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May 2021

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Abstract

The economic consequences of migration have become the topic of many recent contributions in theoretical and applied economics. However, only a handful of papers have dealt with the implications of migration for risk sharing. We intend to fill in this gap in the literature by exploring the effects of migration and the ensuing cultural diversity on risk sharing in receiving economies, by using data on US states in the period 2000-2015. Our empirical results strongly suggest that migration enhances risk sharing in host economies, but non monotonically so. Moreover, cultural diversity is key in this risk sharing-enhancing effect of migration.

Keywords: Regional risk sharing, Consumption insurance, Migration, Diversity

JEL Classification: C23, C51, E21, F36

1 Introduction

Since the seminal papers by Cochrane (1991), Mace (1991), and Townsend (1994), risk sharing (or consumption insurance) has been analysed under many different lenses, both from the standpoint of its determinants, and from the perspective of its implications for economic activities.

The main goal of this vast literature has been that of assessing the extent to which idiosyncratic shocks, for example to income, are buffered ex ante or ex post, and do not get transmitted to consumption. Moreover, a stream of literature originating from the seminal paper of Asdrubali et al. (1996) has also assessed the relative contribution of several different mechanisms in achieving a certain degree of risk sharing. On the other hand, migration has also become a very hot topic in economics, with many contributions to date analyzing its drivers, as well as its consequences on the functioning of economic systems. Moreover, a more recent literature on migration-induced cultural diversity has also offered interesting perspectives. This is meant to explore the socio-economic implications of variety in migrants' stocks, rather than just focusing on the stock of foreign born in a destination country. Interesting motivations for considering cultural diversity as a factor impacting economic variables have been often provided in the literature, and are discussed in the next section.

The purpose and the intended contribution of this paper is to bridge these two streams of literature, by empirically assessing the impact of migration and diversity on risk sharing. Ethnic and cultural diversity may be associated to migration, at some stages of the process, and may have an additional impact upon risk sharing, whose direction, however, is not clear ex ante. Some diversity may be needed, for migration to exert a beneficial effect on risk sharing, but too much of that may also give rise to conflicts (as highlighted by Montalvo & Reynal-Querol (2005)) and reduce trust, and therefore be detrimental to risk sharing.

By using data on US states in the period 2000-2015, our results will be highly suggestive of a beneficial (even to a large extent) effect of migration on regional risk sharing. In fact,

it is possible to compute a level of migration corresponding to almost full risk sharing. Moreover, we are able to detect a key contribution of migrants' diversity in this risk sharing enhancing effect of migration.

The remainder of the paper is organised as follows. Section 2 summarises some of the salient literature on migration, cultural diversity and risk sharing. Section 3 presents the risk sharing model, which is standard in the literature. Section 4 illustrates the data, the diversity measure we adopt in the analysis, while Section 5 explains the empirical procedure to assess the impact of migration and diversity on risk sharing. Section 6 discusses the empirical results. Section 7 concludes, with an eye to some policy implications of our results.

2 Literature

This paper mainly contributes to two streams of literature. First, it discusses one new channel through which a country's economic performance, in terms of its capability to share risks, is affected by the presence of migrants. Secondly, it also provides some new evidence by looking at the additional effect onto risk sharing due to the variety of "cultures" (reflecting migrants' countries of origin) rather than considering only the share of migrant population. In so doing, our evidence will also point at the existence of networks among migrants that might foster risk sharing.

Classic research on the economics of migration often analyses the consequences of migration on the functioning of economic systems, as well as its drivers (Lucas (2005)). In this paper, we focus on the former, by considering a new way that the foreign born might enrich the spectrum of economic opportunities of the host country.

Among the channels that have been extensively studied in recent literature, a relative consensus has been reached on the growth enhancing effects of migration. De Haan (1999) looks in particular at the effects of labour migration on agricultural and rural development, and in the wake of King (1996) and Skeldon (1997)'s positive conclusions, he advocates

policies that facilitate and complement its economic contribution, such as discrimination reducing interventions. Similarly, The World Bank (2009) recognises that movements of labour are determined by the benefits of agglomeration, and that effective policies should not prevent people from moving, but from moving for the wrong reasons.

Effects of migration on the wage distribution of natives have also been widely explored in the literature, although with conflicting evidence. While Borjas (2003) estimates a definite negative impact, Butcher & Card (1991) and Card & Lewis (2007) find little effect and mainly on wages of unskilled natives. On the other hand, Ottaviano & Peri (2006) take into account complementarity effects and propose evidence for a positive impact on US workers' wages.

