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Le sfide della migrazione

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The Labour Demand Response to Supply Shocks: The Indirect Effect of Immigration

Francesco Bloise*
Rama Dasi Mariani**

Abstract

The economic literature is debating from long time on the identification of the impact of immigration on native wages and recent studies seem to validate the result of an average null effect. Nonetheless, the adjustment mechanisms of the labour market need to be further analysed. In particular, we want to study how firms respond to an increase in the foreign labour supply, focusing on the Italian case. We contribute to the ongoing debate by replicating the methodology of Dustmann and Glitz (2015) with RIL data – a firm-level panel dataset on Italian firms. The aim of the study is to measure to wheter extent the labour demand accommodates to a supply shock with an increase in the total production or with the adoption of more labour-intensive technologies. Our main result – obtained with an instrumental variable approach – shows that the second effect is dominant and greater than the one documented in previous studies for other countries. In line with the reference literature, the result holds in particular for the manufacturing sector, while in sectors less exposed to international competition we can suppose a greater effect on prices than on quantities.

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Sintesi – La risposta della domanda di lavoro agli shock di offerta: gli effetti indiretti dell'immigrazione

La recente ondata migratoria ha rappresentato per il mercato del lavoro dei paesi di destinazione uno shock di offerta e molti sono gli studi che hanno cercato di comprendere l'effetto che tale cambiamento demografico ha avuto sui salari e sull'occupazione. Secondo l'opinione prevalente (cfr. ad esempio Ottaviano e Peri, 2008), né il salario medio né il livello di occupazione dei lavoratori nativi è stato influenzato dall'arrivo della forza lavoro straniera. La presente ricerca si propone di analizzare i possibili canali che hanno permesso alle economie di arrivo l'assorbimento di questo shock e il raggiungimento di un nuovo equilibrio.

In generale, a seguito di uno shock positivo di offerta, si può osservare un aumento della domanda di lavoro per mezzo di due canali alternativi: un aumento dell'output prodotto o l'adozione di tecnologie a più alta intensità di lavoro. Replacando la metodologia di Dustmann e Glitz (2015), il nostro principale risultato mostra che il secondo effetto è stato dominante nell'assorbimento della forza lavoro immigrata in Italia tra il 2005 e il 2010.

La ricerca adopera un dataset longitudinale che comprende numerose informazioni circa l'occupazione delle imprese italiane e il suo principale contributo può essere riconosciuto nell'attenzione che rivolge ad un paese che, nel periodo di analisi, è stato l'approdo dei principali flussi migratori verso l'Europa. L'importanza della comprensione del mercato del lavoro italiano non si sostanzia solo nel dibattito europeo sulle politiche migratorie, ma anche nelle peculiarità che caratterizzano il caso di studio. L'effetto stimato è notevolmente più grande di quello della letteratura di riferimento e una possibile spiegazione può risiedere nel fatto che il tessuto produttivo italiano è caratterizzato da numerose piccole imprese caratterizzate da ridotta capacità di accesso al mercato del credito. I vincoli di liquidità esistenti possono aver portato, quindi, le imprese italiane a sostituire il nuovo capitale attraverso la più conveniente manodopera immigrata.

JEL Classification: F2, F6, J2, J6, L2, O33.

Keywords: globalization, immigration, endogenous technological change, firm structure, local labour market.

Parole Chiave: globalizzazione, immigrazione, cambiamento tecnologico, mercato del lavoro.

1. Introduction

In recent years immigration has become a challenging issue for all the Western economies, and it demands from researchers a more profound knowledge of the determinants and the potential effects of the phenomenon. Among the challenges that such a big movement of people may pose for the receiving country, there is the effect of foreign-born individuals on the domestic labour market. The economic literature has been debating from long time on the identification of the impact of immigration on native wages and recent studies seem to validate the result of an average null effect (e.g. Fogel and Peri, 2016). Beyond the heterogeneity of this impact on different groups of workers and along the distribution of wages (Card, 2009; Dustmann et al., 2012), also the adjustment mechanisms of the labour market need to be further analysed. In particular, we want to study how firms respond to an increase in the foreign labour supply, focusing on the Italian case.

