The Economic Effects of Youth Drain *

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Abstract

Economic change and innovation are often embodied in young generations who bring new ideas and transform the productive and organizational structure of companies. What happens to an economy if the cohort of young people, and especially the highly educated among them, shrinks significantly in size? In this paper we exploit a sudden increase in emigration of young and educated Italian citizens during the period 2010-2015 and analyze its effects on firm creation, local productivity and innovation. As the emigration decision are themselves partly driven by local economic conditions, we isolate the "pull-driven" component in the wave of migrants to reduce endogeneity and omitted variable issues. We combine this information with detailed firm-level data on the universe of Italian firms and find that youth emigration is associated with lower firm creation, decline in skill intensity in the local economy and fewer innovative startups.

Key Words: Emigration, Demography, Brain Drain, Entrepreneurship, Innovation, EU Integration.
JEL Codes: J61, H7,O3,M13.

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1 Introduction

Highly educated young individuals, possibly because their human capital has strong complementarity with new technologies or because they are more willing to take risks, are often the vectors of innovation and economic change. Therefore, the inflow of young highly educated people in the economy can be a crucial element to its innovative ability. In Silicon Valley, one of the most innovative places on earth, young managers and entrepreneurs bring new ideas to fruition and sometimes they bring start-up to success by developing those ideas when they are still in their twenties. More commonly, new generations of managers, professionals and entrepreneurs are important drivers of growth as they greatly contribute to the Schumpeterian "creative destruction" of the existing productive structure and technologies (Lazear et al., 2014; Acemoglu et al., 2015). One concern of many rich countries is that the demographic decline is bringing a period of transition in which the cohort of young workers, managers and entrepreneurs shrinks significantly. A similar concern, mainly voiced by people in developing countries is that their young highly educated individuals leave the country, lured by better opportunities in richer economies, leaving the economy and society of origin deprived of a substantial innovative and changing potential.

In the present paper we consider a case in which a significant decline of young educated individuals took place in a relatively short amount of time. This happened in Italy because of the great recession of 2008-2012 and its aftermath. Italy is a developed economy and its reliance on continued innovation and technological progress for economic growth is crucial. Since 1999 it has been part of the European Monetary and Economic Union, which has opened its young, better educated and more mobile individuals to job opportunities in the rest of Europe, where they can freely move and work. While mobility of Italian youth has been non trivial for a long time, the onset of the Great Recession, which has hit the Italian economy much harder than those of central and norther Europe, has provided to several

young individuals strong incentives to leave the country, especially since 2010. What have been the consequences of this emigration wave? Did their departure improve the economic opportunities and wages of those who stayed? Or did it hurt economic growth? Did the rate of new firm creation and the frequency of innovative start-up decrease? This paper uses administrative data on migration flows of Italians to other countries by municipality of origin and demographic group and administrative data on firms' histories and characteristics, to address these questions.

The question of the impact of a decline of highly educated youth on the economic performance of an economy is one on which we know very little. However, it has very important implications because of two important trends which are affecting, respectively, the economies of the rich and of the developing countries. In developing countries, increasing emigration rate of their highly skilled (sometimes called brain drain from these countries) has increased significantly in the last two decades (see Docquier et al., 2014). This may significantly reduce the number of young highly educated people and their creative contribution to the local economies delaying growth and economic success. In developed economies,on the other hand, it is the demographic transition that is reducing significantly the size of young cohorts relative to the older ones. Our analysis will exploit a sharp increase in emigration in Italy, due to economic motivation and free mobility of workers in Europe, and the strongly selective nature of this episode, affecting young and highly educated much more than any other group, to estimate its impact on firm creation, local skill intensity and innovative start-ups.

Estimating the causal effect of emigration on any economic outcome in the origin region presents challenges. An OLS regression of local outcomes on local emigration rates would clearly produce biased estimates because of reverse causality (as people leave regions whose economy is performing poorly) and omitted variable bias (as several unobserved factors may

push people to emigrate and cause poor performance of firms). Migrants leave, in part, because of local conditions (observed and unobserved) which may certainly be correlated with local economic and labor market outcomes.

To overcome these issues, we adopt an instrumental variable strategy in the spirit of Anelli and Peri (2017), using what we call "pull-driven emigration". We construct the network links of the diaspora from each local labor market in Italy in a baseline year (2000) with destination countries and then we interact such bilateral network with the economic performance of the *destination country*. In this way, as certain destinations, mainly within in the European Union, performed better than others, and better than Italy, during the double-dip recession (2008-2011) and the recovery (2012-2015), people residing in municipalities with stronger network links to those countries were more likely to emigrate, attracted by "pull" forces. This instrumental variable allows us to leverage variation of emigration rates driven by the "pull factors" of emigration, independently from any push factor, such as the economic conditions in the local labor market, which are likely to be correlated with local outcomes. We also perform a battery of checks that the pull-driven emigration instrument is correlated with the post-2008 but not with the pre-2008 economic outcomes. This is consistent with the assumed exclusion restriction that the instrument works through affecting emigration intensity and not unobservable and persistent economic trends.

The Italian case is particularly interesting because of the large emigration of young people that took place since the onset of the Great Recession. This phenomenon was common to all education groups but the emigration rate was disproportionately large for college educated and among young workers. Figure 1 shows the scale and the sudden nature of the increase in emigration rate, for Italy, in the years since 2005. The aggregate scale of the flow increased very sharply starting in 2010, and tripled by 2015 going from

0.15 to 0.3% of the population in working age. Figure 2, then shows that among young people (age 25-44, shown in panel a) and among college graduates (panel b) the share of migrating population relative to the residing population was particularly large and it increased significantly since 2010. This phenomenon of emigration of highly educated was not unique to Italy as other Mediterranean countries countries (such as Greece and Spain) experienced large outflows of young people during and after the 2008-2012 recession. Hence, the insight from the Italian Experience may have broader applicability.

Our preliminary findings show a decline in the number of existing firms in areas with larger emigration rates during the period 2008-2015, relative to areas with small rates. The 2SLS estimates confirm that the association is robust to instrumenting emigration with only its pull-driven part. We find that this effect is driven by fewer firm births, rather than by more firm deaths, which is consistent with fewer young people starting businesses. The effects are even stronger if we focus on the emigration rate of 25-45 or of college graduates as explanatory variable. Also consistently with this interpretation, we show that the decline occurs among firms whose owners and managers are 35 years of age or younger. As a further piece of evidence indicating the potential innovative role of the young skilled who left, we also find a decline in the births of innovative start-ups (start-ups operating in technology intensive sectors). Finally we find that local labor markets with higher emigration rates are those with a decline in overall employment, a negative change in the share of qualified workers (i.e., managers, although the effect is not statistically significant) and lower average wages. The direct effect of a loss of highly educated workers, and the indirect job creation effect from fewer entrepreneurs can explain these results.

The rest of the paper is organized as follows. Section **??** describes the main data and trends for emigration and firm creation in Italian local labor market. Section **??** describes the empirical specification and identification strategy. Section 3 presents the main results

and robustness checks. Section 5concludes the paper.

2 Data

We combine data on the emigration flows from each Italian municipality obtained from the Italian statistical office (ISTAT) and from the registry of Italians residing abroad (AIRE; Anelli and Peri, 2017) with data from the social security administration (INPS) on local employment and wages, and with Chambers of Commerce firm-level data on the universe of all firms. INPS data cover the period 1990-2015, and collect information on the yearly number of employees (with breakdown by broad occupation category, i.e., apprentices, blue collars, white collars and managers), average monthly wage, industry, while the data from Chambers of Commerce include information on birth and death of firms by type of firm (individual, multi-person, incorporated) and demographic characteristics of owners and shareholders for each firm for the period 2005-2015. We use this latter piece of information to classify firms as "young" a firm with a majority of owners and managers aged below 35.

Our unit of analysis is the Local Labor Market level (LLM), defined using the Italian statistics institute (ISTAT) 2001 definition. According to ISTAT, LLMs are clusters of municipalities with prevalently internal commuting pattern. Similarly to US Commuting Zones they include an area where people mainly reside and work, and they are used as a proxy for local labor markets. There are 686 LLMs in Italy covering the whole national territory. Usually they do not cross province boundaries. We focus our analysis on the period 2005-2015. We consider the period 2008-2015 as the "treatment" period, when emigration increased substantially so that we can control for pre-2008 economic performance (e.g., LLMs unemployment rate and value added) and test the correlation of the instrument with pre-2008 trends.

3 Empirical Specification and Identification

If, conditional on predetermined controls, one could rely on a randomly distributed outflow of young highly educated people across local economies, one could obtain the causal impact of such outflows on outcomes (employment, average monthly wages, firms demographics, start-up, etc.) with a simple regression of outcome changes on emigration rates. As unobserved factors, correlated with migration rates and outcomes, may bias this approach we need to go beyond it. Nevertheless it is useful to start by taking the differences between 2008 and 2015 in outcome y in local labor system l, Δy_l, and regressing it on the cumulated emigration outflows divided by the baseline population in 2000 $\sum_{t=2008}^{2015} \frac{m_{l,t}}{pop_l,2000}$. In the basic specification we also control for a set of pre-determined and observable LLM characteristics, measured in 2004, $X_{l,2004}$ which account for economic and demographic performance of the area before the emigration event. We also include province fixed effects, ϕ_P, which allow for different trends in outcomes and migrations across provinces determined by unobserved (but common within a province) variables. Finally we allow for randomly distributed idiosyncratic differences, ε_l, and we estimated the following basic specification:

$$\Delta y_l = \alpha + \beta \frac{\sum_{t=2008}^{2015} m_{l,t}}{pop_l, 2000} + \phi_P + \gamma X_{l,2004} + \varepsilon_l \tag{1}$$

The risk of estimating (1) with Least Squares is that the error term ε_l includes unobserved area-specific variations in economic, demographic and social factors which may be correlated with cumulated migration, as those flows are partly determined by local push conditions. In order to exploit variation in the migration rates which is driven by historical network links and pull factors, rather than push factor we adopt a 2SLS strategy and we construct an instrumental variable.

