The Welfare Impact of Global Migration in the OECD Countries*

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Abstract

We develop a simple multi-country model to quantify the aggregate welfare effect of migration in the OECD countries. Our model enables to quantify four channels that determine this aggregate effect: the wage effect, the market size effect, the productivity effect and the fiscal effect. We distinguish between the impact of migration coming from dissimilar countries and the one arising within the OECD countries in order to assess the recent patterns of migration. We compare welfare under the observed levels of migration to a no-migration counterfactual. We observe that the gains from migration are mostly driven by the market size contrary to wage effect. Moreover, contrary to the perception in the public opinion, we find an insignificant fiscal impact of immigration. Surprisingly, gains from migration are driven by labor mobility coming from dissimilar countries and they are reduced by the migration within OECD countries. This second type of migration is characterized the emergence of a brain drain in developed economies. Finally, our results highlight the importance of international trade in distributing gains from migration across countries.

Keywords: migration, market size, general equilibrium, brain drain.

JEL Classifications: C68, F22, J24

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1 Introduction

Migration is nowadays a growing phenomenon in the OECD countries. The average share of immigrants in the population of developed economies increased from 4.5 percent in 1960 to 10.6 percent in 2010 (United Nations (2013)). Over the same period, public perception of migration has tended to be increasingly negative in those countries, especially towards immigration from poorer economies. The absence of comparative statics across countries certainly contributes to public confusion. The public opinion is of matter since it plays a major role in achieving effective economic policies. Therefore if it is irrationally distorted by fear, it could jeopardize the required adaptation of migration policies to the futur economic and demographic challenges that most OECD countries will face. It is then critical to confront it with precise facts.

We aim to quantify the economic impact of global migration (i.e. immigration and emigration) on the welfare of natives in each OECD country. We use a multi-country framework combining the major mechanisms highlighted in the current literature. This allows us to quantify the relative importance of each channel. Moreover, we aim to quantify the effects of the recent migration pattern observed in the OECD. The literature analyzing the effect of migration on the native's welfare legitimately focuses on the migration between significantly different countries in terms of productivity since this type of migration forms the majority of actual stock of migrants. However, migration within OECD countries is not only growing, it is also favoured and targeted by recent immigration policies. We then decompose the effect between migration within OECD countries and outside OECD countries in order to assess the countervailing force determining the aggregate welfare effect. The former fosters emigration in the OECD. This phenomenon, much less visible is rarely seen as a major problem. However, it is both non-negligible and skill-biased. On average, in the year 2000, 7.8 percent of natives from OECD countries had emigrated (Docquier et al (2013)). Emigration-driven losses in human capital may have serious welfare consequences for non-migrants. Our global assessment enables us to investigate whether the welfare effect is mostly diven by immigration or by emigration.

Our analysis completes the literature that has usually studied some effects of migration in single-country, partial equilibrium frameworks. The direct influence of labor mobility on the relative wages of low- and high-skilled people has been commonly studied. The results found in the literature depend on the elasticities of substitution assumed between groups of workers (see Borjas(2009), Ottaviano and Peri (2012), Docquier et al.(2013) and Battisti et al.(2014)). Skill-biased migration can also influence the speed of knowledge accumulation and innovation, leading to a productivity effect of migration (i.e. a change in the level of the total factor productivity). The combined wage and TFP effects of immigration are studied in Peri et al. (2013). They find that flows of scientists, technology professionals, engineers and mathematicians have a significantly positive effect on the wages of college-educated non-migrants in the U.S., and roughly no effect on the non-college-educated. For the same reasons, origin countries might suffer

from the negative consequences of high-skilled emigration. Migration also changes the number of net contributors to (and beneficiaries from) the welfare state and other public interventions. This phenomenon referred as the fiscal (or redistributive) effect of migration has been recently investigated in Dustmann and Frattini (2013) and Dustmann et al. (2010), among others. Finally, recent uncovered gains from migration have been studied by Iranzo and Peri (2009) and di Giovanni et al.(2014). Labor mobility affects the geographic distribution of workers and then the aggregate demand for domestic goods, altering the number of products available for consumption. In a love-of-variety environment, such change directly impacts the welfare of individuals. This phenomenon has been referred to as the market size effect of migration.

A growing consensus on the size of these effects has emerged due to the development of new theoretical foundations and availability of migration data. However these effects are interdependent and cannot be studied in isolation. Little is known about their relative magnitudes and their interdependencies. We revisit here the welfare impact of migration on non-movers in a unified framework. Our setup build upon di Giovanni et al. (2014)'s framework. The authors study the implications of global migration in a monopolistic competitition framework with heterogeneous firms à la Melitz (2003). We complete this study by decomposing the aggregate welfare effect into four channels in order to understand which of these drive the aggregate effect. To do so, we depart from their framework by assuming a simpler model which allows us to identify and quantify these channels through which migration affects the economy.Indeed, contrary to them, we assume homogeneous firms in productivity within a country and labor as the unique production factor. Moreover, we augment their study by modelling the fiscal impact of migration, technological externalities, and considering richer numerical experiments. We decompose the effect between migration within OECD countries and coming from outside the OECD while the literature has only focused on the latter. An analysis of migration in a multi-country framework can also be found in Ortega and Peri (2012), Iranzo and Peri (2009).

The model endogenizes nominal wages, total factor productivity, redistributive transfers from the high skilled to the low skilled, trade between country pairs, prices and the numbers of varieties available for consumption. It is calibrated to fit the economic and demographic situations of the 34 OECD countries in the year 2000. The effect of global migration on welfare is then computed using counterfactual experiments, i.e. a total or partial repatriation of migrants to their home countries. We identify the total economic impact for the high-skilled and the low-skilled natives, and identify the relative contribution of the four main channels described above: the labor market, TFP, market size and fiscal effects.

We observe that migration increases real wages in the OECD countries by 0.9% on average. These gains are unequally distributed across OECD countries. Few countries like Australia, Canada or Switzerland reap the benefits from large immigration. Contrary to these economies, countries encountering a sizable outflow of labor suffer from migration. In our complex economy, heterogeneous workers alter the workforce in different ways. This is the consequence of labor

market and fiscal effects, the signs of which depend on the effect of migration on the proportion of high-skilled in the labor force. Our results show that low-skilled workers are the most exposed to migration shocks. In countries gaining from migration, the low skilled are relatively better off than the high skilled. On the contrary, their real wage drastically falls in countries subject to brain drain. Migrants are the most vulnerable to labor mobility facing on average a fall in their real wage.

Disentangling the aggregate welfare effect reveals interesting results. First, the gains from variety as well as the TFP effect account for the majority of the absolute changes in the real wage contrary to wage effect. They affect identically all residents in a particular country. Hence, our simulations suggest that the between-country welfare effects of migration exceed the within-country effects. Moreover, contrary to the perception in the public opinion, we observe that the fiscal impact of immigration is close to zero on average. Recent migration policies have targeted migration from comparable countries, disregarding the brain drain that it initiates in developed economies. We observe that gains from migration are driven by labor mobility coming from dissimilar countries in terms of productivity and they are reduced by the migration within OECD countries. The latter deteriorates the market size and the long run productivity in most of OECD countries. Finally, our model also highlights the importance of international trade in distributing gains from migration across countries.

The reminder of the paper is organized as follows. In the next section we present the theoretical model. In the third section we describe the solution algorithm and the calibration strategy. Section 4 presents the main results of the simulation as well as the role of international trade. Section 5 discusses an extension and presents a sensitivity analysis. Section 6 concludes.