We contribute to the ongoing debate by replicating the methodology of Dustmann and Glitz (2015) with data from *Rilevazione longitudinale su Imprese e Lavoro* (RIL) – a firm-level panel dataset that contains numerous information about the employment and the investments of the Italian firms. Italy has long been an emigration country – during the century 1876-1976, 24 million people left the country and such a big flow has been called the *Italian exodus*. Mainly due to the return of its citizens, at the end of '70s Italy registered for the first time a slightly positive net migration. At that time no constraints on entry existed. The first mass immigration that affected Italy was at the beginning of the '90s, when the Eastern Bloc collapsed and thousands of Albanians crossed the Italian borders. Due to its geographic characteristics, which make Italy very close to Eastern European countries and the arrive of the Mediterranean routes, in that period immigration started to increase also from North Africa. Nowadays, refugees coming from Maghreb are at the centre of a strongly debated European plan for relocation. Although Italy represents for most asylum-seekers only a landing country, immigration in general increases tremendously from 2007 (OECD, 2017), making Italy a noteworthy case study.

To our knowledge we are the first to study the labour demand adjustment mechanisms in Italy with the use of the decomposition method proposed by Hanson and Slaughter (2002). The aim of our study is to measure to which

extent the labour demand accommodates to a supply shock with an increase of the total production or with the adoption of more labour-intensive technologies.

The channels through which we can observe an increase in the labour demand are two. First, the greater availability of unskilled workers can induce labour-intensive industries in expanding their production. This is a well-known result of the international trade theory (i.e. Rybczynski effect). Second, due to the substitutability between unskilled labour and some kind of capital, the increase in the supply of low-skilled workers can lead to an endogenous technological change that is capital-saving. In other words, after a migration shock we should observe a general more intensive use of unskilled labour. Our result – obtained with an instrumental variable approach (Card, 2001) – shows that the second effect is dominant. From 2005 to 2010, low-skilled immigration increased the number of low-skilled workers employed by the Italian firms while the total employment remained quite stable. In line with the reference literature, the result holds in particular for the manufacturing sector, while in sectors less-exposed to international competition we can suppose a greater effect on prices than on quantities.

The paper is organized as follows. In the next section we review the existing studies on the labour demand reaction to an increase in the foreign labour supply. In section 3 we illustrate the analytical framework and the empirical strategy. In section 4 we present the data and some descriptive statistics. Section 5 includes the empirical results and section 6 concludes.

2. Related Literature

One of the main issue of the economic debate on the impact of immigration on the destination labour market has been the effect of foreigners on native wages. Beginning with Borjas (2003), the workhorse of all the subsequent studies has been a standard CES production function – where the labour-factor combines the contributions of workers who differ in education, experience, and potentially immigrant origins. By disaggregating the workforce in various sub-groups, Borjas (2003) and Borjas et al. (2008) find a negative effect of the foreign labour supply on native wages, while Ottaviano and Peri (2006, 2008) a positive one. The two analyses diverge also because of

different assumptions made on the supply of capital – fixed the first and perfectly elastic the second. Furthermore, Peri and Sparber (2008) show that the aforementioned positive effect originates because immigrants induce native to specialize in occupations that incorporate more *complex tasks* (for example tasks that require communicative abilities). So that this pattern accomplished, the total output has to increase and similarly the supply of capital.

Various papers are dedicated to the reaction of capital to an increase in the immigrant labour supply. They relate on a more consolidated literature on the complementarity between labour and capital (e.g. Doms and Lewis, 2006) and we are going to review them briefly. Nonetheless, the results remain controversial and our analysis wants to shed new light on the issue, adding some empirical evidence with an important new case study.

According to the existing literature, after a shock that changes the skill composition of the domestic workforce we can observe two potential effects: an increase in the output of industries that use more intensively the relative more abundant factor or an endogenous technological change that implies a general more intensive use of the relative more abundant factor. We can refer to the former as the *extensive effect* and to the latter as the *intensive effect*.

One of the first attempts to measure the relative importance of the two adjustment channels is that of Quispe-Agnoli and Zavadny (2002). The authors consider a panel dataset of US low-skilled industries covering the period from 1982 to 1992. The linear regressions implemented for various indicators of the industry performances – such as average value added, capital investments, labour productivity, and the fraction of employment – highlight no effect of immigration on capital investments and on value added.