A recent stream of literature relates migration to innovation and entrepreneurship, which has been shown to be for instance correlated with scientific education and which, according to Wadhwa et al. (2008), is peculiar of specific categories of migrants.

More recently, a different albeit closely related stream of literature has made a step forward, toward analysing the economic effects of ethnic and cultural diversification fostered by migration. The effect of cultural diversity on social and economic outcomes has been formulated and tested under many different respects in the last decades, sometimes producing, depending on the approach, different conclusions. The motivation behind such great interest lies in the idea that some inherited cultural specific traits and beliefs might, through their persistence, affect micro and macro economic variables, not necessarily in a positive way. Alesina & La Ferrara (2005), for instance, highlight the importance for productivity and innovation of having individuals that interpret problems and use cognitive skills differently. Guiso et al. (2006), believe this effect to act through the values that are transmitted by older generations. Similarly, Tabellini (2010) defines culture by indicators such as trust and respect for others, while Gören (2014) considers a wider set of transmission channels to connect culture specific traits to economic performance, such as investment behaviour, political freedom or fertility.

Different types of indicators have been formulated in order to disentangle the effect of cultural diversity. Ottaviano & Peri (2006) use a measure made popular by Mauro (1995) to test its effect on wages and rents in the United States. Following the model in Roback (1982), they find cultural diversity is a "production amenity", i.e. one that has positive effect on both wages and rents, and conclude that *"a multicultural urban environment makes US born citizens more productive"*. Bellini et al. (2013) repeat the same experiment using 15 European countries, and find a positive correlation between diversity and productivity. Alesina et al. (2016) use the same measure of diversity (or fractionalisation), based on birthplace, and found it is positively correlated with long run economic output. Similarly, Trax et al. (2015) show how cultural diversity among employees in German plants, and in particular the number of different nationalities, rather than the group size, increases total factor productivity at the firm level. Furthermore, the findings in Rodríguez-Pose & Hardy (2015) suggest that diversity in England and Wales has favored entrepreneurship: in particular, cultural diversity among highly skilled workers shows the strongest effect on start-up intensities. Ager & Brückner (2013) distinguish between fractionalisation, increasing linearly in the number of different groups within a country's population, and polarisation, whose maximum is reached when the population splits in two equally sized groups. In their experiment on US immigration data for the period 1870-1920, the former is found to significantly increase output per capita while the latter, by capturing the potential presence of conflicts and riots, has an opposite effect. More recently, Bove & Elia (2017) find that both fractionalisation and polarisation exert a positive effect on real GDP per capita, but more so in developing countries. Finally, in their path breaking contribution, Ashraf & Galor (2013) argue that diversity, genetically intended, has a hump-shaped effect on development.

In this paper we start employing an index as used in Ottaviano & Peri (2006), but depart from it in order to disentangle the effect of diversity from pure migration stocks effect. The construction of this new index is illustrated in Section 4.

The second stream of literature to which this work relates is that of risk sharing, and in

particular consumption smoothing in the presence of migration.

As shown by the pioneering work of Cochrane (1991), Mace (1991), and Townsend (1994), the theory and the empirics of risk sharing have firstly developed looking at microeconomic structures, and centering on the behaviour of households or individuals. Many consumption insurance tests were carried out by using microdata (Cochrane (1991), Mace (1991), Hayashi et al. (1996), Attanasio & Davis (1996), Grande & Ventura (2002), Krueger & Perri (2005), Krueger & Perri (2011), and a lot more). At the same time, risk sharing was also investigated at the macro level, within the literature on international risk sharing - based on a representative-agent analog of the micro set-up - and which has introduced, both theoretically and empirically, the notion of risk sharing channels, as in the seminal paper by Asdrubali et al. (1996). More recently, many other papers (Ambrus et al. (2014), Cabrales et al. (2017), Fitzsimons et al. (2018), Woldemichael & Gurmu (2018), among the others) have analysed the risk sharing properties of networks, both theoretically and empirically.

This recent path taken by the risk sharing literature is quite closely related to our main topic, which empirically evaluates the risk sharing enhancing role of migrants' networks. In fact, the topic of migration and risk sharing has also been dealt with in the recent literature, but always from the perspective of the countries from which migration originates[1]. This is the case, for instance, of Balli & Rana (2015), focusing on the role of remittances in providing risk sharing, or of De Weerdt & Hirvonen (2016), highlighting the effects of internal migration on the welfare of extended family members at home. Moreover, nothing has been said to date about the potential effects of migration-induced diversity on risk sharing. Our aim, therefore, is to fill both gaps in the literature, by understanding whether immigration and diversity may have a sizeable impact on risk sharing in the receiving communities. The underlying idea is that immigration may foster risk sharing by introducing or enhancing informal smoothing channels, such as solidarity among households of the same or similar ethnic groups, informal finance, informal job recruitment (as illustrated in Sanders et al.