2 The model

We develop a multi-country model endogenizing the economic effect of global migration (i.e. immigration of foreigners and emigration of nationals) on the welfare of natives in the OECD countries. We distinguish between four channels of influence: labor market effects, changes in total factor productivity (TFP), fiscal effects and changes in the mass of horizontally differentiated products available to consumers. We model the labor market and TFP effects as in Docquier and al.(2014) and the love-of-variety effect as in Dixit-Stiglitz (1977) and Krugman (1980). In particular, Krugman (1980) endogenizes the mass of varieties produced in a country as a function of market size. By changing the mass and the type of consumers/workers in origin and destination countries, migration affects total productivity, aggregate demand and the mass of varieties produced. The resulting welfare impact is transmitted across countries through endogeneous trade flows.

Our model is static and includes N countries indexed by $i \in \{1, 2, ..., N\}$. Total population in country i is denoted by L_i^T and is divided into four types of individuals: L_i^L low-skilled natives,

L_i^H high-skilled natives, L_i^l low-skilled migrants and L_i^h high-skilled migrants. We denote the individual type by $m \in \{H, L, h, l\}$ and assume all individuals have identical preferences. We also use superscript S when aggregating high-skilled nationals and foreigners (H, h), and subscript U when aggregating the less educated (L, l). Individuals only differ in terms of income and place of residence, determining the access to local and foreign varieties. The demographic structure is considered as exogenous: our goal is to quantify the effect of exogenous changes in the population allocation on welfare and inequality between and within country. In this section, we describe the preferences and technologies used to endogenize consumers' and firms' decisions. We then characterize the competitive equilibrium of our economy.

2.1 Preferences and consumers' decisions

Preferences of a representative consumer of type $m \in \{H, L, h, l\}$ in country i are described by a CES utility function over a continuum of varieties indexed by k:

$$U_i^m = \left(\sum_{j \in N_i} \int_0^{B_j} q_{ij}^m(k)^{\frac{\epsilon-1}{\epsilon}} dk \right)^{\frac{\epsilon}{\epsilon-1}}, \tag{1}$$

where $q_{ij}^m(k)$ stands for the quantity of variety k produced in country j and consumed in country i. The set of countries that export to country i is denoted by N_i, whereas B_j is the mass of varieties produced in country j, equal to the number of entrepreneurs. Varieties are imperfect substitutes, characterized by a constant elasticity of substitution equal to $\epsilon > 1$.[1]

The utility function (1) is maximized subject to a standard budget constraint:

$$\sum_{j \in N_i} \int_0^{B_j} p_{ij}(k) q_{ij}^m(k) dk = \tilde{w}_i^m.$$

where $\tilde{w}_i^m$ represents the net (i.e. after-redistribution) nominal wage of a worker of type m who lives in country i. The representative consumer of group m is remunerated according to the type of labor she supplies. The CES preferences induce that she spends all her income on consumption and every available variety faces a positive demand (i.e. $\lim_{x_{ij}^m(k) \to 0} \frac{\partial U_i^m}{\partial x_{ij}^m(k)} = \infty$).

The demand function derived from the first-order condition of this maximization problem writes as:

$$q_{ij}^m(k) = \frac{p_{ij}^{-\epsilon}(k)}{P_i^{1-\epsilon}} \tilde{w}_i^m. \tag{2}$$

[1] We follow the traditional Krugman 1980's model by supposing that foreign and domestic products enter symmetrically in the utility function and they are subject to the same elasticity of substitution.

where P_i denotes the ideal price index in country i and is defined as:

$$P_i = \left[\sum_{j \in N_i} \int_0^{B_j} p_{ij}(k)^{1-\epsilon} dk \right]^{\frac{1}{1-\epsilon}}. \tag{3}$$

The latter expression reflects the underlying love-of-variety property of the CES utility function (1). Given that $\epsilon > 1$, a greater mass of varieties tends to lower the value of the price index. Intuitevely, under CES preferences, the price index should be seen as an index of cost of living. Increasing the mass of varieties reduces the cost of living and increases individual's welfare (keeping consumer's expenditure unchanged). Indeed, the individual indirect utility function is given by:

$$U_i^m = \left(\sum_{j \in N_i} \int_0^{B_j} \left(\frac{p_{ij}(k)^{-\epsilon}}{P_i^{1-\epsilon}} \tilde{w}_i^m \right)^{\frac{\epsilon-1}{\epsilon}} dk \right)^{\frac{\epsilon}{\epsilon-1}} = \frac{\tilde{w}_i^m}{P_i}. \tag{4}$$

with $\frac{\partial P_i}{\partial B_j} < 0$ and so $\frac{\partial U_i^m}{\partial B_j} > 0$.

From (2), we derive the demand function faced by each firm, $q_i(k)$, and the total expenditure function in country i, X_i :

$$q_i(k) = \sum_{j=1}^{N} \sum_{m} q_{ij}^m(k) \qquad \text{and} \qquad X_i = \sum_{j=1}^{N} \int_0^{B_j} q_{ji} p_{ji} dk. \tag{5}$$

2.2 Technology and firms' decisions

In each country i there are B_i firms that operate on a monopolistically competitive market. Production requires labor, which is supplied inelastically by the four types of imperfectly substitutable workers. The labor market is perfectly competitive. Therefore, each type of workers is paid according to her marginal productivity. Contrary to di Giovanni et al. (2014), we assume homogeneous firms in productivity within a country and labor as the unique production factor. Considering heterogeneous firms and intermediate inputs have both advantages and disadvantages. On the one hand, they might provide a more realistic representation of macro and micro features highlighted by the recent literature in trade. On the other hand, they require to define firm's preferences towards intermediate goods and a precise calibration of the parameters of the distribution of firms' productivity and size. The former is difficult to model in a one sector framework and usually imposes the strong assumption of identical preferences for consumers and firms. The literature is still at its early stage concerning the latter and, due to data limitation, has essentially focused on the United States. Therefore, calibrating a model with heterogeneous firms requires assuming a homogenous distribution of firms' productivity and size across countries, parameterized on the United States. Although di Giovanni and Levchenko (2011,2013) provide important contributions to the literature on firms' heterogeneity, we opt for a simpler

and open model which allows us to identify and quantify the main channels through which migration affects the economy. We then use the well-established gravity equation to estimate the trade cost matrix in order to successfully replicate the key macro features of the economy.

Each firm maximizes its profit which then leads to the decision whether to enter the market or not and what price to set if it start to produce. For the sake of clarity, we separately describe two related sides of the profit maximization problem, i.e. the minimization of the unit cost of production for a given level of output, and the determination of the optimal price and output. We first describe the former that enables to highlight the labor demand for each type of workers as well as the full employment condition. We continue with the latter that allows us to derive the pricing rule and the optimal output per firm.

2.2.1 Production function

The production function of firm k in country i is defined as a nested constant-elasticity-of-substitution (CES) function of workers. The upper level production function determines the quantity of high skilled and low skilled workers needed to produce $y_i(k)$ and is specified as:

$$y_i(k) = A_i \bar{\ell}_i^T(k) = A_i \left(\theta_i^S \left(\bar{\ell}_i^S(k) \right)^{\frac{\sigma_S - 1}{\sigma_S}} + \left(1 - \theta_i^S \right) \left(\bar{\ell}_i^U(k) \right)^{\frac{\sigma_S - 1}{\sigma_S}} \right)^{\frac{\sigma_S}{\sigma_S - 1}}, \tag{6}$$

where A_i is the country-specific level of total factor productivity (TFP), $\bar{\ell}_i^T(k)$ is the total employment expressed in efficiency units by firm k which divides into $\bar{\ell}_i^S(k)$ and $\bar{\ell}_i^U(k)$, total employment of high-skilled and low-skilled labor in efficiency units. Each factor is defined in terms of efficiency units to account for the inherent productivity of each type of workers and the benefits from interactions between groups. The elasticity of substitution, $\sigma_S \in (1, \infty)$, captures the imperfect substitutability between workers of different education levels. Parameter θ_i^S reflects the relative preference for high-skilled labor.