The latter variable can confound effects on quantities with effects on prices, so the fraction of employment is also analysed. The results show a positive effect of immigrant labour supply on the fraction of employment in low-skilled industries and also a negative effect on productivity. Specifically, the labour productivity has risen more slowly in those States that received more immigrants during the period under analysis.

A similar methodology is used by De Arcangelis et al. (2015) for a panel dataset of the Italian provinces (NUTS3). The IV regressions show that the manufactures' value added was positively affected by foreign-born workers during 1995-2006. Nonetheless, this measure of the industry performance

needs that output prices and wages are given to be reliable¹. This is a credible assumption with regard to the *tradable sector* – which is exposed to the international competition. Firms in it take advantage of every opportunity of extra-profit. On the contrary, in the *no-tradable sector* the labour market adjusts to a supply shock reaching a new equilibrium with a lower wage. This is clearly demonstrated by Cortes (2008) and Dustmann and Glitz (2015).

Hanson and Slaughter (2002) suggest an alternative analytical framework to examine the labour market adjustment in open economy – a decomposition of factor demand changes into components due to a change in output and a change in production technology – that has been proposed again by different authors in more refined versions. According to Hanson and Slaughter's results the first effect is dominant, while Lewis (2003) indicates the second as the more relevant one. Card and Lewis (2007) suggest that most of the immigration flows to US States have been absorbed by a within-industry increase in the use of unskilled labour. On the contrary, HO-style changes in industry structure have played a relatively small role. All these studies relate to the US labour market. Many others implemented the same methodology to different case studies – Gandal et al. (2004) for Israel, Gonzalez and Ortega (2011) for Spain and Dustmann and Glitz (2015) for Germany – concluding in favour of a technological change due to immigration.

Nonetheless, heterogeneous firms operate within industries, meaning that they produce the same output with different technologies. With this in mind, it is easy to imagine that a scale adjustment between firms can be confounded with a factor intensity adjustment within an industry. This occurs if the rate of growth of a firm is correlated with the production technology used. Therefore, the suggested decomposition should be estimated at the unit level. This is exactly what Dustmann and Glitz (2015) do in their analysis for the German labour market in the period 1985-1995. The estimated results confirm a greater role of the *intensity effect*.

The contribution of the present paper is to make use of a panel dataset of Italian firms (RIL) concerning the years from 2005 to 2010 in order to evaluate the adjustment mechanisms of the labour demand to a supply shock induced by immigration. To our best knowledge we are the first to implement the suggested decomposition at the firm level for the Italian case. In the next

1 The insensitivity of native relative wages to immigration in Italy is explicitly tested (see De Arcangelis et al. (2015) p. 58)

section we are going to illustrate the methodology in details.

3. The Analytical Framework

Following the related literature, the analysis of the various adjustment channels of the labour market to a supply shock starts from the decomposition of the equilibrium condition:

$$dX = \sum_{j=1}^J d(w, A^j) Y^j \quad (1)$$

where X is a vector of factor supplies, C^j is a vector of unit factor demands and Y^j is the output of production unit j . Clearly, the demand depends from factor prices and the technology used A^j .

Totally differentiating (1), we obtain all the possible adjustment mechanisms through which the labour demand accommodates to a supply shock:

$$dX = \sum_{j=1}^J dC_w^j(w, A^j) Y^j dw + \sum_{j=1}^J dC_{A^j}^j(w, A^j) Y^j dA^j + \sum_{j=1}^J C^j(w, A^j) dY^j \quad (2)$$

In other words, after a change from the supply side, the equilibrium is reached again through three different channels or three potential effects of immigration.

First, an impact on wages, which can be defined as the *redistributive effect*. The average wage decreases and the labour market reaches a new equilibrium along the demand curve. Firms employ labour at lower costs and this situation may become stable in case of scarce competition in the goods market. Cortes (2008) and Dustmann and Glitz (2015) – focusing on the non-tradable sector – confirm this result. On the contrary, for the tradable sector we can suppose that the *Factor Price Equalization* hypothesis holds and thus we should observe an upward shift of the labour demand curve. This is coherent with the negligible effect of foreign labour supply on native wage and it is due to the following two (alternative) mechanisms.