[1]However, the risk sharing effects of interstate migration were at least partially dealt with in Asdrubali et al. (1996).

(2002)). Social ties may be very strong within and across migrants' communities, as interestingly argued by Portes & Sensenbrenner (1993), and more recently by Herdağdelen et al. (2016), and may also spill over to native communities. The comprehensive review on migrants' social network in Ryan et al. (2015) confirms that this so-called "migrant capital" has been shown to facilitate settlement and help individuals once established in a new country.

Although works on risk sharing in social networks are sparse, some studies support the existence of potential for informal insurance within migrants' communities. Among these, Ambrus et al. (2014) develop a theoretical model that predicts that, when individual's connections serve as social collateral, resources are shared among local groups, and the effectiveness of these arrangements depends on the network's extension. Jain (2015) uses instead a laboratory experiment implemented in Kenya to show that, with imperfect monitoring, individuals that are socially close (as measured by living in the same village or belonging to the same ethnic group) engage in significantly more risk sharing than those that are distant. Evidence from villages in Côte d'Ivoire (Grimard (1997)) has also found that partial insurance is provided through informal risk sharing arrangements within members of the same ethnic groups, especially when formal financial resources are missing. Finally, some very interesting insight as to the working of migrant communities' networks in providing all sort of support, including risk sharing related assistance, to newcomers is provided in Munshi & Rosenzweig (2016).

3 The Model

Let us consider a very simple economy, where agents maximise a time-separable expected utility function defined over a single consumption good. Uncertainty is represented by S mutually exclusive states of the world, at every time period t, each one representing a complete description of the fundamentals of the economy. By solving the planner's problem we

can obtain the Pareto-optimal consumption allocations, which is also characterised by full risk sharing. The planner maximises the weighted sum of individual households' utilities subject to the feasibility constraint, i.e. that at each period and in each state of the world (in short, at each date-event pair (t, s)) the sum of household consumptions is matched by the sum of the corresponding endowments. The first order conditions of this maximisation problem, with respect to consumption at any date-event pair (t, s) can be written as:

$$(\rho^j)\lambda^j U_c(C^j_{t,s}, \delta^j_t) = \mu_{t,s}, j = 1, ..., J \tag{1}$$

where ρ^j is household $j's$ time preference, λ^j its Pareto weight (which can be shown to be inversely related to its endowment), δ^j is a taste parameter and $\mu_{t,s}$ the Lagrange multiplier associated with the aggregate feasibility constraint at date event pair (t, s), divided by the probability of date-event pair (t, s). The importance of this condition is that it already shows that, at an optimum, households' marginal utility is independent of individual household's endowment. Dividing the expression (1) at two different date-event pairs eliminates the time-invariant Pareto weight, yielding the new expression:

$$\rho^j \frac{U_c(C^j_{t,s}, \delta^j_{t+1})}{U_c(C^j_{t',s'}, \delta^j_t)} = \frac{\mu_{t,s}}{\mu_{t',s'}}, j = 1, ..., J. \tag{2}$$

This expression tells us that the marginal rate of substitution between two any date-event pairs, (t,s) and (t', s') is the same across households and independent of individual household's endowments. If we now specify the instantaneous utility function to be of the CRRA type (for simplicity, without preference shifters), such as $U(C^j_{t,s}) = \frac{(C^j_{t,s})^{\gamma^j}}{1-\gamma^j}$, equation (2) turns into:

$$\log\left(\frac{C^j_{t,s}}{C^j_{t',s'}}\right) = \frac{1}{\gamma^j}\left[\log\left(\frac{\mu_{t,s}}{\mu_{t',s'}}\right) - \log\left(\rho^j\right)\right] \tag{3}$$

where γ^j is household $j's$ risk aversion coefficient. The Pareto optimal solution, which is characterised by the planner's ability to redistribute income and consumption across all dates and states of the world, and thus by full risk sharing, implies that consumption growth

across any two date-event pairs (in practice, consumption growth over two periods), only depends on aggregate endowments, as represented by the Lagrange resource multipliers, while is totally independent of individual specific variables (income or other kind of idiosyncratic shocks).