The economy-wide TFP level, A_i, is endogenous and depends on the average proportion of high-skilled workers in the economy, g_i. We assume a concave functional form:

$$A_i = \bar{A}_i g_i^{\lambda}, \qquad g_i \equiv \frac{L_i^H + L_i^h}{L_i^T}, \tag{7}$$

where λ is the elasticity of A_i with respect to g_i. The TFP level varies with a change in the composition of the labor force.

Moreover, it is well documented that conditional on education, immigrants and natives are imperfect substitutes. Recent papers (such as Ottaviano and Peri (2012), Manacorda et al. (2012)) find imperfect degrees of substitution beween these two types of workforce. To account for this, we define the efficient labor supply for each level of education as a CES function of

native and immigrant employment:

$$\begin{aligned}\bar{\ell}_i^U(k) &= \left[\theta_i^M \left(\ell_i^L(k)\right)^{\frac{\sigma_M-1}{\sigma_M}} + \left(1-\theta_i^M\right)\left(\ell_i^l(k)\right)^{\frac{\sigma_M-1}{\sigma_M}}\right]^{\frac{\sigma_M}{\sigma_M-1}}, \\ \bar{\ell}_i^S(k) &= \left[\theta_i^M \left(\ell_i^H(k)\right)^{\frac{\sigma_M-1}{\sigma_M}} + \left(1-\theta_i^M\right)\left(\ell_i^h(k)\right)^{\frac{\sigma_M-1}{\sigma_M}}\right]^{\frac{\sigma_M}{\sigma_M-1}}.\end{aligned} \tag{8}$$

where the country-specific θ_i^M is a parameter of relative preference for national workers, and $\sigma_M \in (1,\infty)$ is the elasticity of substitution between national and foreign workers.

2.2.2 Optimal labor demand

The before-tax nominal wage rate for a worker of type $m \in \{H,L,h,l\}$ is denoted by w_i^m. Each firm takes w_i^m as given since the labor market is competitive. The ideal (composite) wages of efficient low-skilled and high-skilled workers, denoted by W_i^U and W_i^S, and the ideal composite aggregate wage, denoted by W_i, result from the cost minimization described below. As high-skilled workers are more productive, we generally observe that $W_i^S > W_i^U$; and within each skill category, nationals are usually better paid than immigrants (reflecting, for instance, the imperfect transferability of skills across countries): $w_i^H > w_i^h$ and $w_i^L > w_i^l$. The optimal labor demand allocated to the production process is determined by a two-stage cost minimization.

First, for a given production level $y_i(k)$, each firm chooses the optimal combination of high-skilled and low-skilled workers that minimizes the total labor cost:

$$\min_{\bar{\ell}_i^S(k),\bar{\ell}_i^U(k)} W_i^S \bar{\ell}_i^S(k) + W_i^U \bar{\ell}_i^U(k)$$

$$s.t.\ A_i\left(\theta_i^S\left(\bar{\ell}_i^S(k)\right)^{\frac{\sigma_S-1}{\sigma_S}} + \left(1-\theta_i^S\right)\left(\bar{\ell}_i^U(k)\right)^{\frac{\sigma_S-1}{\sigma_S}}\right)^{\frac{\sigma_S}{\sigma_S-1}} \geq y_i(k).$$

The first-order conditions determine the optimal demands for efficient low- and high-skilled workers in firm k:

$$\bar{\ell}_i^S(k) = \frac{y_i(k)}{A_i}\left(\frac{\theta_i^S W_i}{W_i^S}\right)^{\sigma_S} \qquad \text{and} \qquad \bar{\ell}_i^U(k) = \frac{y_i(k)}{A_i}\left(\frac{(1-\theta_i^S) W_i}{W_i^U}\right)^{\sigma_S}, \tag{9}$$

where W_i is the aggregate wage index and is defined as:

$$W_i = \left[\left(\theta_i^S\right)^{\sigma_S}\left(W_i^S\right)^{1-\sigma_S} + (1-\theta_i^S)^{\sigma_S}\left(W_i^U\right)^{1-\sigma_S}\right]^{\frac{1}{1-\sigma_S}}. \tag{10}$$

Eq. (9) shows that the demand for each type of efficient labor aggregate increases for a given quantity $y_i(k)$ and decreases with the composite labor cost for this particular group of workers. Since $y_i(k)$ is proportional to the TFP, a change in A_i has no effect on the demand for labor. Indeed, we have $y_i(k)/A_i = \bar{\ell}_i^T(k)$ from (6). The assumption of imperfect substitutiability

between the inputs leads the labor demand for each skill level to be a function of all inputs'prices (through the aggregate wage index W_i). Then, the higher the elasticity of substitution between the two types of workforce σ_S, the higher the demand for the relatively cheaper type of labor.

Second, each firm chooses the optimal combination of national and foreign workers within each education category, taking the total supply of efficient high (low) skilled labor as given (see (9)). A firm solves the following cost minimization for the high skilled workers:

$$\min_{\ell_i^H(k),\ell_i^h(k)} w_i^H \ell_i^H(k) + w_i^h \ell_i^h(k)$$

subject to

$$s.t. \left(\theta_i^M \left(\ell_i^H(k)\right)^{\frac{\sigma_M-1}{\sigma_M}} + \left(1-\theta_i^M\right)\left(\ell_i^h(k)\right)^{\frac{\sigma_M-1}{\sigma_M}}\right)^{\frac{\sigma_M}{\sigma_M-1}} \geq \bar{\ell}_i^S(k).$$

The optimal labor demands for skilled natives and migrants are then equal to:

$$\ell_i^H(k) = \bar{\ell}_i^S(k)\left(\frac{\theta_i^M W_i^S}{w_i^H}\right)^{\sigma_M} \quad (11)$$

$$= \bar{\ell}_i^T(k)\left(\frac{\theta_i^S W_i}{W_i^S}\right)^{\sigma_S}\left(\frac{\theta_i^M W_i^S}{w_i^H}\right)^{\sigma_M} \quad (12)$$

and

$$\ell_i^h(k) = \bar{\ell}_i^S(k)\left(\frac{(1-\theta_i^M) W_i^S}{w_i^h}\right)^{\sigma_M}$$

$$= \bar{\ell}_i^T(k)\left(\frac{\theta_i^S W_i}{W_i^S}\right)^{\sigma_S}\left(\frac{(1-\theta_i^M) W_i^S}{w_i^h}\right)^{\sigma_M}$$

where W_i^S is the wage index for the efficient high skilled labor composite described in (9), which we refer to as a wage index for high skilled:

$$W_i^S = \left[\left(\theta_i^M\right)^{\sigma_M}\left(w_i^H\right)^{1-\sigma_M} + \left(1-\theta_i^M\right)^{\sigma_M}\left(w_i^h\right)^{1-\sigma_M}\right]^{\frac{1}{1-\sigma_M}}. \quad (13)$$

Labor demand and wage index for low skilled natives and migrants are derived in a symmetric way. The homogeneity of firms induces that $\ell_i^S(k) = \ell_i^S$ and $\ell_i^U(k) = \ell_i^U$. For the sake of clarity, we will then drop the indice k henceforth.