Second, an impact on the technology used, which can be defined as the

intensity effect. Given the relative abundance of low-skilled labour, firms adopt in general more labour-intensive technologies. This effect is common to all firms in the tradable sector and it is not industry-specific. From a theoretical point of view, this is represented by a rotation of the isoquant in favour of a relative more intensive use of labour, while the slope of the isocost remains unchanged. More specifically, the slope of the isocost is due to the average wage, which – under the FPE hypothesis – is fixed. However, the relative wage of the more abundant skill-group of workers decreases and it induces a technological change.

Third, an impact on production output which can be defined as the *scale effect.* Thanks to the comparative advantage of labour-intensive industries, firms in these sectors may increase their output. Similarly to the previous effect, this implies a new labour-market equilibrium with an higher employment and the same level of wage. Theoretically, this translates in an upward shift of the isocost and the allocation of production to an higher isoquant. The well-known result of the Heckscher-Ohlin model of international trade theory predicts exactly this effect.

We focus on the tradable sector, in which the first channel is effectively null. Therefore, we can rewrite (2) for a particular skill-group i as follows:

$$\frac{dX_i}{X_{i_0}} = \sum_{j=1}^J \frac{C^j Y^j}{X_{i_0}} \frac{dC_{A^j}^j}{C^j} + \sum_{j=1}^J \frac{C^j Y^j}{X_{i_0}} \frac{dY^j}{Y^j} \tag{3}$$

where X_{i_0} represents the labour supply of skill-group i in the base period, while the other variables hold the same meaning.

The common term $C^i Y^j / X_{i_0}$ represents the demand for labour type i in production unit j over the total supply of skill-group j at the base period. It can be approximated by $\alpha_{i_0}^j = X_{i_0}^j / X_{i_0}$, that is the relative employment of skill-group i in production unit j in the base period. In other words, we weight the contribution of each firm by its relative size with respect to total employment. Similarly, we approximate $dC_{A^j}^j / C^j \approx \Delta X_i^j / X^j$, namely the percentage change in employees of skill-group i relative to total employment in production unit j , and $dY^j / Y^j \approx \Delta X^j / X^j$, that is the percentage change of total employment of production unit j . Thus, equation (3) becomes:

$$\frac{\Delta X_i}{X_{i_0}} = \sum_{j=1}^J \alpha_{i_0}^j \frac{\Delta X_i^j}{X^j} + \sum_{j=1}^J \alpha_{i_0}^j \frac{\Delta X^j}{X^j} + \sum_{j=1}^J R_i^j \quad (4)$$

where the first component shows the *intensity effect*, the second the *scale effect*, and the is the residual term and R_i^j it represents the interaction of the other two². The empirical strategy that we are going to illustrate in what follows tries to assess the relative importance of the two channels.

3.1 The Empirical Implementation

We proceed now by regressing each component of the previous decomposition on the relative change of labour supply. In other words, in order to evaluate the relative importance of the various adjustment channels we relate them one to one with the variation in the local labour market supply – the left-hand side of the equilibrium decomposition. We consider the local labour market as relative to a specific region and a particular industrial sector. So, for instance, the equation for the scale effect is given by:

$$\sum_{j=1}^J \alpha_{i_0}^j \frac{\Delta X_{rs}^j}{X_{rs}^j} = \psi_i + \rho_r + \sigma_s + \beta_1 \frac{\Delta X_{ir}}{X_{i_0r}} + \varepsilon_{ir} \quad (4)$$

The total change in employment of region r and sector s , weighted for the relative employment of skill-group i in the base period, is related to the variation of skill-group i supply in region r and sector s . Therefore, ψ_i , ρ_r , and σ_s are skill-group, region, and sector fixed effects, capturing the heterogeneity of worker, geography, and sector units. ε_{ir} is the error term. β_1 represents the proportion of the supply shock that is absorbed by a change in the relative size of firms, i.e. what we have called the *scale effect*.