3.1 Identification: The IV Approach

The key intuition for this instrument, which follows Anelli and Peri (2017), is that it exploits the simultaneous occurrence of (i.e. the interaction between) two factors. The coincidence of these two factors is unlikely to be correlated to any of the 2008-2015 unobserved push-factors in the Local Labor Systems. First, we measure the historical intensity of emigration networks between each SLL, l and each country of destination, c, as of year 2000. A LLM may have a stronger network connection, (through past migration of its residents) with a country, say Germany, while another LLM may have a larger past network with another, say France, and a third with Spain. We measure the intensity of the network as the share of people born in LLM l who lived in each foreign country c in year 2000. This network is likely to generate flows of information and opportunities, through personal and family connections. It is reasonable to think that these are more intense the larger is the size of the network. Interacted with this pre-determined network, we consider the performance of the foreign country GDP relative to Italy over the period 2008-2014. This represents the intensity of the economic pull factor from that country during the recession and post recession years when emigration from Italy spiked. The intensity of the country-specific economic pull factor, weighted by the LLM specific intensity of network with that country produces the LLM-specific pull factor. We consider this as a proxy for the intensity of the "attraction" that economic differences during the 2008-14 period exerted on that specific LLM. The factor is as follows:

$$Pull_l = \sum_c sh_{l,c,2000} * \frac{(GDP_c^{2014}/GDP_c^{2008})}{(GDP_{Ita}^{2014}/GDP_{Ita}^{2008})} \tag{2}$$

In expression (2), the variable $sh_{i,c,2000}$ is the number of Italians born in a municipality of local labor market l living in country c in year 2000 as a share of that LLM's population

in the year 2000 (we then aggregate all the municipality-level networks to the LLM l by taking a weighted average). This variable captures the relative size of the historic networks between each municipality of the local labor market l living in a specific foreign country c. The term $\frac{(GDP_c^{2014}/GDP_c^{2008})}{(GDP_{Ita}^{201}/GDP_{Ita}^{2008})}$ is the cumulative real GDP growth factor in country c relative to Italy during and after the deep recession affecting Mediterranean economies much more then the rest of the European Union (2008-2014). That term captures the relative, country-specific "pull factor" representing economic incentives for moving to country c during the considered period. This variable is used as instrument for the intensity of emigration, captured by $\frac{\sum_{t=2008}^{2015} m_{l,t}}{pop_l,2000}$ and included as dependent variable in estimating equation (1).

4 Empirical Estimates

4.1 First Stage Results

In Table 1 we report the first stage results when using the "pull factor", $Pull_l$, as instrument and the emigration rate as dependent variable. In each column we choose a different group to calculate the emigration rate. In the first column we use the overall emigration rate, in column 2 the emigration rate of young (25-45) and in the last column the emigration rate of highly educated. The IV is the same pull factor for the aggregate labor market population in each column. In the regressions we control for province and year fixed effects and for predetermined economic and labor market indicators, specifically per capita GDP and unemployment rates in 2004. The estimates in the first row of Table 1 show that the Pull factor has a significant predictive power for each measure of emigration and the significance and the size of the coefficient, relative to the average value of the dependent variable, is also similar. The first stage F statistics equals 23, above the standard rule of thumb value of 10, and it is above 19 and 14 when predicting young and high skilled

emigrants. As we do not have for now a separate instrument for the emigration of young and high skilled we use the total emigration rate as explanatory variable instrumented with the pull factor. We show that our main effects remain large and significant also when we use the aggregate instrument, in separate specifications, to predict the emigration of young and high skilled rather than overall.

4.2 Effects on Firm Creation

Table 3 shows the results of estimating equation 1 using the number of active firms (stock) and the creation of new and destruction of existing firms as dependent variables. The estimates all use two stage least squares as method and the errors are clustered at the province level. The basic estimates are in column (1)-(3). They show, for the change in total number of firms (1), the firm births (2) and firm deaths (3) over the period 2008-15, the estimated coefficient on the migration rate as explanatory variable. The variable is instrumented with the pull factor.

The estimates indicate that in areas with larger emigration flows between the period 2008-2015 the number of firms declines. This effect is driven by fewer firm births (that is, less firm creation) rather than more firm deaths (see column 2 and 3). The fact that firm creation was particularly affected is consistent with the idea that emigration drained potential entrepreneurs reducing the potential for new firms in the area. Over the whole period 2008-2015, 34 new firms were created for every 100 existing in 2005 in the average labor market. With respect to this baseline, a 1 percentage point higher emigration rate (a bit more than the 0.7 percentage point average emigration rate) is associated with 11 fewer new firms. This is a substantial reduction and if partly causal suggest a very high rate of potential entrepreneurs among the people who left.

On the other hand, the small and not significant coefficient on the number of firm

deaths can also be interpreted as a reassuring fact. A higher rate of firm failure associated with emigration could suggest a reverse channel of causation, namely people left with no jobs or bankrupt firms in declining area may leave generating larger emigration flows. The estimated effects are even stronger in columns (4)-(6) and (7)-(8) where the endogenous variables are the emigration rate of 25-45 years old, or the emigration rate of college graduates. As we use the same instrument, we cannot separately identify causal effects for these subgroup of migrants. However, the different scaling of the coefficients, obtained by using different endogenous variables, is suggestive that the effects are even stronger if we concentrate the measure of emigration to young and highly educated.

In Table 4, in order to zoom specifically into the role of young people in starting new firms, we look at the creation and destruction of firms whose owners and managers are people younger than 35-year-old. As we observe the age of owners and managers directly from the Chamber of Commerce data, we use this information to construct a synthetic measure that identifies a firm as "young-owned and managed" if the majority of owners and managers is under 35. We then look at the number, creation and destruction of these firms. The results in table 4 whose structure mirror that of Table 3 indicate that emigration, especially when measured by young and highly educated emigrants, reduced the creation of firms whose owners and managers are 35 or less. According to the estimates, a one percentage point increase in the overall emigration rate led to a creation of 3.5 fewer new "young-managed firms" with respect to a baseline creation in the same period of 16.3 "young-managed" firms for every 100 existing firms in 2005. The effect, again, are stronger when we use as endogenous variables the emigration rate of 25-45-year-old or that of college graduates.

4.3 Effects on Employment and Skill Composition

The outflow of highly educated young workers may have deprived local economies of entrepreneurs. However it also reduced the potential employees. For each person who leaves the municipality less than one job may be loss (if the person was not employed or if she is replaced by stayers). We want to inquire into the effect of emigration on the employment at the local level, and decompose this into different type of workers. Did the emigration leave employment in a local economy significantly reduced? and which group was particularly affected. Our estimates show the combined effect on employment due to the departure of emigrants and to the potential replacement or complementary by stayers. By calculating the emigration rate overall, for young and for highly educated, we re-scale the effect of emigration from that group on employment in the area. We show the estimates of this regression in Table 5. In column (1), (4) and (7) the coefficients show the associated decline in employees as percent to initial employment as one percent of the population, or one percent of the young population (25 to 45 years of age) or one percent of the highly educated population, respectively, leave the municipality. Columns (2), (5), (8) show the corresponding effect on the average firm size.

While emigration rate does not translate into employment loss one to one, the estimates of table 5 indicate a significant decline of 0.1 percent of employment for each one percent increase in emigration rate. The association becomes a 0.32 percent employment loss for each one percent of young people moving out a municipality and it is one percent employment loss for one percent emigration rate of highly educated. The size of the labor market therefore shrinks and the effect on employment is a full one-for-one loss when emigrants are measured as highly educated. This effect is only partially reflected on the average firm size at the LLM level (column 2,5 and 8), where we see a negative but not significant association. The progressively larger association with employment when going

from overall emigration to emigration of highly educated may be due to several factors. First, highly educated are more likely to be employed so the loss of one of them is the loss of a job with very high probability, while for less educated their probability of having a job is lower, especially in Italy. Second, the jobs of highly educated may be associated with larger local labor multiplier (see Moretti 2010). This means that loosing one engineer or manager or doctor in a local economy implies the loss also of jobs associated to her consumption of local services, and to her role in local firms. highly skilled jobs are "connected" with several other jobs and in this case the multiplier effect may result in a magnified negative effect. Finally, highly skilled emigrants may be entrepreneurs and (as we saw above) they may create new firms and new jobs. Their loss decreases the creation of firms and the demand for new workers. Overall it appears that "pull-driven" emigration during the period 2008-2015 was associated with significant employment losses.

Table 6 then explores in some detail the effects of emigration rates on the labor market skill structure by estimating the effects on the change in the number of workers, separately by occupation. We distinguish between white collar, Blue collar and managerial jobs. we find that, while there is a small non significant negative coefficient (Column 1,4 and 7) on the number of blue collar workers in the labor market, the negative effect is substantially larger on white collar workers. When measuring emigration of highly educated we find a negative and significant effect on percent change of white collar larger than one. The association of emigration with (negative) change in managers is very large but imprecisely estimated and it is not statistically significant. The coefficients suggest potentially important local multiplier effects, possibly a vicious cycle in the decline of highly skilled workers and managers in areas where the brain drain takes place.