The cost minimization problem described above first determines the optimal unit cost of production for each firm:

$$c_i = \frac{w_i^H l_i^H + w_i^h l_i^h + w_i^L l_i^L + w_i^l l_i^l}{y_i(k)} = \frac{W_i}{A_i}. \quad (14)$$

Second, it establishes the labor demand for the share of the workforce allocated to the production

process and consequently the total labor demand in the economy i. Indeed, to enter in the domestic market, each firm in country i faces a fixed entry cost, f_i, measured in the units of the efficient labor composite.[2] This cost can be interpreted as the investment that a firm must make in order to differentiate its product. Therefore, the aggregate demand for labor also includes the one for the workers who are employed for investment purposes. The amount of efficient labor required to create a mass B_i of firms (i.e. the total fixed cost of entry born by the economy) equals $B_i f_i$, inducing a monetary cost of $B_i f_i W_i$. The total share of efficient labor devoted to creating firms is then $\xi \equiv \frac{f_i B_i W_i}{W_i \bar{L}_i^T} = \frac{1}{\epsilon}$ and then $1-\xi$ (i.e. $\frac{\epsilon-1}{\epsilon}$) of workers produces the final good.[3] Therefore, the efficient labor per firm, $\bar{\ell}_i^T(k)$, can be rewritten as

$$\bar{\ell}_i^T(k) = \frac{\epsilon - 1}{\epsilon} \frac{\bar{L}_i^T}{B_i}, \tag{15}$$

Consequently, given that the share of labor allocated to the firm creation is constant, the total labor demand in the economy is defined as:

$$L_i^m = B_i \left(f_i + \ell_i^T \right).$$

2.2.3 Optimal price and output

The firm's profit maximization determines the price and quantity produced per firm. Each firm differentiates its product. Indeed, the love-of-variety assumption induces that every variety is consumed, consequently two firms do not manufacture the same product. At the same time since we assume a continuum of firms, the effect of the pricing rule of each firm on the demand for another firm is negligible. Therefore, each firm faces a residual demand curve with a constant elasticity of substitution equal to ϵ and then chooses the same markup $\epsilon/(\epsilon-1)$ which yields the following pricing rule:

$$p_i = \frac{\epsilon}{\epsilon - 1} c_i = \frac{\epsilon}{\epsilon - 1} \frac{W_i}{A_i}. \tag{16}$$

Where c_i is the marginal cost of production defined in (14). Moreover, a firm from country i faces an iceberg trade cost $\tau_{ij}>1 \ \forall \ i \neq j$ if it exports to country j. Hence, the price paid by consumers in country j for the goods produced in country i equals to $p_{ij} = p_j \tau_{ij} \ \forall i \neq j$. Due to the love-of-variety property of the preferences, each firm exports to all foreign markets as long as the trade cost is finite.

The output per firm, y_i, is determined by the profit maximization and the free entry condition. Indeed, as long as the profits are positive, new firms will enter in the market causing profits to fall until they are driven to zero. In equilibrium, the profit of each firm k operating on the market

[2] We assume that firms have perfect information about the costs of entry, thus they will be indifferent between paying the one time investment cost $\bar{f}_i$ and the amortized, discounted per-period portion of this cost $f_i = \bar{f}_i / d_i$. In a dynamic framework, d_i would be the expected age of a firm operating in country i.

[3] We assume that both the marginal entrepreneur and the marginal worker are remunerated identically, so that those two agents are indifferent between being employed and starting a firm.

is equal to zero:

$$\pi = (p_i - c_i)\, y_i - W_i f_i = 0, \tag{17}$$

By replacing the price by its value defined in (16) in the zero profit condition (17), we derive the output per firm:

$$y_i = (\epsilon - 1) A_i f_i. \tag{18}$$

Finally, we derive the mass of varieties B_i produced in the economy i as a function of country size. To do so, we define the total production in the economy i, $B_i y_i$. We then substitute (15) for $\bar{\ell}_i^T$ into (6) and equalizes to its value defined in (18).

$$B_i y_i = B_i A_i \bar{\ell}_i^T = A_i \tfrac{\epsilon-1}{\epsilon} \bar{L}_i = B_i (\epsilon - 1) A_i f_i,$$

The mass of varieties produced in the economy i is then:

$$B_i = \frac{\bar{L}_i^T}{\epsilon f_i}. \tag{19}$$

This result is similar to the one derived by Krugman (1980). The equilibrium number of firms in a particular country is proportional to the size of the country, $\bar{L}_i^T$ and inversely proportional to the fixed cost, f_i. In line with a recent literature (see Helpman et.al (2008)), we assume a country specific entry cost. Therefore, a reallocation of the population across countries might change the aggregate mass of varieties. Indeed, if the workforce moves to countries with lower entry cost, the aggregate mass of varieties will increase, potentially enhancing the global welfare.

2.3 Taxes and transfers

Our model accounts for redistributive taxes and transfers. We assume that a proportional tax is levied on all high-skilled workers (natives and migrants) to increase the income of low-skilled national and foreign workers. We denote the taxe rate on the high-skilled workers' nominal income and the subsidy rate for the low-skilled ones by t_i and b_i, respectively. Therefore, the after tax income of a high-skilled worker is equal to $\tilde{w}_i^m = (1 - t_i) w_i^m$ for $m \in \{H, h\}$ while the one of a low-skilled individual after the transfer equals $\tilde{w}_i^m = (1 + b_i) w_i^m$ for $m \in \{L, l\}$. The government budget constraint writes as

$$t_i \left(w_i^H L_i^H + w_i^h L_i^h \right) = b_i \left(w_i^L L_i^L + w_i^l L_i^l \right). \tag{20}$$

In our numerical analysis, we assume fixed-benefit redistributive schemes. Hence, the tax rate adjusts to balance the government budget. One can observe that by changing the ratio of high-skilled to low-skilled workers in origin and destination countries, migration affects the number of beneficiaries and contributors to the redistributive scheme.

2.4 Equilibrium

A competitive equilibrium is a set $(A_i, w_i^m, W_i, W_i^S, W_i^U, c_i, X_i, p_i, P_i, B_i, t_i)_{i\in N}$ such that for a set of common parameters (ϵ, λ, σ_s, σ_M), a set of country-specific parameters $(\theta_i^S, \theta_i^U, L_i^m, \bar{A}_i, f_i, b_i)_{i\in N}$ and the matrice of country-pair trade costs $(\tau_{ij})_{i,j\in N}$:

1. A_i is a predetermined variable by $\bar{A}_i$ and the exogeneous labour supply.

2. Each vector of nominal wages in country i, w_i^m, is determined by the following four labor market clearing equations.

$$
\begin{aligned}
L_i^L &= (1-\xi)\bar{L}_i^T(1-\theta_i^S)^{\sigma_S}\left(\theta_i^M\right)^{\sigma_M}(W_i)^{\sigma_S}\left(W_i^U\right)^{\sigma_M-\sigma_S}(w_i^L)^{-\sigma_M},\\
L_i^H &= (1-\xi)\bar{L}_i^T\left(\theta_i^S\right)^{\sigma_S}\left(\theta_i^M\right)^{\sigma_M}(W_i)^{\sigma_S}\left(W_i^S\right)^{\sigma_M-\sigma_S}\left(w_i^H\right)^{-\sigma_M},\\
L_i^l &= (1-\xi)\bar{L}_i^T(1-\theta_i^S)^{\sigma_S}(1-\theta_i^M)^{\sigma_M}(W_i)^{\sigma_S}\left(W_i^U\right)^{\sigma_M-\sigma_S}(w_i^l)^{-\sigma_M},\\
L_i^h &= (1-\xi)\bar{L}_i^T\left(\theta_i^S\right)^{\sigma_S}(1-\theta_i^M)^{\sigma_M}(W_i)^{\sigma_S}\left(W_i^S\right)^{\sigma_M-\sigma_S}(w_i^h)^{-\sigma_M}.
\end{aligned}
$$

   where $L_i^L, L_i^H, L_i^l, L_i^h$ are the exogenous values of labor supplies, for every country i.