The same estimating equation is then implemented for the other two channels – the *intensity effect* and the residual term. In the first case, the dependent variable becomes the relative change of employees of skill-group and in the second one the interaction of the other two components. The underlying decomposition – which holds as identity – makes the estimated coefficients to sum to one. Therefore each regression coefficient expresses the relative con-

2 For the derivation of the labour market equilibrium decomposition see Mariani (2018)

tribution of the various mechanisms in absorbing local labour market supply shocks.

The level of the analysis is the Italian regions (NUTS2), sectors are distinguished by ATECO07 system, and workers are divided in three skill-groups: low-, medium- and high-skilled. The first includes high-school dropout workers, the second is the group of high-school graduates and the third encompasses who attended the college. Regressions are estimated using the OLS method.

It is important to note that from both sides of the estimating equations (see e.g. equation 5) we have the same variable, but differently specified. This implies that by construction the independent variable is endogenous to the model and the estimated coefficients have no statistical meaning. To overcome the limit of the OLS method, we can use an instrumental variable approach. The idea is that of making use of the well-known network instrument proposed by Card (2001) in order to capture only the exogenous part of supply shock induced by immigration.

In general, this instrumental variable is applied in migration studies to predict the current immigrant share with the past one. There are various issues that make the present immigration a biased regressor. For instance, immigrants can locate where the labour demand is growing so that a comparison between areas with different immigration share would show no effect of foreign labour force on labour market outcomes. The same applies to our specific case – immigrants can locate in expanding regions, so that there could be a spurious correlation between the current immigration in a region and the performance of firms in the same area.

A common feature of migration flows is that the new immigrants tend to settle where previous immigrants already live (Bartel, 1989). Sharing experiences and information about the new place of residence are all advantages that reduce the cost of movement. We can then use the past location to predict the exogenous part of current immigration – that part that depends from the network between people and not from the actual conditions of local labour markets.

In formula our instrument is defined as follow:

$$z_{ir} = \frac{\sum_c \lambda_{cr} \theta_{ci} \Delta I_c}{X_{i0,r}} \quad (6)$$

The current probability of being of skill-group i and living in region r is proportional to the probability of belonging to ethnic group c and living in region r in 1991, λ_{cr} , and to the probability of belonging to ethnic group c and being of skill-group i in the current period, θ_{ci} . ΔI_c is the actual flow of immigrants of ethnicity c and $X_{i0,r}$ is the skill-group i labour-supply in the base period. Differently from most papers that share this instrumental variable, we use it in the first stage to regress the overall labour-supply.

The exogeneity of the instrument relates to the specific history of the phenomenon. From one hand, the current flow is calculated on the years from 2005 to 2010. This is a very crucial period for the Italian immigration history. Indeed, as explained before, in 2007 immigration increased tremendously – because of the agreement of free movement of workers from Bulgaria and Romania (OECD, 2017) – making our case study an important occasion to evaluate the impact of an immigration shock. On the other hand, the base period has to refer sufficiently in the past, so that to consider the previous immigrant location independent from current local conditions. We have chosen the year 1991. The beginning of the '90s – consequently the collapse of the Eastern Bloc – is the period when Italy faced for the first time a mass arrival. From that date to the present, two important policy shocks changed significantly the legislation on immigration, so that they make our instrument reasonably exogenous to the current conditions. In 1998, *temporary residence centres* were established to deter illegal immigration. Immigrants who arrived in Italy without a Visa were held and were not allowed to freely move on the territory. The legislation became even more strict in 2002, when the possibility of an *immediate expulsion* was set up.

4. Data and Descriptive Statistics

The main dataset used to implement the analysis is the *Rilevazione longitudinale su Imprese e Lavoro* (RIL), a panel dataset provided by the ISFOL research centre. It contains detailed information on the employment, investments, and other characteristics of Italian firms. We consider the years 2005 and 2010 for the aforementioned motives and we keep only firms that are present in both waves. This is because if a firm exits the sample we cannot distinguish the death of that firm from attrition. Similarly, when a new firm enters we do not know if it is a newly constituted firm or just a newly sampled one. The survey concerns approximately 22,000 firms and the panel size of the sample is about half of the full size. It is representative of the Italian firms in all industrial sectors apart from agricultural. We focus on the tradable sectors, especially on manufacturing, so we can neglect it.