Given the large negative effect on employment, and the skill "downgrading" shown in table 5, associated with emigration, one could wander what is the association with average

wages. On one hand fewer workers may reduce competition in the local labor market and, if there are issues of crowding or decreasing returns this may increase wages, at least in the short-run. On the other hand, the larger loss of skilled young people may reduce local productivity, and the composition of workers will change towards lower wage workers, which would affect average wage. The combination of selection and productivity effects, can therefore, produce negative effect on local average wages. This is what we find in Table 7 both for the total wage bill and for average individual wage. A one percentage point higher emigration rate is associated to a 4.3% decrease (although not significant) in the overall local labor market wage bill and a strongly significant 2.9% decrease of the average wage in the labor market. The effects are rescaled to be bigger when we measure emigration of young individuals (columns 3 and 4) or of highly educated individuals (columns 5 and 6). The effect on average wage is quite small implying that an emigration rate of 10% would produce an average wage decline of 0.3% in the local labor market. The effect is likely to be driven by the drain of the highly educated and productive workers, consistently with the change in skill composition presented in Table 5.

4.4 Effects on Innovation

The negative association between the pull-driven youth (brain) drain and firm creation or employment and especially skilled employment is already consistent with the idea that emigration brings a loss of economic potentials. This loss can be particularly damaging if it is also associated with less innovation and slower technological and productivity growth. We tackle the analysis of potential impact on innovation, or at least on economic activity in innovative sectors, by focusing on the creation of start-ups, namely newly created firms, that operate in technology intensive sectors and are not spin-offs of larger established firms. We call this group of new firms "innovative start-ups" as they are those more likely

to embody genuinely new technologies and ideas.[1] Table 8 shows the results of equation (1) estimated using the number of startups in each LLM between 2010 and 2016 as dependent variables. one limitation of our data is that we observe only the number of such firms in 2016 (and not the change between 2010 and 2016). However given the very small presence of innovative startups in Italy, at the beginning of the considered period and their substantial increase over the past years, their number in 2016 approximates well the actual creation of innovative start-ups in the period 2010-2016).[2] The estimated coefficients are statistically significant and indicate that the larger migrant outflows from Italian LLMs, the less likely is the creation of innovative start-ups. While on average there was one innovative start for every 100 existing firms in the average local labor market between 2010-2016, areas with emigration rate one percentage points higher than the average had essentially zero innovative startup. Emigration seem associated with very worrying decline in the creation of firms in most innovative sectors. Given the well known tendency of STEM (Science, Technology, Engineering and Math) professional to dominate the group of highly educated migrants to countries such as the US (see Peri et al. 2015) or the UK, and their significant contribution to innovation there (see Kerr and Lincoln 2010) it is very likely that the corresponding effect in countries of origin could be a slowdown of innovative start-up and activities.

4.5 Instrument Validity

In order to strengthen our confidence that the constructed "pull-driven" instrument is not correlated to unobserved economic trends at the local level, which would invalidate the exclusion restrictions, we performs some checks. We construct the IV using information on

[1] The Italian law also requires innovative start-ups to register in order to obtain funding. One of the conditions required for registration is to have at least one PhD graduate or two Master graduates among the owners. Therefore, the startups we observe are also human capital intensive.

[2] We obtained the change in the stock of start-ups from the Cerved group only for the period 2010-2016.

bilateral networks in 2000, interacted with the economic pull 2008-2014. We can divide our period of analysis in a pre-migration wave period (or pre-treatment using a difference in difference language) which is 2004-2008 and a migration wave period (treatment) which is 2008-2014. To have a first visual check, we start by dividing the Italian local labor markets into those with high pull-driven emigration rates (above the median) and those with low pull-driven emigration rates (below the Median) as measured by our IV. Then Figures **??**, **??** and 4 show, respectively, the average number of firm births and firm deaths and the total number of firms (Figure 4), normalizing the averages to 1 in 2008 for the two groups of local economies.

All three graphs show that the high "pull-driven-emigration" labor markets (solid line) and the low "pull-driven-emigration" ones (dashed line) have a very similar pre-2008 trend. The average firm creation and firm destruction was moving together prior to 2008 for these economies. However, as the Italian economy starts under-performing with respect to the other major European economies, around 2009 and more clearly since 2010, pull-driven emigration begins attracting people, especially from LLMs with larger historical networks. The post-2010 divergence can be explained by the differential emigration rate. Most importantly for the validity of our identification strategy, the economies with high or low pull-driven emigration behave very similarly in the pre-2008 period. This is consistent with the instrument being orthogonal with unobserved and persistent economic factors affecting the firm creation outcomes.

Along the same lines, in order to check the correlation of our instrument with the pre-2008 trends for firm creation, we report the results of two more formal tests. In Table 9 we regress the 2005-2008 change in the number, birth and death of firms on the emigration IV predicting pull-driven emigration between 2010 and 2015. The test confirms formally that the IV does not predict pre-2008 firm creation and total number even when, as in

Table 11, we only consider firms owned and managed by people under 35. While we find a significant negative effect on pre-2008 firm deaths, this effect indicates that in areas with more predicted emigration during the great recession, there were fewer firm exits before the recession, which would imply a correlation of the instrument with good economic performance pre-2008 and hence, bias our effects against finding negative effects during the emigration period. Finally, Tables 12, 13 and 14 repeat the exercise for LLM aggregate economic outcomes such as employment, skills and wages. The independence of these variables from the instrument indicate similar pre-trends in local economies that exhibited large and small emigration rates post 2004. Hence the set of test performed confirms the validity of our IV and identification approach.

5 Conclusions

In this paper, we provide empirical evidence to an important question on which we know very little. What is the economic effect of "missing" a generation of highly educated people? Or more precisely what happens if such a generation becomes smaller? We do this by taking advantage of the effects of an emigration wave mainly concentrated among young and high skilled people in Italy on the creation of firms, on local employment and on the number of new start-ups operating in technology-intensive sectors.

In order to isolate exogenous variation in this emigration rates across local economies, we adopt an identification strategy based on the coincidence of economic pull factors and past networks which made some local economies more likely to experience emigration in the 2008-2015 period, simply because better connected with better performing foreign countries. We test the validity of our identification strategy by checking that such an instrument, which we call "pull-driven emigration" does not predict pre-2008 trends in local firm and employment dynamics.

Our results indicate that Italian LLMs that lost more young and high skilled people as emigrants, experienced less firm creation and worse employment outcomes. In particular, we observe a lower creation of firms at the Local Labor Market, a decrease in the share of highly skilled workers, a drop in average worker wages and a smaller number of innovative start-ups . The results are consistent with ideas put forth by Lazear et al. (2014) and Acemoglu et al., (2015) namely that demography, and specifically young managers and young entrepreneurs are crucial drivers of growth, innovation and creative destruction.

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Figures

Figure 1: Emigration flow, share of 2005 population, 2005-2015

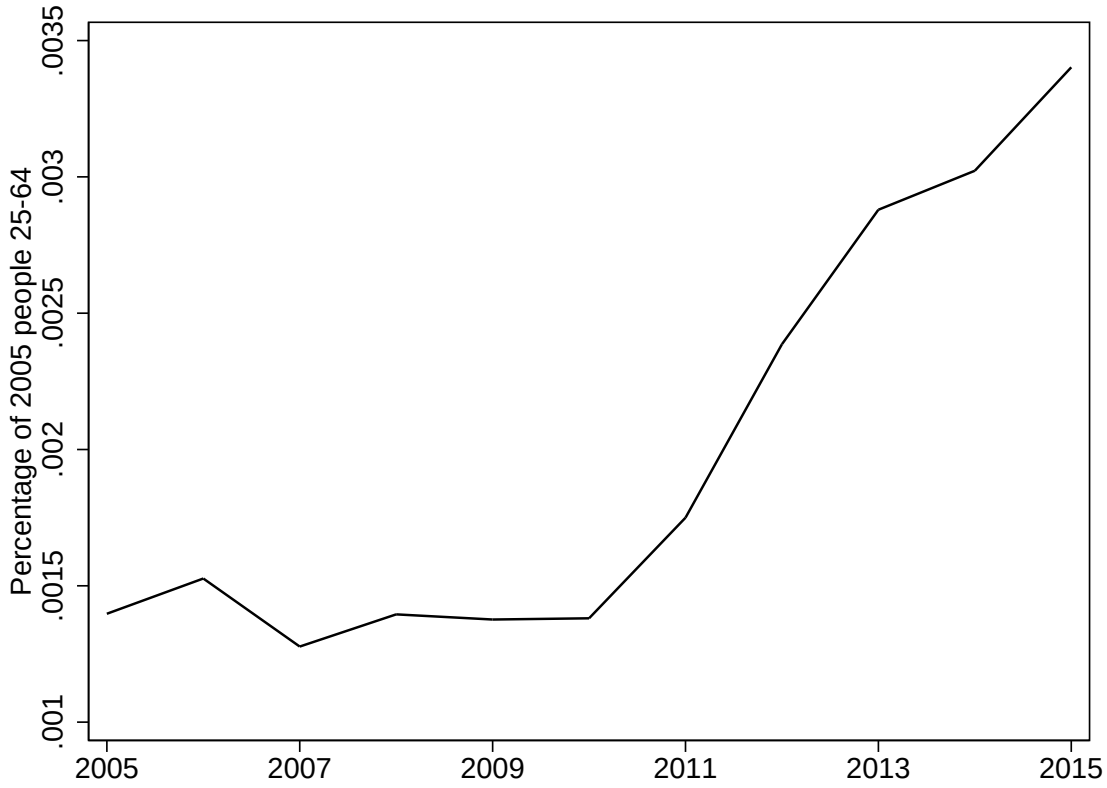
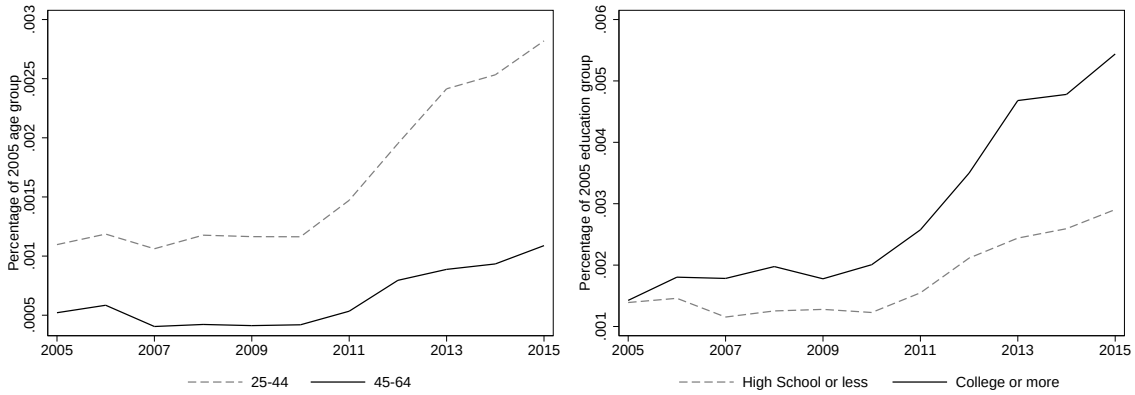