   The equilibrium wages then determine $\{W_i, W_i^S, W_i^U, c_i, p_i\}$ by (10), (13) and t_i by (20).

3. The optimal mass of varieties produced in country i, B_i is pinned down by the ouptut clearing condition, the zero profit condition and the full employment condition.

   The equilibrium mass of varieties, B_i and the equilibrium wage index, W_i determine then P_i by (3) and X_i by (5).

4. Finally, the trade matrix $[X_{ij}]_{i,j\in N}$ is determined by the balance of payments equilibrium, X_i and the trade cost matrix $\tau_{ij\,i,j\in N}$.

2.5 Welfare decomposition

Our model enables to decompose the indirect utility function of an individual of type m in country i (defined as the real wage in eq.(4)) into five components. All of these elements are altered by migration, as it is shown in figure (1).

The wage effect is the most common channel highlighted in the literature especially for low-skilled workers. A change in the population size, L_i, due to migration affects the workforce size and then its wage. Eq. (2) shows the negative relationship between the size of each type of workers $m \in$\{H, L, h, l\} and its wage. Because we model heterogeneous workers, the wage effect also captures the compositional change in the workforce generated by migration. Indeed, the skill distribution across migrants might differ from the one across natives. Therefore, migration has not only an effect on the supply of labor but also on the wage of the skilled workers relative to the unskilled ones.

This compositional change of the workforce might also affect the whole economy. This is captured by our second channel, the TFP effect. In our model, the long-run level of productivity of all factors is increasing in the share of high skilled workers in the population as described in (7). Therefore, if migration (immigration and emigration) leads to an increase in the high-skilled share of the population, it will also improve the total productivity of the economy leading to rise the nominal wage of every workers.

Beyond the traditional wage effect, our model enables to identify recently uncovered gains from migration that might enhance global welfare (including the country subject to emigration). Immigration does not only alter the workforce but also stimulates the domestic demand. This channel is captured by a fall in the price index (3). Due to the presence of trade cost, this increase in the domestic demand is biased towards domestic varieties (if the wage difference across countries does not offset this advantage). Indeed, in (3), each variety is weighted by the price (including the trade cost). Other things unchanged, a increase in the mass of varieties produced in country i leads to a greater fall in the price index. Moreover, migration may also increase the global mass of varietie if the population moves towards more efficient market (i.e. lower market entry cost) as shown in eq.(19). Therefore, in the presence of trade, the sending country may also gain from migration if the aggregate mass of varieties increases. Indeed, even though the mass of domestic products decreases, the one imported expands rising the welfare of stayers. International trade coupled with migration might then have a global welfare enhancing effect. The market size effect is challenging to quantify because the changes in the price index capture not only the change in mass of varieties but also the productivity gain through the change in the price (name the general equilibrium effect in figure (1)). We isolate the gains from variety by computing the change in the price index keeping the price constant.

Finally, the fiscal effect forms the last channel we identify. It has been largely disregarded even though it animates debates and political campaigns. We quantify how migrants, by changing the ratio of high-skilled to low-skilled workers in origin and destination countries, affect the number of beneficiaries and contributors to the redistributive scheme.

3 Identification of parameters and simulations

We solve the general multi-country model described in Section 2 for the 34 OECD countries and the Rest of the World (ROW), i.e. the aggregation of all non-OECD countries. To do so, we use stocks and flows of migrants from Docquier et al. (2013). They are disaggregated by education level, origin and destination countries. This dataset is available for the years 1990 and 2000. There are in total ten parameters. Four of them are common across countries and are set a priori following the literature. The bilateral costs of trade is country-pair specific and is empirically estimated. Finally, five of them are country specific. Amongst those, four are calibrated.

3.1 Common parameters

We assume the following reference values for the a priori fixed parameters $\{\epsilon, \lambda, \sigma_s, \sigma_M\}$. The elasticity of substitution between varieties of goods, ϵ, was estimated by Feenstra (1994) in the range of [2.96; 8.38]. We take $\epsilon = 4$. The elasticity of the TFP with respect to the proportion of college graduates in the labor force is assumed to be equal to $\lambda = 0.3$. This value is in between the estimates found by Acemoglu and Angrist (2000) ($\lambda = 0$) and by Moretti (2004) ($\lambda = 0.75$). Finally, we follow Docquier et al. (2013) in setting the values of σ_S and σ_M. We take the middle value amongst the range of elasticities found in the literature: $\sigma_S = 1.75$ and $\sigma_M = 20$. A sensitivity analysis conducted with respect to the values fixed for these parameters is described in section 5.

3.2 Country-pair specific parameter

It is well established that the bilateral trade costs $[\tau_{ij}]_{i,j\in N}$ play a major role in shaping the trade patterns (see Anderson and VanWincoop (2004)). To the best of our knowledge, the following quantitative analysis has always relied on a calibrated parameter for trade barriers. However, Anderson and VanWincoop (2003) microfound the gravity equation based on a model assuming CES preferences, horizontally differentiated goods by country and monopolistic competition. The similarity of our model with their microfoundations as well as the success of the gravity equation to replicate the key macro features of the economy provide an opportunity to use precise estimates for the trade costs.

We estimate the matrix of bilateral trade costs $[\tau_{ij}]_{i,j\in N}$ using 2000's bilateral trade flows from the CEPII gravity dataset.[4] This dataset also includes other determinants of trade such as dummies for common currency, common language or legal system, the existence of regional trade agreement (free trade agreement). We augment our estimates by using the geographic data from CEPII Distances dataset including indicators of sharing border, sharing official language and the history of colonizing.

First, we estimate the log-linearized equation describing the bilateral trade flows which yields the following gravity expression:

$$\begin{aligned}\ln(X_{ij}) &= \beta_0 + \lambda_i + \phi_j + \beta_1 \ln(Dist_{ij}) + \beta_2 Border_{ij} + \beta_3 Legal_{ij} + \beta_4 Language_{ij} + \beta_5 Colonial_{ij} \\ &\quad + \beta_6 CU_{ij} + \beta_7 FTA_{ij} + u_{ij},\end{aligned}$$

where λ_i is a fixed effect of the importing country and ϕ_j is a fixed effect for the exporting

[4]This dataset does not disentangle trade flows from Belgium and Luxembourg. We then collect the data for those two countries. Trade flows are from the UN Comtrade Statistics Database, RTA from the the WTO web site and data on common legal origins of the two countries are available from Andrei Shleifer's website. Finally, trade flows between Australia and Luxembourg and Turkey and Luxembourg are not reported for the year 2000. As Belgium is the most similar country to Luxembourg, we predict the trade between those countries from Belgian observations.

country. Trade barriers are proxied by standard bilateral variables which affect the volume of exports; geographic distance ($Dist$), common border ($Border$), same legal system ($Legal$), common language ($Language$), colonial ties ($Colonial$), common currency (CU) and free trade agreement (FTA). The standard errors are adjusted for heteroskedasticity. Our sample is composed of the OECD countries and other large trade partners, therefore zero trade flows are negligible in our sample.[5] Consequently, our estimation does not suffer from either omitted variables bias or selection bias as highlighted by Helpman et al. (2008).