More specifically, by firm we know the total number of employees and the number of employees for each skill-group. Skills are identified by occupations and divided in three groups. We do not have any information on the ethnic origin of immigrant workers. Therefore, in order to define our instrumental variable, we take data of another survey – the *Rilevazione sulle Forze Lavoro*. It is provided by the Italian National Statistics Institute from the 2004 every three months. We consider the first quarter both for 2005 and 2010. In this dataset skills are defined by the education, grouped in order to be coherent with the skill classification of the main dataset.

Immigrants are divided in nine ethnic groups, which distribution in terms of importance and skill is reported in tables (1) and (2). As expected, the most numerous groups are those of Central-Eastern Europe and North Africa. Ethnic groups are classified based on the categories of the other dataset that we use – the Italian census data. In it we can find information about the allocation of immigrants in 1991.

Table 1- Characteristics of immigrant ethnic groups, 2005

	Share of Immigrants	Low-Skilled	Medium-Skilled	High-Skilled
Central and Eastern Europe	36.36	93.56	1.58	4.85
North Africa	18.21	94.07	2.17	3.75
Asia	14.43	92.77	0.75	6.48
Africa others	7.31	93.10	1.97	4.93
Central and South America	7.16	88.94	2.01	9.05
Europe 12	6.70	60.22	5.38	34.41
Europe others	5.47	71.05	6.58	22.37
North America	2.59	81.94	.	18.06
Europe EFTA	1.76	73.47	4.08	22.45
All Immigrants	100.00	89.06	2.16	8.78

Note: Authors' elaboration on RCFL (ISTAT) 2005

Table 2 - Characteristics of immigrant ethnic groups, 2010

	Share of Immigrants	Low-Skilled	Medium-Skilled	High-Skilled
Central and Eastern Europe	43.25	94.41	1.43	4.16
North Africa	14.86	93.19	1.24	5.57
Asia	14.67	90.50	2.06	7.44
Europe others	8.67	81.67	3.64	14.70
Central and South America	6.65	86.76	2.57	10.67
Africa others	6.41	94.88	1.02	4.10
Europe 12	3.60	58.39	4.01	37.59
North America	1.27	88.66	1.03	10.31
Europe EFTA	0.60	63.04	4.35	32.61
All Immigrants	100.00	90.51	1.84	7.65

Note: Authors' elaboration on RCFL (ISTAT) 2010

In general, around 90% of the Italian immigrants falls in the low-skilled group, therefore we can argue that the analysis highlights especially the mechanisms of absorption of unskilled workforce.

Table 3 - Immigration Rate by Region (Labour Force)

	2005	2010	2010-2005
Piemonte/Valle d'Aosta	5.05	10.63	5.23
Lombardia	6.04	12.07	5.66
Trentino Alto Adige	5.23	9.85	4.60
Veneto	6.30	12.18	5.56
Friuli Venezia Giulia	5.48	10.34	4.40
Liguria	4.41	9.06	4.29
Emilia Romagna	6.55	13.27	6.59
Toscana	5.49	11.36	5.55
Umbria	6.70	13.19	6.32
Marche	6.52	11.07	4.34
Lazio	4.88	11.01	6.18
Abruzzo	3.29	6.72	3.46
Molise	1.41	3.31	1.87
Campania	1.62	2.91	1.29
Puglia	1.38	1.94	0.56
Basilicata	1.02	2.68	1.61
Calabria	1.60	3.59	1.94
Sicilia	1.55	2.95	1.39
Sardegna	0.93	2.14	1.19
All	4.30	8.72	3.31
Observations	117991	105607	223598

Note: Authors' elaboration on RCFL-ISTAT 2005 and 2010

From 2005 to 2010 immigration to Italy increased substantially. Looking at the last row of table (3) we can notice that immigration rate has more than tripled from 2005 to 2010. With respect to the Italian workforce in 2005, immigration has increased by roughly 4 p.p.. Between regions there is a huge variance both in the share of immigrants and in its variation. Immigrants has settled mainly in the Centre-North of Italy. This is clearly depicted in figures (1) and (2).