At the other extreme, when it is not possible to effect any redistribution of income or consumption between any two date-event pairs, idiosyncratic shocks cannot be smoothed (risk cannot be shared) and households end up consuming their respective endowments at any date and in any state of the world, i.e.:

$$\log\left(\frac{C^j_{t',s'}}{C^j_{t,s}}\right) = \log\left(\frac{W^j_{t',s'}}{W^j_{t,s}}\right) \tag{4}$$

The Pareto optimal solution, and the ensuing irrelevance of idiosyncratic shocks to households' consumption, can also be achieved in a decentralised way, by an economy characterised by complete markets, or by ex post arrangements, such as taxation and transfers, informal transfers among households, or by using up one's own savings, or resorting to credit markets. Financial and credit markets, public transfers and taxation, and informal transfers can, therefore, be used to effect redistributions of income and consumption across periods and states of the world, and possibly get to a full risk sharing allocation.

Be as it may, the analysis sketched above has been used to define standard risk sharing (or consumption insurance) tests, which are based on regressions of the form:

$$\Delta\tilde{c}_{it} = \alpha + \beta\Delta\tilde{y}_{it} + \varepsilon_{it}\ , \tag{5}$$

where $\Delta\tilde{c}_{it}$ is idiosyncratic consumption growth (i.e. an individual specific shock to consumption at time t), and $\Delta\tilde{y}_{it}$ is the corresponding growth in idiosyncratic income (i.e. individual specific shock to income). The regression coefficient β measures the sensitivity of idiosyncratic consumption to idiosyncratic income, and has also been taken to gauge the extent of the departure from the hypothesis of perfect risk sharing (i.e. the case of $\beta = 0$, or perfect insurability of idiosyncratic shocks). A smaller β corresponds to a larger amount

of risk sharing at work in the economy, as the effect of idiosyncratic shocks to income are better smoothed by various insurance channels at work in the economy. Expression (5) can also be obtained by a rather different argument, albeit intuitively appealing, drawn from the model by Crucini (1999), and Artis & Hoffmann (2012), and based on an explicit process of income pooling. Defining by λ the share of income pooled by individuals, assuming constant proportionality between consumption and permanent income, one obtains:

$$\tilde{c}_{it} = (1-\lambda)\tilde{y}_{it} + \phi_i + \varepsilon_{it} \tag{6}$$

in log levels, and

$$\Delta\tilde{c}_{it} = (1-\lambda)\Delta\tilde{y}_{it} + \phi_i + \eta_{it} \tag{7}$$

in log differences, where the tilde indicates differences from the corresponding per capita value (identifying the idiosyncratic components of consumption and income). As it captures the share of income pooling among members of states or regions, λ can be impacted upon by several variables, including the share of foreign born population, possibly featuring higher levels of income pooling, as suggested in the review of the literature. (1-λ) is the equivalent of β in expression (5), and it is also a measure of lack of consumption insurance (originating from incomplete income pooling).

In many recent contributions (see for example, Mélitz & Zumer (1999), Mélitz (2004) and Kose et al. (2009)), one or more independent variables have been interacted with idiosyncratic income shocks, to measure the impact of those variables on the amount of risk sharing. The risk sharing regression then becomes:

$$\Delta\tilde{c}_{it} = \alpha + \beta\Delta\tilde{y}_{it} + \gamma\mathbf{X}_{it}\Delta\tilde{y}_{it} + \varepsilon_{it}\ , \tag{8}$$

where $\mathbf{X}_{it}$ is a vector of variables thought to affect risk sharing. The overall risk sharing coefficient will therefore be equal to $\beta + \gamma\mathbf{X}_{it}$, where γ measures the impact of variable X_{it} on overall risk sharing. If γ is negative, variable X_{it} increases overall risk sharing, while the opposite is true if γ is positive.

We will use equation (8) in the sequel, as we will try to assess the impact of both migration and cultural diversity on risk sharing. To identify the idiosyncratic components of consumption and income growth we will follow Fuleky et al. (2018), and use the Pesaran (2006) CCE estimator, in its two step version: we will first regress consumption and income growth rates upon the cross-sectional means of consumption and income growth rates, and then retain the residuals from such regressions as the idiosyncratic components, to be used in (5) and (8). Although the more standard simple demeaning would generate quantitatively similar results in terms of regression's coefficients, CCE does yield better estimates from a statistic viewpoint.