Second, we compute the average bilateral trade cost by combining the characteristics described above and their respective coefficients estimates:

$$\tau_{ij} = \hat{\beta}_1 ln(Dist_{ij}) + \hat{\beta}_2 Border_{ij} + \hat{\beta}_3 Legal_{ij} + \hat{\beta}_4 Language_{ij} + \hat{\beta}_5 Colonial_{ij} + \hat{\beta}_6 CU_{ij} + \hat{\beta}_7 FTA_{ij}$$

The trade cost is derived from geographical characteristics and common institutional setting to both countries. Therefore, it is symmetric for each pair of countries (i.e. $\forall i, j\ \tau_{ij}{=}\tau_{ji}$).The computed average trade cost is 8.6. This value is in line with the recent strand of literature quantifying the trade costs for OECD countries such Irarrazabal et al. (2013).

3.3 Country specific parameters

The five remaining parameters are country specific $(f_i, \theta_i^S, \theta_i^U, b_i, \bar{A}_i)_{i \in N}$. A measure of the fixed cost of entry, f_i, is built using the Doing Business and the World Development Indicators from the World Bank. We propose an unweighted synthetic indicator of three proxies for the fixed cost of penetrating the market: the number of days and the relative cost (as a percentage of GDP per capita) to start a business as well as the share of surviving firms. Then, the synthetic indicator is normalized by the minimum value (achieved by Norway). We obtain values in the range $[1; 3.64]$.

We compute the contribution of each group of workers (i.e. θ_i^S, θ_i^M and their counterparts) to the production function for each country. To do so, we derive the group specific GDP by multiplying country specific data on the skills premium (from Hendricks (2004) for the high/low skilled and from Buchel and Fritsch (2005) for the natives/migrants) with the group specific population levels taken from Docquier et al. (2013). We then obtain the contribution of high skilled relative to low skilled workers to the country's production and the corresponding ratio between natives and immigrants:

$$r_i^1 = \frac{w_i^H L_i^H + w_i^h L_i^h}{L_i^H + L_i^h} \Big/ \frac{w_i^L L_i^L + w_i^l L_i^l}{L_i^L + L_i^l} \qquad r_i^2 = \frac{w_i^L L_i^L + w_i^H L_i^H}{L_i^L + L_i^H} \Big/ \frac{w_i^l L_i^l + w_i^h L_i^h}{L_i^l + L_i^h}.$$

[5] Apart from 34 OECD countries, we consider the Rest of the World (ROW). For all of the gravity variables ROW is a weighted average of the 10 largest non-OECD countries: Argentina, Brazil, China, Algeria, Egypt, Indonesia, India, Russia, Saudi Arabia, South Africa. We compute the trade volume by summing exports of all those non-OECD countries.

From this relation, we are able to calculate the firms' parameters of preference towards the two groups for each country i:

$$\theta_i^S = \frac{r_i^1}{1+r_i^1} \qquad \theta_i^M = \frac{r_i^2}{1+r_i^2}.$$

This procedure ensures that θ_i^S and θ_i^M match the actual labor income share in each country.

The subsidy rate, b_i, is calibrated in order to fit perfectly the relative changes in the Gini coefficients for the OECD countries before and after imposing the governmental taxes and subsidies computed by Immervoll and Richardson (2011).

Finally, the TFP residual, $\bar{A}_i$, is computed in order to fit perfectly the GDP level and to satisfy the zero-profit equilibrium conditions country by country. The vector $[\bar{A}_i]_{i\in N}$ must be computed iteratively. We proceed by defining for every economy i an initial value assigned to $\bar{A}_i$, labeled $\bar{A}_i^0$, which allows to compute the vector of prices: $[p_i]_{i\in N}$ and the vector of price indexes: $[P_i]_{i\in N}$. We take the vector of GDP's, $[X_i]_{i\in N}$, as given and we solve the N zero profit conditions. We then obtain $\bar{A}_i^{sol}$ as a solution of the system leading to new values for p_i's and P_i's. The iterative process continues until $\sum_{i\in N}\left(A_i^{sol,t} - A_i^{sol,t-1}\right)^2$ is sufficiently small.

3.4 Simulation algorithm

The migration shock we impose alters the labor supplies L_i^m and consequently the aggregated efficient labor stock $\bar{L}_i^T$. This in turn translates into changes in the TFP levels, A_i, and the mass of varieties, B_i by (7) and (19) respectively.

The other endogeneous variables are determined iteratively. We first assign initial values to the vector of composite wage indexes: $[W_i^0]_{i\in N}$. This in turn determines $[X_i]_{i\in N}$ and $[p_i]_{i\in N}$ by (5) and (16). The latter coupled with the equilibrium values of B_i's determines the price indexes: $[P_i]_{i\in N}$. The system of N zero profit conditions is solved for N unknowns, W_i^{sol}. Then, the values of p_i's and P_i's are recomputed taking the new vector of wage indexes. The iterative process continues until $\sum_{i\in N}\left(W_i^{sol,t} - W_i^{sol,t-1}\right)^2$ is sufficiently small. Furthermore, due to the fact that the proportions of low/high skilled, natives and migrants are now different, the labor market clearing wages for every type of workers are adjusted such that they aggregate to the new wage index, W_i. The equilibrium levels of the endogenous variables: X_i, P_i and the trade matrix $[X_{ij}]_{i,j\in N}$ are then computed using the equilibrium solutions of B_i and W_i.

4 Results

We simulate the model described in Section 2 for 34 OECD countries and the ROW in order to quantify the effect of migration on population's welfare. We then use the welfare decomposition described in section 2.5 to understand which channel drives the aggregate change. To do so, we compare real wage across ocuntries using the actual demographic distribution to the one we

would observe in the absence of migration. To buid the latter, we send back foreigners to their country of birth.

$$\frac{\Delta \frac{W_i}{P_i}}{\frac{W_i}{P_i}} = \frac{\frac{W_i}{P_i}_{Reference} - \frac{W_i}{P_i}_{Counterfactual}}{\frac{W_i}{P_i}_{Counterfactual}}.$$

We assess the migration's welfare effect by using the flows of migrants occuring between 1990 and 2000. Such exercise enables to capture the recent migration which better fits our assumption of imperfect substituability between natives and foreigners. Indeed, the stocks of migrants are mostly composed of well established immigrants who share closer characteristics to native workers. Moreover, flows of migrant capture better the recent patterns of migration characterized by a growing share of skilled workers.

Finally, we split the sample into two groups according to the type of migration. The recent literature analyzing the effect of migration on the native's welfare legitimately focuses on the migration between significantly different countries in terms of productivity since this migration forms the majority of actual stock of migrants. However, migration within OECD countries is not only growing, it is also favoured and targeted by recent immigration policies. We then decompose the effect between migration within OECD countries and outside OECD countries in order to assess the countervailing force determining the aggregate welfare effect. This distinction is made according to the conterfactual we create. In the first scenario, we only send back to their home country the migration arising between the OECD countries and the non OECD countries to assess the effect of labor mobility between dissimilar countries. In the second scenario, we reallocate the stock of intra-OECD countries migrants to their home countries. We conclude this section by quantifying the effect of international trade on the global welfare. As described previously, international trade enables to transfer gains from migration across countries and play then a key role to quantify the welfare impact of migration.