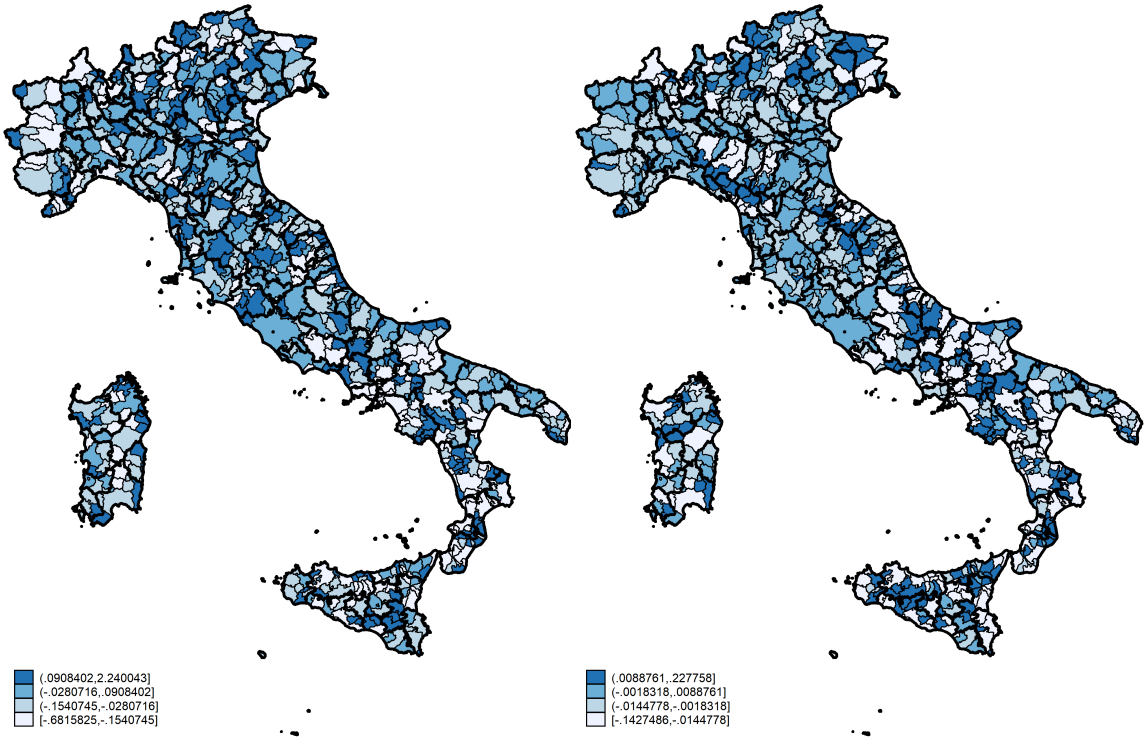
Figure 2: Absolute share of 2005 population emigrating by age and education level, 2005-2015



(a) Age

(b) Education

Figure 3: Graphical First Stage



(a) Emigration

(b) Predicted Emigration

Figure 4: Firm stock in predicted high and low emigration LLMs, 2005-2015

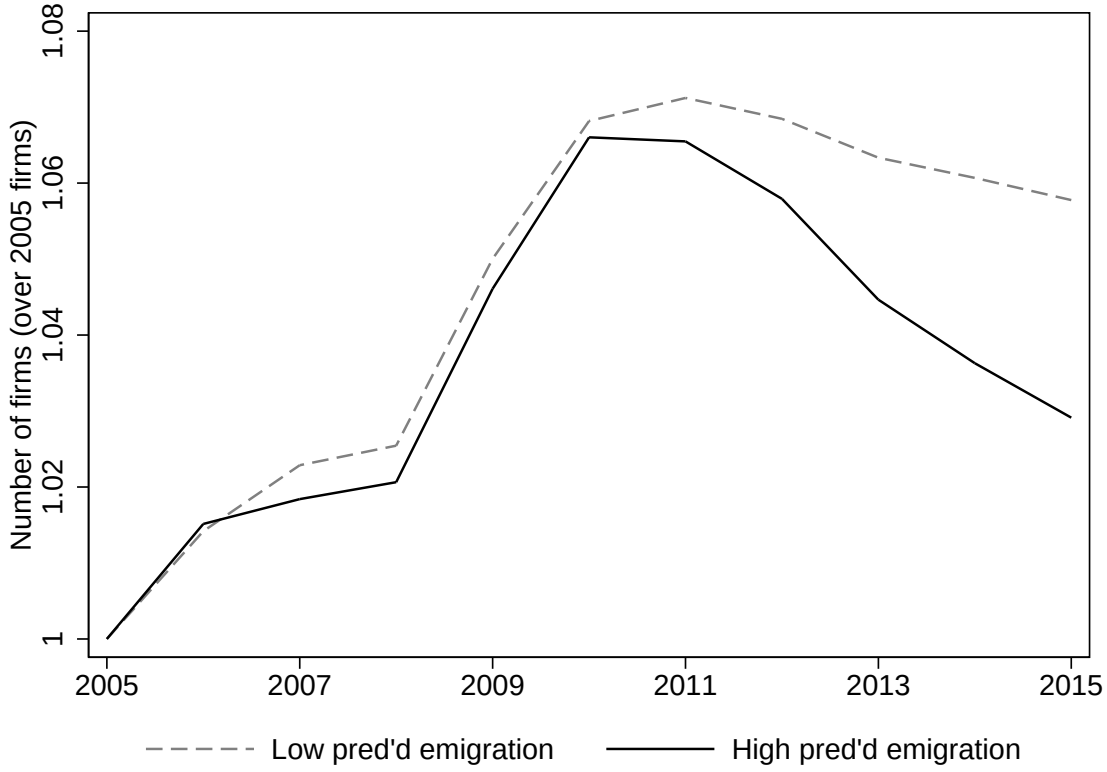
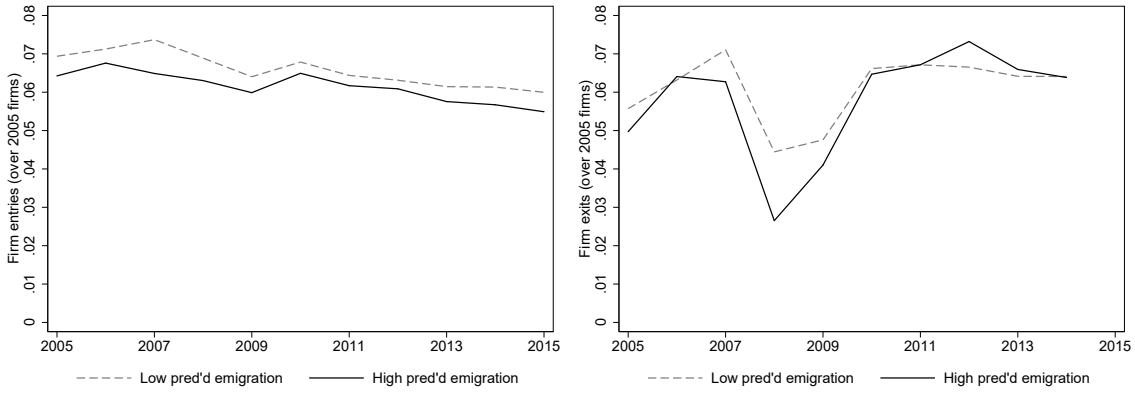


Figure 5: Firm flows in predicted high and low emigration LLMs, 2005-2015



(a) Firm births

(b) Firm deaths

Tables

Table 1: Pre-period local labor market characteristics, 2005-2008

	Below median predicted emigration	Above median predicted emigration
Firm stock over 2005 firm stock	0.023	0.025
	(0.032)	(0.038)
Under 35 owned firms over 2005 firm stock	-0.011	-0.011
	(0.012)	(0.015)
Entry of under 35 owned firms over 2005 firm stock	0.114	0.115
	(0.026)	(0.029)
Exit of under 35 owned firms over 2005 firm stock	0.039	0.039
	(0.011)	(0.011)
Entry of firms over 2005 firm stock	0.196	0.199
	(0.039)	(0.041)
Exit firms over 2005 firm stock	0.167	0.169
	(0.023)	(0.025)
Change in LLM employees over 2005 employees	0.116	0.121
	(0.118)	(0.115)
Change in avg firm size	0.021	0.119
	(0.810)	(0.840)
Change in number of managers to blue collars	-0.004	-0.014
	(0.245)	(0.091)
Change in wage bill	0.123	0.132
	(0.155)	(0.123)
Change in avg retrib TO BE DONE AGAIN	0.007	0.009
	(0.021)	(0.043)

Notes: LLM averages and standard deviations in parenthesis, 2005-2008.

