 8,000; 11,000; 10,000 and 15,000 people enrolled in private schools respectively. Unfortunately the dataset does not report their age.

Figure 8: Migration and Attendance rate, 1904-1911. Source: see text.



$$dr_{i,t} = \alpha + \beta_1 dr_{i,t-1} + \beta_2 m_{i,t} + \beta_3 ret_{i,t} + \beta_4 exp_{i,t} + \beta_5 tax_{i,t} + \upsilon_{i,t}$$

From the equation above we can calculate the implied long run elasticities of abroad emigration and return migration, i.e. the elasticities that would prevail in the long run computed supposing that the model is in a steady state equilibrium. We interpret the 1904-1911 elasticities as percentage changes in the non-dropout rate that would follow a permanent change in outflows and inflows so that $dr_{i,t} = dr_{i,t-1}$. Given the empirical model, this long run abroad emigration and return migration elasticities are respectively:

$$\frac{\beta_2}{1-\beta_1} \tag{8}$$

$$\frac{\beta_3}{1-\beta_1} \tag{9}$$

while β_2 and β_3 are the impact multipliers.
In the estimates the coefficient of *Migration* ranges from .019 to .030 (Tables 2 col. 1 and Table 5, col. 4). To this estimate corresponds a long run elasticity that ranges from .013 to .022.[36] Similarly the coefficient of *Returns* ranges from .037 to .050; the steady state elasticity ranges from .024 to .035.

So, the results reported indicate that a rise in emigration of one percent would have increased the non-dropout rate from 1.9 to 3.0 percent in two years and from 1.3 to 2.2 percent in the entire period. By translating these figures in the number of

[36]We choose β_1= -.42 deriving from column (3) in Table 6.

people, we have that each 100 people who additionally left, kept at school a number of individuals going from 5 to 7 in the short term and a number ranged from 2.7 to 5 in the long run. Following the same line of reasoning, our results suggest that every 100 additional returnees, increased the number of non-dropping out pupils in a range from 26 to 40 as impact, and a number from 8 to 28 in the "long run". If we consider evening schools (Table 3, col. 1), although elasticities are very high, we found "'reasonable"' magnitudes since evening enrollments are very little. So, we calculated that 100 more migrants pushed into evening schools from 6 to 10 individuals. Figures we have just reported are in line with those found in many other studies that investigates the brain gain phenomenon (e.g.Docquier and Rapoport (2009)).

6 Conclusions

This paper is a first attempt of measuring the effect of migration on schooling in Italy in the age of mass migration. The idea of a 'brain gain' has been investigated by many scholars and it is well documented in historical qualitative evidences. More precisely, we investigated whether emigration or its prospects, and return migration lowered school dropout rates in Italy in the first decade of the XX century. Results are obtained by using a unique dataset at the municipal level that has allowed us to partially overcome some of the problems deriving from the lack of suitable data. We estimated the effects of migration and return migration on the dropout rate by controlling for fixed effects at the city level. We tried to address endogeneity issues with different tools. First, we implemented an IV approach using pre-natal mortality as an instrument for migration. Then, we resort to a GMM estimation adopting a multivariate model and testing its robusteness with respect to different aspects. We (cautiously) affirm that the direction of causality goes from migration to schooling (conditionally to our dataset and to the period of inspection). Finally, we trasformed the point estimates (elasticities) into the amount of people motivated not to leave schools because of migration .

The results empirically support the working of a beneficial outward and potential migration channel as well as a valuable return migration mechanism. On average, return migration seems to have a stronger impact on schooling. We also tried to control for remittances (using as a proxy the unexplained variation of consumption). No geographical differences emerge between the North and the South. Basically and according to many studies on migration, we can say that the traditional perception of the brain drain often labelled as a *looting* from poorer countries to richer ones, met some countervailing forces in the case of Italy. As far as the influence of returnees is concerned, our estimates highlight the positive impact and the robustness to a large variety of specifications. Finally our analysis points to a moderate converging process in schooling performances between Italian cities.

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