4.1 Aggregate welfare

Table 3 reports the percent change in the net real wage after migration for each type of labor. Positive values represent welfare gain from no migration to the one actually observed. Countries are ranked by real wage gains.

If we focus only on the aggregate welfare, the average OECD country would experience a small gain from migration (+ 0.59%). The distribution of these gains is fairly unequal across countries. A handful of OECD countries are able to reap large benefits from migration. Those are Australia (+ 3.82%), Switzerland (+ 2.89%), Canada (+ 2.70%), Iceland (+ 2.70%), Luxembourg (2.53%) and Austria (2.19 %).[6] The economies benefiting from migration are then the ones characterized as the main destination for migration. Contrary to these economies, countries which are described

[6]Israel and Estonia are treated as outliers and consequently are not considered in the following analysis.

in table 2 as encountering a sizable outflows of labor suffer from migration (Poland, Portugal, Mexico and Estonia).

The distribution of this aggregate gains across the heterogeneous workforce is also fairly unequal. Col.(2) to Col.(5) depict the change in the net real wage for each type of labor. Contrary to common beliefs, the low skilled workers are relatively better off than the high skilled in countries gaining from migration. This follows from the composition effect of the labor force after the shock. On the contrary, the real wages of migrants decrease after the shock due to the substitution effect (-0.09% for the low skilled and -2.15% for the high skilled). The real wage of natives living in countries subject to brain drain falls with migration. Emigration of high-skilled leads to a larger supply of of low-skilled workers relative to high-skilled ones causing to a fall in the real wage of low-skilled workers. Note that the high skilled worforce is the most insulated group of workers. Indeed, in countries benefiting from migration, they do not gain as much as low skilled but they still face an increase in their real wage while in countries loosing from migration, the fall of their real wage is not as important as the one for low-skilled workers.

From col.(6) we distinguish the effect of migration between countries that have significant productivity difference (migration from the non OECD countries) from the change in welfare driven by labor mobility within the OECD countries. The aggregate gains reaped by the desirable destinations (Canada (2.77%), Australia (2.10%), Switzerland (1.22%) and Iceland (1.85%)) for migration described above are driven by the migration between countries with significant productivity differences confirming the findings of di Giovanni et al.(2013) and Iranzo and Peri (2009). The presence of the non-OECD migrants has a strong, positive impact on the overall welfare of natives (2.2% on average in the OECD countries). The aggregate welfare is then mostly reduced by the migration within OECD countries. Except the workers in Australia, Canada, Switzerland, the US and Sweden, the natives in OECD countries are worse off. The average change in the real wage for workers falls by 0.39 %.

4.2 Decomposing the welfare effect

Our model enables us to decompose the aggregate welfare effect derived above into four channels in order to understand which one drives the aggregate results. The decomposition of the total change in the real wage in shown from figure 2 to figure 5. The results are decomposed by level of education in order to compute the fiscal effect and the type of migration (outside the OECD vs within the OECD).

The traditional mechanism studied in the literature concerns a drop in wages due to the shift in the labor supply caused by an inflow of immigrants. Our results, on average, partially confirm the statement that migration decreases the nominal wages, but its cause is not only immigration but also emigration. As the recent literature has highlighted, the heterogeneous workforce might be affected differently by immigration. We then assess the effect of migration

on the nominal wages of each type of workers defined in section 2. We observe a slightly negative effect on the nominal wage for the low skilled (on average −0.08%). This adverse effect does not result from countries encountering large inflows of immigrants but by countries facing a large outflow of their workforce such as Poland (−3.95%), Portugal (−3.71%) or Hungary (−4.22%). Indeed, countries that are successfully attracting large inflows of immigrants face a positive effect of migration on their nominal wages (i.e. Australia +10.26%, Canada (+5.89%) or Switzerland (+3.12%). Linking these results to table 2, we can explain these changes by the composition effect. Countries facing a large fall in the wage of low skill are also countries having a large share of high-skilled emigrants. The departure of these leads to a large supply of low-skill workers relative to high skilled leading to a fall in their wage. on the contrary, countries facing a large inflows of high-skilled immigrants see the wage of low-skilled natives increases. We observe, contrary to common believe but in line with the results found in the recent literature (Ottaviani and Peri (2012) and Docquier et al. (2014)) a small positive effect of immigration on the wages of native and a substantial effect on the wage of migrants. This distinction might be explained by the greater mobility of natives along the occupation distribution as described by Peri and Sparber (2009). In line with the recent literature, we observe a tiny effect of immigration on wage. Our framework allows us to also understand in what extent the change in the nominal wage affect the welfare of workers. We observe that the wage effect only account on average for 5.3% of the total welfare effect. Therefore, not only the effect on the nominal wage of native is small but it only explains partially the change in the aggregate real wage.

The long-run total factor productivity (which is function of the proportion of high-skilled workers in the population) has slightly fallen in the majority of countries (21 out of 34) even though the average gain is positive (+ 0.1 p.p) due to large benefits reaped by some countries. This productivity loss is mostly driven by the migration within OECD and then by emigration of high-skilled workers. The gains are large for countries with restrictive policies targeting high-skilled workers (Australia (+2.1 p.p.), Switzerland (+1.9 p.p.) and Canada (+0.8) for instance). However, interestingly these gains might not be large enough to offset the productivity loss driven by emigration of high-skilled workers. Indeed, New Zealand, for instance, faces a productivity loss due to the migration within the OECD countries that offsets the gains arisen with migration coming from significantly different countries in terms of productivity. Countries such as Ireland, Portugal, Greece and Mexico face a large outflow of their high-skilled workforce that hurts their long-run productivity. Other countries such as Austria, Czech Republic, Denmark do not suffer from emigration but they mostly attract low-skilled workers who do not foster their productivity. Again the negative effect is driven by the migration within the OECD which leads to the impoverishment of the country's skilled workforce. Contrary to the wage effect, the TFP is large. It accounts on average for 40 % of the aggregate welfare effect. The TFP effect is the second most important channel to drive the welfare impact of migration and should then not be underestimated by authorities when shaping migration policies.

Immigration does not only increase the labor supply but also rises the demand for final goods, stimulating firm's creation. The cost of living falls then due to the gains from variety. This new channel was largely disregarded in the literature while it drives the aggregate welfare gains and forms the most significant channel providing the largest variations in the welfare of natives in the OECD countries as shown in 2 to figure 5. It accounts on average for 50% of the aggregate welfare change. The market size effect resulting from the gains from variety is again driven by the migration coming from outside the OECD. Indeed, the increase in population is also coupled with an efficiency gain since the production of varieties is reallocated to countries stimulating entrepreneurship (i.e. countries with lower fixed cost). Relative to the other channels, the gains are large for the main destinations of immigrants (Australia (+1.7p.p.), Canada (+1.9p.p.)) and for small countries (+ 3.7 p.p. for Ireland and +2.62 p.p. for Luxembourg). If immigration from non OECD countries leads to substantial drop in the price index, migration within the OECD countries slightly increases the price index. However, small countries such Luxembourg Switzerland and Ireland that attract and target European migration still substantially gains from migration within OECD countries.

The market size effect is computed keeping the marginal cost constant. However, the latter also changes the price index. We called this effect the general equilibrium effect which on average does not affect the price index. Indeed, in our model, the aggregate wage index is adjusted by the productivity change and it has a negligible effect on the total average effect (it only accounts for 4.3 p.p.).