Table 2: First stage regression of observed emigration rates on emigration rates as predicted by the Instrument Variable

VARIABLES	(1) Emig Rate	(2) Emig 25-45	(3) Emig High Edu
Emig. IV	2.934***	1.064***	0.342***
	(0.611)	(0.241)	(0.091)
Unemp.Rate 2004	0.745	0.359	0.094
	(0.992)	(0.427)	(0.191)
GDP 2004	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
Constant	0.702***	0.333***	0.174***
	(0.054)	(0.024)	(0.011)
Observations	686	686	686
R-squared	0.457	0.557	0.463
F-excluded instrument	23.097	19.423	14.019
Avg. Outcome	0.699	0.346	0.144
Province FE	X	X	X

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Sample: Local Labor Markets.
Dependent variable: Observed emigration rates.
Indipendent Variable: Emigration shock as predicted by our instrumental variable of pre shock-network intensity to country c: $\sum_{t=2008}^{2015} \widehat{\frac{m_{l,t}}{pop_{l,2000}}} = \sum_c sh_{i,c,2000} * \frac{(GDP_c^{2015}/GDP_c^{2008})}{(GDP_{Ita}^{2015}/GDP_{Ita}^{2008})}$
Control variables: unemployment rate and per capita added value in 100,000 euros in 2004 at commuting zone level.
Fixed Effects: 105 province fixed effects

Table 3: Effect of emigration rates on change in stock and flows of firms

VARIABLES	(1) All Firms Δ Stock 2008-15	(2) All Firms ∑ Births 2008-15	(3) All Firms ∑ Deaths 2008-15	(4) All Firms Δ Stock 2008-15	(5) All Firms ∑ Births 2008-15	(6) All Firms ∑ Deaths 2008-15	(7) All Firms Δ Stock 2008-15	(8) All Firms ∑ Births 2008-15	(9) All Firms ∑ Deaths 2008-15
Emig Rate	-0.068***	-0.113***	-0.027						
	(0.019)	(0.042)	(0.029)						
Emig 25-45				-0.187***	-0.311***	-0.074			
				(0.055)	(0.118)	(0.080)			
Emig High Edu							-0.582***	-0.967***	-0.230
							(0.181)	(0.371)	(0.245)
Unemp.Rate 2004	0.237*	0.823***	0.507***	0.254*	0.851***	0.513***	0.241	0.830***	0.508***
	(0.127)	(0.242)	(0.149)	(0.137)	(0.257)	(0.151)	(0.149)	(0.280)	(0.155)
GDP 2004	0.000***	0.000**	0.000	0.000***	0.000*	0.000	0.000***	0.000**	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-0.011	0.355***	0.359***	0.003	0.379***	0.365***	0.042	0.445***	0.380***
	(0.017)	(0.031)	(0.022)	(0.021)	(0.041)	(0.028)	(0.034)	(0.066)	(0.044)
Observations	686	686	686	686	686	686	686	686	686
R-squared	0.465	0.214	0.503	0.397	0.108	0.492	0.205		0.454
F-excl. instr.	23.097	23.097	23.097	19.423	19.423	19.423	14.019	14.019	14.019
Avg. Outcome	0.005	0.343	0.336	0.005	0.343	0.336	0.005	0.343	0.336
Avg. Treatment	0.699	0.699	0.699	0.346	0.346	0.346	0.144	0.144	0.144
Province FE	X	X	X	X	X	X	X	X	X

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Sample: Italian Local Labor Markets.
Specifications: 2-stage-least-squares IV
Dependent variable: Change in Firms controlled by a majority of under 35 year old individuals between 2008-2015 as a share of initial number of firms in each commuting zone in 2005.
Indipendent Variable: Emigration flows computed using AIRE registry enrollment as share of population in 2000 instrumented by our instrumental variable of pre shock-network intensity to country c: $\sum_{t=2008}^{2015} \widehat{\frac{m_{l,t}}{popl,2000}} = \sum_c sh_{i,c,2000} * \frac{(GDP_c^{2015}/GDP_c^{2008})}{(GDP_{Ita}^{2015}/GDP_{Ita}^{2008})}$
Control variables: Per capita added value in 100,000 euros and unemployment rate in 2004 at provincial level

Table 4: Effect of emigration rates on change in stock and flows of firms with owners below 35

VARIABLES	(1) Young Firms Δ Stock 2008-15	(2) Young Firms ∑ Births 2008-15	(3) Young Firms ∑ Deaths 2008-15	(4) Young Firms Δ Stock 2008-15	(5) Young Firms ∑ Births 2008-15	(6) Young Firms ∑ Deaths 2008-15	(7) Young Firms Δ Stock 2008-15	(8) Young Firms ∑ Births 2008-15	(9) Young Firms ∑ Deaths 2008-15
Emig Rate	-0.004	-0.035*	-0.007						
	(0.010)	(0.020)	(0.013)						
Emig 25-45				-0.012	-0.096*	-0.019			
				(0.028)	(0.057)	(0.037)			
Emig High Edu							-0.038	-0.299*	-0.058
							(0.088)	(0.175)	(0.114)
Unemp.Rate 2004	-0.017	0.499***	0.281***	-0.015	0.508***	0.282***	-0.016	0.501***	0.281***
	(0.052)	(0.125)	(0.074)	(0.051)	(0.128)	(0.075)	(0.051)	(0.130)	(0.075)
GDP 2004	0.000***	0.000	0.000	0.000***	0.000	0.000	0.000***	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-0.034***	0.150***	0.062***	-0.033***	0.158***	0.064***	-0.031*	0.178***	0.067***
	(0.010)	(0.015)	(0.011)	(0.012)	(0.019)	(0.014)	(0.018)	(0.030)	(0.021)
Observations	686	686	686	686	686	686	686	686	686
R-squared	0.432	0.552	0.588	0.431	0.522	0.584	0.418	0.456	0.578
F-excl. instr.	23.097	23.097	23.097	19.423	19.423	19.423	14.019	14.019	14.019
Avg. Outcome	-0.044	0.163	0.070	-0.044	0.163	0.070	-0.044	0.163	0.070
Avg. Treatment	0.699	0.699	0.699	0.346	0.346	0.346	0.144	0.144	0.144
Province FE	X	X	X	X	X	X	X	X	X

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Sample: Italian Local Labor Markets.
Specifications: 2-stage-least-squares IV
Dependent variable: Change in All Firms 2008-2015 as a share of initial number of firms in each commuting zone in 2005.
Indipendent Variable: Emigration flows computed using AIRE registry enrollment as share of population in 2000 instrumented by our instrumental variable of pre shock-network intensity to country c: $\widehat{\sum_{t=2008}^{2015} \frac{m_{l,t}}{pop_{l,2000}}} = \sum_c sh_{i,c,2000} * \frac{(GDP_c^{2015}/GDP_c^{2008})}{(GDP_{Ita}^{2015}/GDP_{Ita}^{2008})}$
Control variables: Per capita added value in 100,000 euros and unemployment rate in 2004 at provincial level

Table 5: Effect of emigration rates on change in local labor market employment

VARIABLES	(1) Δ% Employees 2008-15	(2) Δ Avg. Size 2008-15	(3) Δ Qual Empl. 2008-15	(4) Δ% Employees 2008-15	(5) Δ Avg. Size 2008-15	(6) Δ Qual Empl. 2008-15	(7) Δ% Employees 2008-15	(8) Δ Avg. Size 2008-15	(9) Δ Qual Emp 2008-15
Emig Rate	-0.116**	-0.115	-0.034						
	(0.054)	(0.285)	(0.132)						
Emig 25-45				-0.319**	-0.318	-0.094			
				(0.156)	(0.792)	(0.364)			
Emig High Edu							-0.992*	-0.990	-0.291
							(0.508)	(2.490)	(1.129)
Unemp.Rate 2004	0.017	-2.797**	-1.852	0.046	-2.769**	-1.843	0.024	-2.790**	-1.850
	(0.382)	(1.394)	(1.174)	(0.387)	(1.398)	(1.161)	(0.399)	(1.397)	(1.173)
GDP 2004	0.000*	0.000	-0.000***	0.000	0.000	-0.000***	0.000	0.000	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-0.038	0.333	0.176	-0.013	0.358	0.183	0.054	0.425	0.203
	(0.048)	(0.228)	(0.149)	(0.061)	(0.289)	(0.175)	(0.097)	(0.455)	(0.249)
Observations	686	686	686	686	686	686	686	686	686
R-squared	0.217	0.279	0.135	0.215	0.280	0.135	0.158	0.276	0.132
F-excl. instr.	23.097	23.097	23.097	19.423	19.423	19.423	14.019	14.019	14.019
Avg. Outcome	-0.110	-0.042	0.027	-0.110	-0.042	0.027	-0.110	-0.042	0.027
Avg. Outcome 2005	1.7e+04	5.466	0.367	1.7e+04	5.466	0.367	1.7e+04	5.466	0.367
Avg. Treatment	0.699	0.699	0.699	0.346	0.346	0.346	0.144	0.144	0.144
Province FE	X	X	X	X	X	X	X	X	X