4 Data

Our dataset includes variables from different sources, whose main descriptive statistics are provided in Table 1. It is a panel composed by 50 cross-sectional units (49 states[2] and one federal district) observed over the period 2000-2015. The variables used for the main empirical specifications include each state average income, measured by real per capita GDP, personal non durable consumption expenditure, the share of foreign born over state population, denoted as *Migration*, and a measure of diversity. The first two variables are made available by the Bureau of Economic Analysis (BEA), while the latter two are aggregations of IPUMS USA microdata. As can be seen from the descriptives in Table 1, consumption, income and migration display quite a large amount of variability, both across time and geography. The computation of the diversity index is detailed in the following section. Apart from migration and diversity, the other variables have been used for robustness checks, to perform a few regressions of migration on a set of possible determinants which may also be connected to risk sharing, as will be more clearly illustrated below. Among these variables, employment rate, share of people with an undergraduate degree, and the wage and salary income are IPUMS aggregations, the share of GDP for each economic sector has been re-

[2]We only consider mainland US states, in the interest of sample homogeneity.

trieved from the BEA, while exports, and welfare expenditures are obtained from the US Census Bureau Government Finances and Foreign Trade sections. Note that as imports were only available for a subperiod, only exports (highly correlated with imports whenever both are available) have been used as a measure of openness. Savings are computed as disposable income net of personal consumption expenditure (BEA). All nominal measures have been deflated by the 2010 Consumer Price Index.

Table 1: Descriptive Statistics.

Variable	Mean	Standard Deviation	Min	Max	Observations
Consumption (Δ%)	0.0124	0.0142	-0.573	0.0745	750
Income (Δ%)	0.0078	0.0246	-0.0960	0.1764	750
Migration	0.0902	0.0622	0.0116	0.2839	800
DI_m	0.8664	0.0928	0.4918	0.9655	800
Employment Rate	0.7161	0.0457	0.6017	0.8267	800
Per capita GDP	48171.76	18172.04	28856.00	170687.00	800
Primary Sector	0.0449	0.0622	0.0000	0.3460	792
Tertiary Sector	0.6220	0.0760	0.3922	0.7881	800
Public Sector	0.1455	0.0430	0.0879	0.3842	800
Undergraduate Degrees	0.1224	0.0229	0.0645	0.2022	800
Exports	0.0695	0.0380	0.0081	0.2696	800
Total Welfare	2189.14	370.55	1083.89	3445.87	800
Savings	0.0697	0.0581	-0.1092	0.2429	800
Wage and Salary Income	38561.85	6099.10	27637.39	62566.24	800

Notes: Consumption and Income are expressed in log differences. Migration is the ratio of foreign born over total population in the same state. DI_m the Diversity Index calculated for the foreign born population. Employment Rate is the ratio of employed people in a state over total state population. Per capita GDP is calculated in 000 of US Dollars. Primary, Tertiary and Public Sector refer to the share of GDP allocated to each of those industry sectors in each state. Undergraduate Degrees in the share of population in a state whose maximum education is a the undergraduate level. Exports is the value of exports of each state as a share of their GDP. Total Welfare is the sum of the average per person social security income and average per person welfare income, and it is calculated in 000 of dollars. Savings the share of the state's average per person savings as a share of disposable income, with per person savings are calculated as the difference between disposable income and personal consumption expenditure. Wage and Salary Income is calculated in 000 of dollars. All monetary values are in real terms, as deflated by the 2010 Consumer Price Index.

5 Method

One of the most common measures of diversity is the frequently used (as, for instance, in Ottaviano & Peri (2006) and in Alesina et al. (2016)) Diversity index. For state s in year t this index is defined as:

$$DI_{st} = 1 - \sum_{i=1}^{M} \left(\frac{CoB_{ist}}{TP_{st}} \right)^2 = 1 - \sum_{i=1}^{M} (share_{ist})^2 \tag{9}$$

where CoB_{ist} is the number of residents born in country *i*, TP_{st} is the total population of the state, and *M* the number of different cultural/ethnic groups that are potentially present on the territory.

Table 2: Correlation coefficients

	Diversity index	Migration	DI_m
Diversity index	1.000		
Migration	0.998	1.000	
DI_m	-0.134	-0.143	1.000

Notes: Diversity index is calculated as in equation (7). Migration is the share of foreign born for each state and year. DI_m the Diversity index calculated for the foreign born population.

The diversity (or fractionalisation) index yields the probability that two individuals randomly drawn from the population of the state are born in different countries. Note that we only explicitly consider the groups that represent a share of the population of at least 0.5%, while all the others are regrouped in a residual category.