Figure 1 - Immigration rate of Italian regions (NUTS2) in 2005



Figure 2 - Immigration rate of Italian regions (NUTS2) in 2010



Firms operating in the tradable sector have grown during the period under analysis – passing from about 53 employees per firm to more than 65. Looking at the skill composition of them, we notice the relevant proportion of unskilled workers and the decrease in the percentage of high-skilled (table 4). This is even more exacerbated in the non-tradable sector (table 5). These two features offer some insights for both effects, so in the next section we will try to empirically evaluate them.

Table 4 - Characteristics of firms in tradable sector

	2005	2010
Average size	49.11 (188.99)	55.33 (210.13)
% low skill	47.81 (33.43)	73.22 (22.95)
% medium skill	45.42 (33.09)	23.97 (21.30)
% high skill	6.77 (14.93)	2.82 (7.44)
Observations	3009	2819

Note: Authors' elaboration on Isfol-Ril: 2005,2010. Standard deviations in parenthesis.

Table 5 - Characteristics of firms in tradable and non-tradable sector

	2005	2010
Average size	51.43 (403.50)	61.25 (472.53)
% low skill	46.20 (35.47)	58.27 (36.04)
% medium skill	45.20 (35.41)	37.77 (34.08)
% high skill	8.60 (17.27)	3.96 (10.73)
Observations	6979	6979

Note: Authors' elaboration on Isfol-Ril: 2005,2010. Standard deviations in parenthesis.

5. Empirical Results

Tables (6) and (7) report the main results of our empirical analysis.

Table 6 - Decomposition of Changes in Labor Supply on the Firm Level. Tradable Sector

	[Firm Scale Effect]	[Firm Intensity Effect]	[Residual Term]
OLS	0.08 [0.13]	0.25*** [0.07]	0.68*** [0.10]
Obs.	390	390	390

Note: All regressions include a full set of skill, region and sector fixed effects. Robust standard errors are reported in parentheses. Regressions are weighted by $(1/N_{rs}^{05} + 1/N_{rs}^{10})^{-1/2}$, where N_{rs} represents overall employment in tradable industries in region r and sector s in year t . * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7 - Decomposition of Changes in Labor Supply on the Firm Level. Tradable Sector

	[Firm Scale Effect]	[Firm Intensity Effect]	[Residual Term]
IV	0.06 [0.04]	0.94*** [0.09]	-0.00 [0.08]
Obs.	390	390	390

Note: All regressions include a full set of skill, region and sector fixed effects. Robust standard errors are reported in parentheses. Regressions are weighted by $(1/N_{rs}^{05} + 1/N_{rs}^{10})^{-1/2}$, where N_{rs} represents overall employment in tradable industries in region r and sector s in year t . The first-stage F-statistic of the instrument is 59.29. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The OLS specification suggests that the labour supply variation has been absorbed by the increase in the proportion of low-skilled employment. More specifically, we can say that from 2005 to 2010 firms absorbed two thirds of the change in the labour supply because of a more intensive use of unskilled workers. Output growth has contributed to employ the remaining variation of the labour supply. As explained before, we need to implement an IV estimation strategy in order to empirically assess which of the two theoretical effects has prevailed. The IV estimate reinforces previous results and we conclude

that the labour supply change induced firms to adopt more capital-saving production technologies. In this case, the instrumental variable specification allows us to capture only the exogenous part of the supply shock generated by migration flows. This is why we call it the “indirect effect of immigration”.³

As a final step, we compare our main result with the one documented by previous studies. In particular, in Dustmann and Glitz (2015) the estimated coefficient of the *firm intensity effect* is 0.712 (*s.e.* 0.141), compared to ours that is 0.94 (*s.e.* 0.09). We argue that the magnitude of our estimate is admissible with respect to the Italian case. Italy is characterized by a lot of small firms, which are more constrained in accessing the credit market. In line with this condition, we suppose a greater tendency to substitute capital investments with more labour-intensive technologies. A preliminary evidence for this mechanism is given by table 9 which shows the results only for big firms – defined as those production units with more than 20 employees. The IV estimates for the *firm intensity effect* is 0.750 (*s.e.* 0.02), which is significantly lower with respect to the complete model. When we reduce the sample our estimates become less reliable. Nonetheless, this potential explanation deserves to be better analysed in further researches.