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Sample: Italian Local Labor Markets.
Specifications: 2-stage-least-squares IV
Dependent variable: Change in employment (as a share of initial number of employees in each commuting zone in 2005), average size and share of qualified workers (i.e., managers as share of total LLM employees) 2008-2015.
Independent Variable: Emigration flows computed using AIRE registry enrollment as share of population in 2000 instrumented by our instrumental variable of pre shock-network intensity to country c: $\widehat{\sum_{t=2008}^{2015} \frac{m_{l,t}}{popl,2000}} = \sum_c sh_{i,c,2000} * \frac{(GDP_c^{2015}/GDP_c^{2008})}{(GDP_{Ita}^{2015}/GDP_{Ita}^{2008})}$
Control variables: Per capita added value in 100,000 euros and unemployment rate in 2004 at provincial level

Table 6: Effect of emigration rates on change in local labor market skill structure

VARIABLES	(1) Δ Blue Coll 2008-15	(2) Δ White Coll 2008-15	(3) Δ Managers 2008-15	(4) Δ Blue Coll 2008-15	(5) Δ White Coll 2008-15	(6) Δ Managers 2008-15	(7) Δ Blue Coll 2008-15	(8) Δ White Coll 2008-15	(9) Δ Managers 2008-15
Emig Rate	-0.041	-0.143**	-2.853						
	(0.071)	(0.071)	(2.795)						
Emig 25-45				-0.113	-0.394**	-7.727			
				(0.198)	(0.199)	(7.653)			
Emig High Edu							-0.352	-1.225**	-30.171
							(0.625)	(0.617)	(31.735)
Unemp.Rate 2004	-0.185	-0.490	-23.036**	-0.175	-0.455	-22.698**	-0.183	-0.482	-25.381*
	(0.439)	(0.593)	(11.040)	(0.440)	(0.602)	(11.201)	(0.439)	(0.623)	(13.992)
GDP 2004	0.000	-0.000	-0.000*	0.000	-0.000	-0.000*	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-0.091	0.078	3.473	-0.082	0.109	4.056	-0.059	0.191*	6.927
	(0.061)	(0.062)	(2.678)	(0.076)	(0.076)	(3.274)	(0.118)	(0.115)	(6.420)
Observations	686	686	584	686	686	584	686	686	584
R-squared	0.199	0.239	0.207	0.199	0.240	0.195	0.188	0.210	0.025
F-excl. instr.	23.097	23.097	10.253	19.423	19.423	8.350	14.019	14.019	2.860
Avg. Outcome	-0.117	-0.013	0.248	-0.117	-0.013	0.248	-0.117	-0.013	0.248
Avg. Outcome 2005	8950.138	6737.377	163.226	8950.138	6737.377	163.226	8950.138	6737.377	163.226
Avg. Treatment	0.699	0.699	0.680	0.346	0.346	0.341	0.144	0.144	0.144
Province FE	X	X	X	X	X	X	X	X	X

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Sample: Italian Local Labor Markets.
Specifications: 2-stage-least-squares IV
Dependent variable: Change in blue collar workers (as a share of initial number of blue collar workers in each commuting zone in 2005), Change in white collar workers (as a share of initial number of white collar workers in each commuting zone in 2005), Change in managers (as a share of initial number of managers in each commuting zone in 2005).
Independent Variable: Emigration flows computed using AIRE registry enrollment as share of population in 2000 instrumented by our instrumental variable of pre shock-network intensity to country c: $\sum_{t=2008}^{2015} \widehat{\frac{m_{l,t}}{pop_l,2000}} = \sum_c sh_{i,c,2000} * \frac{(GDP_c^{2015}/GDP_c^{2008})}{(GDP_{Ita}^{2015}/GDP_{Ita}^{2008})}$
Control variables: Per capita added value in 100,000 euros and unemployment rate in 2004 at provincial level

Table 7: Effect of emigration rates on change in local labor market wages

VARIABLES	(1) Δ Wagebill 2008-15	(2) Δ Avg. Wage 2008-15	(3) Δ Wagebill 2008-15	(4) Δ Avg. Wage 2008-15	(5) Δ Wagebill 2008-15	(6) Δ Avg. Wage 2008-15
Emig Rate	-0.043	-0.029***				
	(0.059)	(0.009)				
Emig 25-45			-0.120	-0.081***		
			(0.165)	(0.028)		
Emig High Edu					-0.373	-0.251***
					(0.517)	(0.091)
Unemp.Rate 2004	-0.562	-0.059	-0.551	-0.052	-0.560	-0.058
	(0.526)	(0.097)	(0.530)	(0.101)	(0.527)	(0.103)
GDP 2004	-0.000	0.000	-0.000	0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-0.059	0.024***	-0.050	0.030***	-0.025	0.047***
	(0.051)	(0.008)	(0.063)	(0.010)	(0.096)	(0.016)
Observations	686	686	686	686	686	686
R-squared	0.267	0.117	0.267	0.088	0.259	
F-excl. instr.	23.097	23.097	19.423	19.423	14.019	14.019
Avg. Outcome	-0.113	-0.007	-0.113	-0.007	-0.113	-0.007
Avg. Outcome 2005	3486.004	1644.434	3486.004	1644.434	3486.004	1644.434
Avg. Treatment	0.699	0.699	0.346	0.346	0.144	0.144
Province FE	X	X	X	X	X	X

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Sample: Italian Local Labor Markets.
Specifications: 2-stage-least-squares IV **Dependent variable:** Change 2008-2015 in wagebill (as a share of initial wage bill in each LLM in 2005), change 2008-2015 in average LLM wage (as a share of initial average wage in each LLM in 2005).
Independent Variable: Emigration flows computed using AIRE registry enrollment as share of population in 2000 instrumented by our instrumental variable of pre shock-network intensity to country c: $\sum_{t=2008}^{2015} \widehat{\frac{m_{l,t}}{pop_{l,2000}}} = \sum_c sh_{i,c,2000} * \frac{(GDP_c^{2015}/GDP_c^{2008})}{(GDP_{Ita}^{2015}/GDP_{Ita}^{2008})}$
Control variables: Per capita added value in 100,000 euros and unemployment rate in 2004 at provincial level

Table 8: Effect of emigration rates on change in stock of innovative start-ups

VARIABLES	(1) Innovative Start-ups Δ Start-ups 10-16 2010-16	(2) Innovative Start-ups Δ Start-ups 10-16 2010-16	(3) Innovative Start-ups Δ Start-ups 10-16 2010-16
Emig Rate	-0.001***		
	(0.000)		
Emig 25-45		-0.002***	
		(0.001)	
Emig High Edu			-0.005***
			(0.002)
Unemp.Rate 2004	0.000	0.000	0.000
	(0.001)	(0.001)	(0.002)
GDP 2004	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)
Constant	0.001**	0.001***	0.001***
	(0.000)	(0.000)	(0.000)
Observations	686	686	686
R-squared	0.274	0.237	0.112
F-excl. instr.	23.097	19.423	14.019
Avg. Outcome	0.001	0.001	0.001
Avg. Treatment	0.699	0.346	0.144
Province FE	X	X	X

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Sample: Italian Local Labor Markets.
Specifications: 2-stage-least-squares IV
Dependent variable: Change in Innovative Start-Ups 2010-2016 as a share of initial number of firms in each commuting zone in 2005.
Independent Variable: Emigration flows computed using AIRE registry enrollment as share of population in 2000 instrumented by our instrumental variable of pre shock-network intensity to country c: $\sum_{t=2008}^{2015} \widehat{\frac{m_{l,t}}{pop_l,2000}} = \sum_c sh_{i,c,2000} * \frac{(GDP_c^{2015}/GDP_c^{2008})}{(GDP_{Ita}^{2015}/GDP_{Ita}^{2008})}$
Control variables: Per capita added value in 100,000 euros and unemployment rate in 2004 at provincial level

Table 9: Instrument validity check - Effect of emigration rates on pre-shock change in stock and flows of firms (2005-08)

	(1)	(2)	(3)
	All Firms	All Firms	All Firms
	Δ Stock	$\sum$ Births	$\sum$ Deaths
VARIABLES	2005-08	2005-08	2005-08
Emig. IV	-0.059	-0.080	-0.013
	(0.050)	(0.064)	(0.022)
Unemp.Rate 2004	0.299***	0.401***	0.083*
	(0.107)	(0.116)	(0.044)
GDP 2004	0.000**	0.000*	0.000
	(0.000)	(0.000)	(0.000)
Constant	-0.020***	0.174***	0.187***
	(0.006)	(0.007)	(0.002)
Observations	686	686	686
R-squared	0.478	0.494	0.626
Avg. Outcome	0.024	0.198	0.168
Avg. Treatment	0.144	0.144	0.144
Province FE	X	X	X

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Sample: Italian Local Labor Markets.
Specifications: Ordinary least square estimations
Dependent variable: Change in All Firms 2005-2008 as a share of initial number of firms in each commuting zone in 2005.
Indipendent Variable: instrumental variable of pre shock-network intensity to country c: $\sum_{t=2008}^{2015} \widehat{\frac{m_{l,t}}{pop_{l,2000}}} = \sum_c sh_{i,c,2000} * \frac{(GDP_c^{2015}/GDP_c^{2008})}{(GDP_{Ita}^{2015}/GDP_{Ita}^{2008})}$