It turns out that the Diversity index can be expressed as the sum of two components, one representing diversity *between* natives and all foreign born and the other looking at differences *within* the immigrants groups. As a matter of fact, they both depend, in a multiplicative way, on the share of migrants over total population, which in turn implies that the correlation between the share of foreign born population and the Diversity index is likely

to be very high. Following the steps in Alesina et al. (2016), the index can be decomposed as

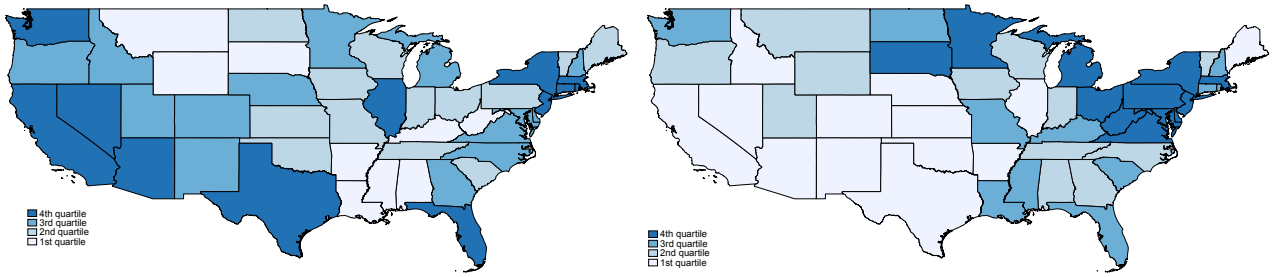
$$\begin{aligned} DI_{st} &= DI_{between} + DI_{within} = \\ &= 2 * share_{1st} * Migration_{st} + DI_{mst} * Migration_{st}^2 \end{aligned} \tag{10}$$

where $share_1$ is the share of native population and DI_m follows the same construction of DI but for the foreign born population only.

Indeed, in our sample the correlation is close to unity, as shown in Table 2. Therefore, we cannot use both migration and diversity as distinct regressors in the same equation. To be able to analyse both migration and diversity effects on risk sharing we resort to an alternative identification strategy, in the spirit of Alesina et al. (2016), whereby we use as independent variables both the share of foreign born and the Diversity index calculated for the migrant population DI_{mst} according to the following specification:

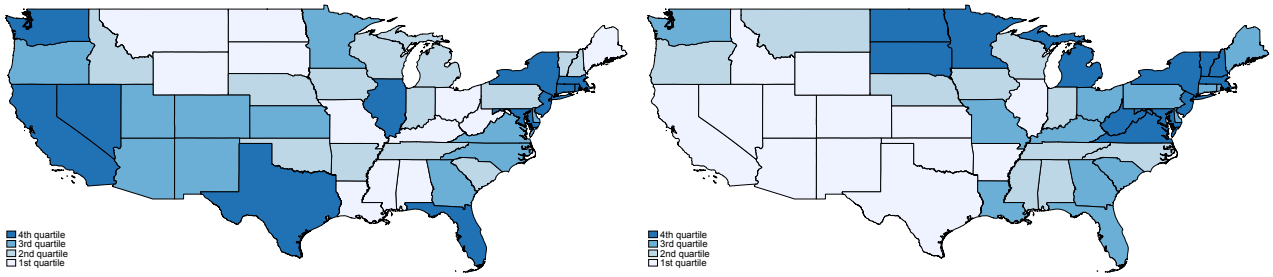
$$\Delta\tilde{c}_{st} = \alpha + \beta\Delta\tilde{y}_{st} + \gamma_1 Migration_{st}\Delta\tilde{y}_{st} + \gamma_2 DI_{mst}\Delta\tilde{y}_{st} + \varepsilon_{st} \ , \tag{11}$$

Figures (1) and (2) represent for comparison the distribution of these two variables in the first and last year of observation. The two maps provide with a visual representation of the desired property of the two measures, which appear not to be overlapping for most states. Although variations in migration and diversity across years are not striking, there is indeed a large and rather visible difference, in both periods, between the two migration related phenomena. In fact we can also check, in Table 2, that the correlation between migration and migrant diversity is negative, though not large in absolute value.



(a) (b)

Figure 1: Migration (a) and DI_m (b) in 2000.



(a) (b)

Figure 2: Migration (a) and DI_m (b) in 2015.

We run the model in equations (5) and (8) for the main specifications. In particular, the fact that both $\Delta\tilde{c}_{it}$ and $\Delta\tilde{y}_{it}$ are variations from the cross-sectional means of consumption and income allows us to omit time dummies. Moreover, after running the Hausman specification test we could not reject the null hypothesis of the random effect estimator being consistent and efficient. Therefore, this estimator is used for the regressions reported in Table 3 and Table 5. By the same test procedure, the auxiliary regressions in Table 4 employ instead fixed effect estimators.

6 Results

Table 3 illustrates the main results of our analysis. All coefficients are estimated precisely, and point at a positive effect of both diversity measures. In column (3) we include a quadratic term for the share of foreign born, to capture possible non linearities in the impact of migration upon risk sharing.