Table 8 - Decomposition of Changes in Labor Supply on the Firm Level. Tradable Sector

	[Firm Scale Effect]	[Firm Intensity Effect]	[Residual Term]
OLS	0.056 [0.07]	0.395*** [0.16]	0.0438** [0.21]
Obs.	306	306	306

Note: All regressions include a full set of skill, region and sector fixed effects. Robust standard errors are reported in parentheses. Regressions are weighted by $(1/N_{rs}^{05} + 1/N_{rs}^{10})^{-1/2}$, where N_{rs} represents overall employment in tradable industries in region r and sector s in year t .
 * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

3 The documented effect is robust to different specifications of the baseline model. Results of the implemented tests are available on request.

Table 9 - Decomposition of Changes in Labor Supply on the Firm Level. Tradable Sector

	[Firm Scale Effect]	[Firm Intensity Effect]	[Residual Term]
IV	-0.022 [0.02]	0.750*** [0.02]	0.043** [0.02]
Obs.	306	306	306

Note: All regressions include a full set of skill, region and sector fixed effects. Robust standard errors are reported in parentheses. Regressions are weighted by $(1/N_{rs}^{105} + 1/N_{rs}^{10})^{-1/2}$, where N_{rs} represents overall employment in tradable industries in region r and sector s in year t . The first-stage F-statistic of the instrument is 3.544. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

6. Conclusions

Existing studies on the impact of immigration on native labour market outcomes have tentatively concluded that on average native wages are not negatively affected by immigrant labour supply. How labour market clears is still to be examined in depth and we try to give some evidence on the adjustment mechanisms at work. We want to appraise two alternative hypotheses. First, from international trade theory we learn that the increase in the supply of one production factor induces industries that use it more intensively to expand their output. The result is a change in the output mix between industries. Second, a technological change in favour of the relative more abundant factor could occur after a supply shock. In this case, industries can adopt production technologies that incorporate a more intensive use of unskilled labour.

To implement our analysis, we follow Dustmann and Glitz (2015). According to their analytical framework, an increase in the total employment of firms reflects a growth of the output, while an increase in the proportion of low-skilled workers points at a technological change. One possible bias originates from the endogenous increase in the labour supply. To overcome this limit and capture only the exogenous part of the supply shock we use an instrumental variable approach. We replicate the network instrument proposed by Card (2001), so the current growth in the local labour supply is related to the past allocation of immigrant workers.

Based on the ISFOL-RIL dataset covering the period 2005-2010, our results show that half of the foreign labour supply has been absorbed through a capital-saving technological change, while the rest of the mechanism remains unexplained. In addition, the premise of our analysis is that this effect emerges only if we consider the tradable sector, where international competition between firms realizes the *factor price equalization*. So, we expect to observe a stronger effect when we focus on a narrower definition of the tradable sector, i.e. the manufacture. Our regression outputs point in this direction, but they have been enhanced. On the contrary, the main result is slightly weaker when we consider only big firms. Indeed, we can suppose that small firms tend to invest less because of a more limited ability in attracting capital. Anyway, evidence in favour of the *intensity effect* is robust also to this model specification.

The present paper contributes to the existing literature by offering new evidence on the important case-study of Italy. Previous studies concerned especially the US labour market. Nevertheless, the current European situation deserves a specific analysis and ours is the first using a firm-level dataset.

In conclusion, some policy considerations have to be made. An important body of the literature (e.g. Peri and Sparber, 2008; Fogel and Peri, 2016) concluded that in order to have a non-negative effect of immigration on wages, the labour market has to be sufficiently flexible to allow native workers to specialize in more productive occupations. Whereas, our analyses would put some attention also on the degree of competition between firms and their propensity to invest. Indeed, to have a reshuffle of occupations and let immigrants to be employed in low-skilled jobs, the total output has to increase. In other words, we should find a strong *extensive effect*. Anyhow, also in this case we should be worried not only of labour market flexibility but also to integration and redistributive policies in order to mitigate the risk of marginalisation.

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