Table 10: Robustness check - Effect of emigration rates on change in stock and flows of firms (2008-15) controlling for lagged outcome difference (2005-08)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	All Firms	All Firms	All Firms	All Firms	All Firms	All Firms	All Firms	All Firms	All Fi
	Δ Stock	Δ Births	Δ Deaths	Δ Stock	Δ Births	Δ Deaths	Δ Stock	Δ Births	Δ Dea
VARIABLES	2008-15	2008-15	2008-15	2008-15	2008-15	2008-15	2008-15	2008-15	2008-
Emig Rate	-0.049**	-0.066***	-0.023						
	(0.022)	(0.021)	(0.023)						
Emig 25-45				-0.135**	-0.180***	-0.063			
				(0.061)	(0.060)	(0.064)			
Emig High Edu							-0.414**	-0.552***	-0.19
							(0.193)	(0.184)	(0.19
Stock	0.914***			0.938***			0.963***		
	(0.079)			(0.078)			(0.092)		
Unemp.Rate 2004	-0.050	0.102	0.415***	-0.046	0.107	0.420***	-0.063	0.079	0.415*
	(0.112)	(0.145)	(0.140)	(0.117)	(0.150)	(0.142)	(0.120)	(0.156)	(0.14
GDP 2004	0.000***	0.000***	0.000	0.000***	0.000**	0.000	0.000***	0.000**	0.00
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.00
Births		1.714***			1.740***			1.778***	
		(0.055)			(0.061)			(0.072)	
Deaths			1.081***			1.082***			1.096*
			(0.138)			(0.139)			(0.14
Constant	-0.007	0.024	0.154***	0.004	0.033	0.159***	0.032	0.063*	0.169*
	(0.021)	(0.023)	(0.025)	(0.026)	(0.026)	(0.026)	(0.039)	(0.034)	(0.03
Observations	686	686	686	686	686	686	686	686	686
R-squared	0.675	0.809	0.618	0.644	0.780	0.611	0.553	0.696	0.58
F-excl. instr.	25.035	27.868	25.960	21.878	23.806	21.137	15.941	17.012	15.01
Avg. Outcome	0.005	0.343	0.336	0.005	0.343	0.336	0.005	0.343	0.33
Avg. Treatment	0.699	0.699	0.699	0.346	0.346	0.346	0.144	0.144	0.14
Province FE	X	X	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X	X	X

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Sample: Italian Local Labor Markets.
Specifications: 2-stage-least-squares IV
Dependent variable: Change in Firms between 2008-2015 as a share of initial number of firms in each commuting zone in 2005.
Indipendent Variable: Emigration flows computed using AIRE registry enrollment as share of population in 2000 instrumented by our instrumental variable of pre shock-network intensity to country c: $\sum_{t=2008}^{2015} \widehat{\frac{m_{l,t}}{popl,2000}} = \sum_c sh_{i,c,2000} * \frac{(GDP_c^{2015}/GDP_c^{2008})}{(GDP_{Ita}^{2015}/GDP_{Ita}^{2008})}$
Control variables: Per capita added value in 100,000 euros and unemployment rate in 2004 at provincial level, Change in Firms between 2005-2008 as a share of initial number of firms in each commuting zone in 2005.

Table 11: Instrument validity check - Effect of emigration rates on pre-shock change in stock and flows of firms with owners below 35 (2005-08)

	(1)	(2)	(3)
	Young Firms	Young Firms	Young Firms
	Δ Stock	$\sum$ Births	$\sum$ Deaths
VARIABLES	2005-08	2005-08	2005-08
Emig. IV	0.017	-0.038	-0.037***
	(0.033)	(0.048)	(0.012)
Unemp.Rate 2004	0.118***	0.327***	0.102***
	(0.045)	(0.091)	(0.028)
GDP 2004	0.000*	0.000	0.000
	(0.000)	(0.000)	(0.000)
Constant	-0.016***	0.096***	0.036***
	(0.003)	(0.005)	(0.002)
Observations	686	686	686
R-squared	0.385	0.541	0.530
Avg. Outcome	-0.011	0.114	0.039
Avg. Treatment	0.144	0.144	0.144
Province FE	X	X	X

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Sample: Italian Local Labor Markets.
Specifications: Ordinary least square estimations
Dependent variable: Change in All Firms 2005-2008 as a share of initial number of firms in each commuting zone in 2005.
Indipendent Variable: instrumental variable of pre shock-network intensity to country c: $\widehat{\sum_{t=2008}^{2015} \frac{m_{l,t}}{pop_{l,2000}}} = \sum_c sh_{i,c,2000} * \frac{(GDP_c^{2015}/GDP_c^{2008})}{(GDP_{Ita}^{2015}/GDP_{Ita}^{2008})}$

Table 12: Instrument validity check - Effect of emigration rates on pre-shock local labor market employment (2005-08)

	(1)	(2)	(3)
	Δ% Employment	Δ Avg. Size	Δ Qualified Empl.
VARIABLES	2005-08	2005-08	2005-08
Emig. IV	-0.138	-2.283	-0.274
	(0.173)	(2.172)	(0.203)
Unemp.Rate 2004	0.350	1.945	0.927
	(0.422)	(2.067)	(1.116)
GDP 2004	-0.000***	-0.000**	-0.000
	(0.000)	(0.000)	(0.000)
Constant	0.032	-0.128	-0.074
	(0.022)	(0.116)	(0.058)
Observations	686	686	686
R-squared	0.281	0.199	0.167
Avg. Outcome	0.119	0.070	-0.009
Avg. Outcome 2005	1.7e+04	5.466	0.367
Avg. Treatment	0.144	0.144	0.144
Province FE	X	X	X

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Sample: Italian Local Labor Markets.
Specifications: Ordinary least square estimations

Dependent variable: Change in employment (as a share of initial number of employees in each commuting zone in 2005), average size and share of qualified workers (i.e., managers as share of total LLM employees) 2005-2008.
Independent Variable: instrumental variable of pre shock-network intensity to country c: $\sum_{t=2008}^{2015} \widehat{\frac{m_{l,t}}{pop_{l,2000}}} = \sum_c sh_{i,c,2000} * \frac{(GDP_c^{2015}/GDP_c^{2008})}{(GDP_{Ita}^{2015}/GDP_{Ita}^{2008})}$

Table 13: Instrument validity check - Effect of emigration rates on pre-shock local labor market skills (2005-08)

	(1)	(2)	(3)
	Δ Blue Coll	Δ White Coll	Δ Managers
VARIABLES	2005-08	2005-08	2005-08
Emig. IV	0.010	-0.188	4.982
	(0.193)	(0.207)	(4.993)
Unemp.Rate 2004	0.462	0.265	16.164*
	(0.385)	(1.039)	(9.252)
GDP 2004	-0.000***	-0.000**	-0.000
	(0.000)	(0.000)	(0.000)
Constant	0.034*	0.027	-0.908*
	(0.020)	(0.054)	(0.545)
Observations	686	686	584
R-squared	0.321	0.138	0.144
Avg. Outcome	0.129	0.133	0.247
Avg. Outcome 2005	8950.138	6737.377	163.226
Avg. Treatment	0.144	0.144	0.144
Province FE	X	X	X

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Sample: Italian Local Labor Markets.
Specifications: Ordinary least square estimations

Dependent variable: Change in blue collar workers (as a share of initial number of blue collar workers in each commuting zone in 2005), Change in white collar workers (as a share of initial number of white collar workers in each commuting zone in 2005), Change in managers (as a share of initial number of managers in each commuting zone in 2005).
Independent Variable: instrumental variable of pre shock-network intensity to country c: $\sum_{t=2008}^{2015} \widehat{\frac{m_{l,t}}{pop_l,2000}} = \sum_c sh_{i,c,2000} * \frac{(GDP_c^{2015}/GDP_c^{2008})}{(GDP_{Ita}^{2015}/GDP_{Ita}^{2008})}$

Table 14: Instrument validity check - Effect of emigration rates on pre-shock change in local labor market wages (2005-08)

	(1)	(2)
	Δ Wagebill	$\Delta Avg.Wage$
VARIABLES	2005-08	2005-08
Emig. IV	-0.182	0.042
	(0.193)	(0.029)
Unemp.Rate 2004	0.628	-0.045
	(0.756)	(0.079)
GDP 2004	-0.000***	-0.000*
	(0.000)	(0.000)
Constant	0.022	0.004
	(0.039)	(0.004)
Observations	686	686
R-squared	0.193	0.098
Avg. Outcome	0.127	0.008
Avg. Outcome 2005	3486.004	1644.434
Avg. Treatment	0.144	0.144
Province FE	X	X

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Sample: Italian Local Labor Markets.
Specifications: Ordinary least square estimations
Dependent variable: Change in wagebill (as a share of initial wage bill in each LLM in 2005), change 2008-2015 in average LLM wage (as a share of initial average wage in each LLM in 2005).
Independent Variable: instrumental variable of pre shock-network intensity to country c: $\sum_{t=2008}^{2015} \widehat{\frac{m_{l,t}}{pop_{l,2000}}} = \sum_c sh_{i,c,2000} * \frac{(GDP_c^{2015}/GDP_c^{2008})}{(GDP_{Ita}^{2015}/GDP_{Ita}^{2008})}$