Table 3: Migration, Diversity and Risk Sharing.

	Consumption shocks		
	(1)	(2)	(3)
Income shocks	0.1886***	0.7315***	0.9517***
	(0.02)	(0.24)	(0.26)
Income shocks * Migration		-1.8427***	-5.1826***
		(0.44)	(1.54)
Income shocks * DI_m		-0.4593*	-0.5608**
		(0.26)	(0.27)
Income shocks * Migration^2			14.5922**
			(6.45)
R^2	*0.0857*	*0.1072*	*0.1133*
Observations	*750*	*750*	*750*

Notes: Random effects GLS regressions. *** p<0.01, ** p<0.05, * p<0.1. Consumption and Income shocks are calculated as detailed in Section 2. In columns (2) and (3) Migration is the ratio of foreign born over total population in the same state. DI_m is the Diversity Index calculated for the foreign born population.

A cursory look at coefficients and their statistical significance indicates that the overall degree of risk sharing is quite high but not full, around 81%, which is remarkably close to other results in the literature at the regional level (for example, Asdrubali et al. (1996) estimate the overall level of risk sharing at the same 81% in the period 1981-1990 for US states). In the second column we estimate equation (8), where income shocks are interacted with the percentage of foreign born in each state, and the sign of the interacted coefficient is negative, revealing a risk sharing increasing effect of the stock of migrants. However, column (3) also contains a quadratic interaction, with a positive and significant estimated coefficient, showing that the positive impact of migration on risk sharing is not monotonic, but decreases as migration grows over a certain threshold. In our dataset, this threshold is around 18% of foreign born population, quite close to the 90^{th} percentile of the share of migrants across mainland US states in the considered time frame. This share of foreign born population is associated to a minimum in the overall coefficient on the income shocks (i.e., accounting for both the linear and the quadratic effects), of around 0.006, when migrant diversity is set at its mean value across states, which corresponds to almost perfect consumption insurance (over 99% of idiosyncratic shocks to income are smoothed). This is the main and most remarkable finding in our analysis: migration exerts a positive, and

possibly strong, effect on risk sharing. However, migration must be complemented by diversity to achieve the best result. In fact, migration without diversity does not reduce the risk sharing coefficient (i.e. improve risk sharing) as effectively (column 2, setting diversity to 0), while it can reduce it almost to zero with an average value of diversity (column (3)). On the other hand, if we fix the share of migrants to its minimum over states and years, diversity may bring about a reduction in the risk sharing coefficient (hence an increase in risk sharing) by about 50%. Therefore, confirming the many results in the recent literature that were reviewed above, diversity is not a secondary trait of migration, also in relation to risk sharing.

Also, as mentioned in the data section, we would like to make sure that the results we get, in terms of risk sharing enhancing effects of migration, are not driven by underlying factors, for which migration itself might be a proxy. To check that this is not the case, and since we could not find adequate instruments to run a proper IV estimation, the original migration variable is replaced by the residuals of the equation reported in column (1) of Table 4, where migration is regressed on a set of possible determinants, which are thought to influence risk sharing. In other words, we purge migration of the indirect effects of other variables, possibly correlated with risk sharing. Fixed effects are also used in the regressions in Table 4, to account for regional unobserved heterogeneity.

Indeed, as we observe in Table 4, some risk sharing related variables are correlated with migration. For some variables the correlation is very weak, as revealed by the magnitude of the estimated coefficient (as for per capita GDP and undergraduate education), and from the difference in the R squared obtained with and without the variable (as in the case of total welfare expenditures, which is possibly the variable most directly related to risk sharing). For other variables the correlation with migration is opposite with respect to their expected effect on risk sharing (as for savings and wage and salary income), which constitutes an indirect confirmation of the robustness of our findings.

The results reported in Table 5, which uses this new, filtered, migration variables, broadly

Table 4: Migration and risk sharing related variables.