New Tables - Sectors

Table 15: Effect of emigration rates on change in stock of firms by sector

VARIABLES	(1) Δ High VA 2008-15	(2) Δ Low VA 2008-15	(3) Δ Tradable 2008-15	(4) Δ Non-Tradable 2008-15	(5) Δ High VA 2008-15	(6) Δ Low VA 2008-15	(7) Δ Tradable 2008-15	(8) Δ Non-Tradable 2008-15	(9) 2008-15	(10) 2008-15	(11) 2008-15	(12) 2008-15
Emig Rate	-0.004***	-0.065***	-0.004	-0.065***								
	(0.001)	(0.019)	(0.003)	(0.019)								
Emig 25-45					-0.011***	-0.178***	-0.010	-0.179***				
					(0.004)	(0.053)	(0.007)	(0.054)				
Emig High Edu									-0.035***	-0.554***	-0.032	-0.558***
									(0.013)	(0.174)	(0.024)	(0.175)
Unemp.Rate 2004	0.004	0.238*	0.002	0.240**	0.005	0.254*	0.003	0.256*	0.004	0.242*	0.002	0.244*
	(0.008)	(0.123)	(0.020)	(0.121)	(0.009)	(0.132)	(0.020)	(0.131)	(0.009)	(0.143)	(0.019)	(0.144)
GDP 2004	0.000**	0.000***	-0.000	0.000***	0.000*	0.000***	-0.000	0.000***	0.000*	0.000***	-0.000	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-0.004***	-0.006	0.000	-0.011	-0.003***	0.008	0.001	0.003	-0.001	0.045	0.003	0.041
	(0.001)	(0.016)	(0.002)	(0.016)	(0.001)	(0.021)	(0.003)	(0.021)	(0.002)	(0.033)	(0.004)	(0.033)
Observations	686	686	686	686	686	686	686	686	686	686	686	686
R-squared	0.498	0.474	0.446	0.470	0.474	0.410	0.440	0.404	0.361	0.231	0.422	0.218
F-excl. instr.	23.097	23.097	23.097	23.097	19.423	19.423	19.423	19.423	14.019	14.019	14.019	14.019
Avg. Outcome	0.001	0.004	0.005	-0.000	0.001	0.004	0.005	-0.000	0.001	0.004	0.005	-0.000
Avg. Treatment	0.699	0.699	0.699	0.699	0.346	0.346	0.346	0.346	0.144	0.144	0.144	0.144
Province FE	X	X	X	X	X	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X	X	X	X	X	X

Sample: Italian Local Labor Markets.
Specifications: 2-stage-least-squares IV
Dependent variable: Change in firm stock 2008-2015 as a share of initial number of firms in each commuting zone in 2005, by sector.
Indipendent Variable: Emigration flows computed using AIRE registry enrollment as share of population in 2000 instrumented by our instrumental variable of pre shock-network intensity to country c: $\sum_{t=2008}^{2015} \frac{\widehat{m_{l,t}}}{pop_{l,2000}} = \sum_c sh_{i,c,2000} * \frac{(GDP_c^{2015}/GDP_c^{2008})}{(GDP_{Ita}^{2015}/GDP_{Ita}^{2008})}$
Control variables: Per capita added value in 100,000 euros and unemployment rate in 2004 at provincial level

Table 16: Effect of emigration rates on change in entry of firms by sector

VARIABLES	(1) Δ High VA 2008-15	(2) Δ Low VA 2008-15	(3) Δ Tradable 2008-15	(4) Δ Non-Tradable 2008-15	(5) Δ High VA 2008-15	(6) Δ Low VA 2008-15	(7) Δ Tradable 2008-15	(8) Δ Non-Tradable 2008-15	(9) 2008-15	(10) 2008-15	(11) 2008-15	(12) 2008-15
Emig Rate	-0.017***	-0.097**	-0.015***	-0.099**								
	(0.004)	(0.039)	(0.004)	(0.039)								
Emig 25-45					-0.046***	-0.268**	-0.041***	-0.273**				
					(0.011)	(0.109)	(0.013)	(0.110)				
Emig High Edu									-0.142***	-0.833**	-0.127***	-0.849**
									(0.039)	(0.340)	(0.039)	(0.344)
Unemp.Rate 2004	0.043*	0.788***	0.023	0.808***	0.047*	0.812***	0.027	0.832***	0.044	0.794***	0.024	0.814***
	(0.023)	(0.225)	(0.025)	(0.224)	(0.026)	(0.238)	(0.026)	(0.238)	(0.030)	(0.256)	(0.027)	(0.259)
GDP 2004	0.000**	0.000**	0.000*	0.000**	0.000**	0.000*	0.000*	0.000**	0.000**	0.000*	0.000*	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.019***	0.336***	0.027***	0.329***	0.023***	0.357***	0.030***	0.351***	0.033***	0.414***	0.038***	0.408***
	(0.004)	(0.029)	(0.004)	(0.029)	(0.005)	(0.038)	(0.005)	(0.038)	(0.008)	(0.060)	(0.007)	(0.061)
Observations	686	686	686	686	686	686	686	686	686	686	686	686
R-squared	0.282	0.267	0.315	0.255	0.140	0.180	0.236	0.163			0.037	
F-excl. instr.	23.097	23.097	23.097	23.097	19.423	19.423	19.423	19.423	14.019	14.019	14.019	14.019
Avg. Outcome	0.013	0.331	0.030	0.314	0.013	0.331	0.030	0.314	0.013	0.331	0.030	0.314
Avg. Treatment	0.699	0.699	0.699	0.699	0.346	0.346	0.346	0.346	0.144	0.144	0.144	0.144
Province FE	X	X	X	X	X	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X	X	X	X	X	X

Sample: Italian Local Labor Markets.
Specifications: 2-stage-least-squares IV
Dependent variable: Change in firm entry 2008-2015 as a share of initial number of firms in each commuting zone in 2005, by sector.
Indipendent Variable: Emigration flows computed using AIRE registry enrollment as share of population in 2000 instrumented by our instrumental variable of pre shock-network intensity to country c: $\sum_{t=2008}^{2015} \frac{\widehat{m_{l,t}}}{pop_{l,2000}} = \sum_c sh_{i,c,2000} * \frac{(GDP_c^{2015}/GDP_c^{2008})}{(GDP_{Ita}^{2015}/GDP_{Ita}^{2008})}$
Control variables: Per capita added value in 100,000 euros and unemployment rate in 2004 at provincial level

Table 17: Effect of emigration rates on change in exits of firms by sector

VARIABLES	(1) Δ High VA 2008-15	(2) Δ Low VA 2008-15	(3) Δ Tradable 2008-15	(4) Δ Non-Tradable 2008-15	(5) Δ High VA 2008-15	(6) Δ Low VA 2008-15	(7) Δ Tradable 2008-15	(8) Δ Non-Tradable 2008-15	(9) 2008-15	(10) 2008-15	(11) 2008-15	(12) 2008-15
Emig Rate	-0.012***	-0.015	-0.011***	-0.016								
	(0.003)	(0.027)	(0.003)	(0.027)								
Emig 25-45					-0.034***	-0.041	-0.031***	-0.045				
					(0.008)	(0.075)	(0.010)	(0.074)				
Emig High Edu									-0.107***	-0.128	-0.095***	-0.140
									(0.029)	(0.232)	(0.029)	(0.228)
Unemp.Rate 2004	0.039**	0.475***	0.021	0.493***	0.042**	0.478***	0.024	0.497***	0.040*	0.476***	0.021	0.494***
	(0.018)	(0.140)	(0.020)	(0.141)	(0.020)	(0.142)	(0.020)	(0.143)	(0.024)	(0.143)	(0.022)	(0.144)
GDP 2004	0.000**	-0.000	0.000*	0.000	0.000**	-0.000	0.000*	0.000	0.000**	-0.000	0.000*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.024***	0.335***	0.026***	0.333***	0.026***	0.338***	0.029***	0.336***	0.034***	0.347***	0.035***	0.346***
	(0.003)	(0.021)	(0.003)	(0.020)	(0.004)	(0.026)	(0.004)	(0.026)	(0.006)	(0.041)	(0.006)	(0.041)
Observations	686	686	686	686	686	686	686	686	686	686	686	686
R-squared	0.553	0.572	0.488	0.572	0.477	0.570	0.443	0.569	0.249	0.558	0.335	0.553
F-excl. instr.	23.097	23.097	23.097	23.097	19.423	19.423	19.423	19.423	14.019	14.019	14.019	14.019
Avg. Outcome	0.012	0.324	0.024	0.311	0.012	0.324	0.024	0.311	0.012	0.324	0.024	0.311
Avg. Treatment	0.699	0.699	0.699	0.699	0.346	0.346	0.346	0.346	0.144	0.144	0.144	0.144
Province FE	X	X	X	X	X	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X	X	X	X	X	X

Sample: Italian Local Labor Markets.
Specifications: 2-stage-least-squares IV
Dependent variable: Change in firm exit 2008-2015 as a share of initial number of firms in each commuting zone in 2005, by sector.
Indipendent Variable: Emigration flows computed using AIRE registry enrollment as share of population in 2000 instrumented by our instrumental variable of pre shock-network intensity to country c: $\sum_{t=2008}^{2015} \frac{\widehat{m_{l,t}}}{pop_{l,2000}} = \sum_c sh_{i,c,2000} * \frac{(GDP_c^{2015}/GDP_c^{2008})}{(GDP_{Ita}^{2015}/GDP_{Ita}^{2008})}$
Control variables: Per capita added value in 100,000 euros and unemployment rate in 2004 at provincial level