	Migration		
	(1)	(2)	(3)
Employment Rate	-0.0476**	0.0092	-0.0684***
	(0.02)	(0.04)	(0.02)
Per capita GDP	0.0008**	0.0001	0.0007**
	(0.00)	(0.00)	(0.00)
Primary Sector	0.0002	-0.0197	0.0062
	(0.04)	(0.03)	(0.04)
Tertiary Sector	0.1003***	-0.0224	0.1128***
	(0.03)	(0.03)	(0.03)
Public Sector	0.0405	0.2001**	0.0006
	(0.10)	(0.09)	(0.09)
Undergraduate Degrees	0.3698***	-0.0576	0.4431***
	(0.08)	(0.08)	(0.08)
Exports	0.0469	-0.0084	0.0505*
	(0.03)	(0.03)	(0.03)
Per capita Total Welfare	0.0057*	-0.0218***	
	(0.00)	(0.00)	
Savings	-0.0132	-0.0167	-0.0102
	(0.02)	(0.02)	(0.02)
Wage and Salary Income	-0.0009**	-0.0004	-0.0008**
	(0.00)	(0.00)	(0.00)
Time fixed effects	NO	YES	NO
Observations	*792*	*792*	*792*
R^2	*0.578*	*0.697*	*0.573*

Notes: Fixed Effects regressions with robust standard errors. *** p<0.01, ** p<0.05, * p<0.1. Migration is the ratio of foreign born over total population in the same state. Employment Rate is the ratio of employed people in a state over total state population. Per capita GDP is calculated in 000 of US Dollars. Primary, Tertiary and Public Sector refer to the share of GDP allocated to each of those industry sectors in each state. Undergraduate Degrees in the share of population in a state whose maximum education is a the undergraduate level. Exports is the value of exports of each state as a share of their GDP. Total Welfare is the sum of the average per person social security income and average per person welfare income, and it is calculated in 000 of dollars. Savings the share of the state's average per person savings as a share of disposable income, with per person savings are calculated as the difference between disposable income and personal consumption expenditure. Wage and Salary Income is calculated in 000 of dollars. All monetary values are in real terms, as deflated by the 2010 Consumer Price Index.

Table 5: Migration, Diversity and Risk Sharing.

	Consumption shocks		
	(1)	(2)	(3)
Income shocks	0.1886***	0.6501***	0.7099***
	(0.02)	(0.24)	(0.24)
Income shocks * Migration		-1.7425***	-2.5350***
		(0.52)	(0.65)
Income shocks * DI_m		-0.5537**	-0.6761**
		(0.28)	(0.28)
Income shocks * Migration^2			15.1201**
			(7.54)
R^2	*0.0857*	*0.1013*	*0.1062*
Observations	*750*	*742*	*742*

Notes: Random effects GLS regressions. *** p<0.01, ** p<0.05, * p<0.1. Consumption and Income shocks are calculated as detailed in Section 2. In columns (2) and (3) Migration is the ratio of foreign born over total population in the same state. DI_m the Diversity Index calculated for the foreign born population.

confirm those reported in Table 3, with some small differences in the estimated coefficients.

7 Conclusions

Many recent contributions in the literature have tried to evaluate the economic consequences of migration, both on the migrants' countries of origin and destination. This paper is meant to fill in a gap in this literature, by showing the effects of migration and ethnic diversity on risk sharing, at the regional level. Risk sharing is a key issue in any economy, as it has a direct impact on welfare, and an indirect impact on growth via investments and savings. We showed that migration has a positive and quite sizeable effect on risk sharing, but also that there is a threshold over which it can worsen an economy's performance in terms of risk sharing. However, this threshold is quite large, at least in the case of US states. This result is not too surprising, if we recall that migrants often come from developing countries, where income fluctuations abound (due to weather, diseases, natural disasters, etc...) and where rather efficient informal risk sharing arrangements have been arranged and commonly used. These mechanisms are often based on local obligations, which sometimes reach out to establish a situation of almost full insurance, as noted by Townsend (1994).

In view of the very high correlation of the foreign born share of population with a variable capturing ethnic diversity, the empirical effect of migration might also indirectly include, at least to some extent, the effects of diversity. Therefore, we have disentangled the two effects by separately including migrants and diversity among migrants, thus highlighting a distinct and sizeable beneficial effect of diversity on risk sharing. According to some contributions in organizational theory, surveyed in Horwitz & Horwitz (2007), where diversity was described as a "double edged sword", too much diversity might generate a decrease in trust, an increase in conflicts, and other negative outcomes. Also, the "Out of Africa" hypothesis (Ashraf & Galor (2013)) where diversity, genetically intended, has a non monotonic effect on development, seems to indicate a hump shaped effect of diversity. Our analysis could not detect any non linear effect in the impact of diversity[3], which calls for further empirical research in this direction.

In terms of policy implications, our results point at the need to favour integration measures to enhance risk sharing, at least at the regional level, and to avoid too much polarisation, as a more balanced mix of immigrant residents seems to be preferable to better smooth shocks to consumption.

8 Data availability statement

The data that support the findings of this study are available from the corresponding author, Luigi Ventura, upon reasonable request.

[3]Results for this regression specification are available upon request from the authors.

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