The change in relative supply of low and high-skilled workers may have some substantial consequences on the redistributive schemes provided by the governments of both sending and receiving countries. In our model, the fiscal effect of migration works through the change in the tax rate on the income of high skilled workers, assuming a constant benefit redistribution system. High level attention and debates have been focused on the potential responsibility of international labor mobility for the growing inequality within country. According to OECD, the net fiscal contribution of immigrants characterizes the main element shaping the public opinion while the latter plays a significant role in the definition of fiscal policy. Recent opinion polls show that citizens in OECD countries fear that immigration increases the pressure on public spending. The perception is driven by the idea that immigrants are in general low-skilled and would then increase the number of beneficiaries instead of contributors to the social system. A greater fear towards migrants from dissimilar countries occurs due to the idea that they migrate in order to benefit from more developed social system. However, our results show that countries should not fear from immigration but from emigration. Migrants characterize, on average, the cream of the labor force. Immigrants increase then the numbers of contributors while emigration shrinks the latter and relatively increases the number of beneficiaries.

Figure 4 and figure 5 present the fiscal effect imputed to migration. We distinguish the effect

of migration on the redistributive scheme from OECD countries vs migration from non OECD countries. This exercise is of matter since these two types of migration differ with the migration within the OECD countries being more skilled. Second, the public opinion is more adverse towards migration from dissimilar countries in terms of productivity while this type of mobility barely affects the redistributive system in OECD countries. Indeed, immigration from outside the OECD decreases the tax rate required to keep the income distribution unchanged by 0.7% on average. In other words, the immigration coming from countries with low productivity relaxes the fiscal pressure. On the contrary, migration within OECD (characterizing by larger emigration rates) increases inequality. The average tax rate increases by 0.4% in OECD countries. Except Australia, Canada and Turkey, all countries face a rise in their tax rate. Not only migration within the OECD countries increases inequalities but it has a larger impact on the redistributive system than migration from dissimilar countries. This increase in inequality is driven by the emigration of high-skilled that shrinks the tax base. Contrary to the expectations and public perceptions, the modest increase in the inequality is driven by the high skilled emigration and not immigration. Countries may mitigate these effect by increasing the number of high skilled workers through labor market liberalization and the stimulation of education.

This exercise shows that the gains from migration are unequally distributed and not driven by the expected channels. Indeed, a large literature has focused on the change in the wage resulting from a substitution effect. Docquier et.al (2014) have concluded that this channel was rather small to explain the change in the real wage. We confirm this result by finding that the change in the nominal wage account for 5% of the absolute change in the real wage. Iranzo et Peri (2009) and di Giovanni et al. (2014) recently highlight the importance of the market size effect. In line with their findings, we find that the fall in the cost of living driven by the gains from variety accounts for the majority of the absolute changes in the real wage. The productivity effect is not to be underestimated. Most of OECD countries face a productivity loss on the long-run mostly driven by migration within OECD countries. Indeed, we distinguish the effect of migration coming from significantly different countries in terms of development to the effect of labor mobility within similar countries. Surprisingly, migration within OECD countries adversely affects the welfare of native. Indeed, this type of migration is characterized by a large outflow of high-skilled from OECD countries leading to a productivity loss and an increase in the cost of living by reducing the market size. This new result leads us to question the recent immigration policies in OECD countries targeting qualitative immigration and underestimating the new brain drain faced by the majority of OECD countries.

4.3 The role of international trade

International trade consists of an important channel of distributing gains from migration across countries. An increase in the mass of varieties in a particular country (due to a positive net

migration shock) influences, ceteris paribus, the quantity of available varieties in all of its trading partners. The recent use of new trade theory enables to assess the potential complementarity between migration and trade. International trade may then mitigate the potential loss of sending countries. Our model enables to easily quantify the role of international trade in transmitting the gains from migration. To control for the importance of trade, we conduct the same simulations assuming closed economies. The changes in real wages for 35 autarkic economies are presented in the first column of table 4. Trade increases the welfare in all countries in our sample considering each of the four previous counterfactual scenarii. The average real wage index increases by 2% for the OECD countries. The largest gainers are the small economies (Estonia, Luxembourg, Slovakia, Slovenia or Iceland). Since their small market size, opening their border improves their natives' welfare. Large countries like the U.S., Japan or the Rest of the World, slightly gain from international trade, due to the marginal gains from variety.

We also find that international trade reduces the difference of gains from migration across countries.(see the last two columns in table 4). International trade enables to reallocate the positive spillovers induced by migration from winning to loosing economies. The workers living in countries which loose in terms of net migration shock, observe a larger increase in their welfare in presence of trade. Consequently, one observe how trade may enhance welfare in all countries by equalizing the gains from migration across countries.

5 Robustness check

5.1 From perceptions to facts

Public perception of migration tends to be increasingly negative in the OECD countries. Recent terrorisms events as well as the current economic crisis have revived the feeling of insecurity and might have fostered anti-immigrants feelings. The absence of comparative statics across countries certainly contributes to public confusion. Our results counter the traditional perception of the public which according to OECD (2010, 2013) favour immigration from comparable developed countries as well as perceive immigrants as imposing a fiscal pressure. As our work and the recent literature show, there is not one typical migrant. However, migrants are usually lumped together in public debates. We try to get closer to this perception and assess the effect of the stock of migrants on the welfare of natives. Such analysis is less suited for our model since the established migrants are more likely to be closer substitute to natives than new migrants but such it would be closer to the public perception on immigrants that sees then as whole. We then assess how considering migrants as a whole affects our results.

The same pattern rises from our exercise. Table 5 shows that the real wage has on average slightly increased by 0.9 p.p.. Once again, the low skilled natives are on average better off after imposing the non-OECD migration shock. Their real wage increases by 3.6 p.p., compared to

2.2 p.p. for the high skilled natives. However, the latter are again more insulated from adverse shocks. The migration within the OECD barely affects them while the low-skilled natives face a drop of 2.5 p.p. of their real wage from this last type of migration. Moreover, we observe that some countries benefit from recent labor mobility. Countries like Hungary, Austria, United Kingom, Ireland or Austria are now adversely affected by migration due to past large outflows of their workforce. These countries were able to recently reshape their migration policies in order to improve their population's welfare. The benefits from migration are still driven by flows between significantly different countries in terms of their productivity.

We confirm our previous results when decomposing the aggregate welfare effect. However, the effects are all magnified due to larger changes in the size of the population. The market size effect derived from the gains from variety still accounts for the majority of the aggregate welfare impact (about 61 % of the change in the aggregate welfare). This channel still enables countries suffering from a productivity loss to increase their total production. Small countries such as Luxembourg or Ireland subtantially gain from the market size effect. The benefits result from the migration outside of the OECD. Migration within similar countries generates large outflows and hurts these economies resulting to a fall by 0.4 p.p. on average of the market size effect. Contrary to the previous analysis, we observe a fall in the long-run productivity by 0.7 p.p. on average in the OECD countries. This fall is mostly driven by migration within the OECD countries which account for 70% of this falls. We observe different results for some countries which have faced a substantial change in their pattern of immigration recently. United Kingdom sees its productivity falling when considering the stock of migrants because the inflows of workers from outside the OECD is not large enough to offset the outflows while the recent immigration has been able to reverse the situation. New Zealand faces the opposite situation. Considering the stock of migrants increases its long-run productivity by 0.15 p.p. while the recent outflows has deteriorated it by 1.79 p.p. The wage effect is larger than when considering flows of migrants but it still only accounts for 4.5% of the total aggregate welfare change. The nominal wage increase by 0.9 p.p. on average in the OECD. These gains are again driven by attractive destinations such as Australia (+0.30 p.p.) and Canada (+ 0.15 p.p.).

The analysis of the stocks of migrants confirms the importance of the market size effect explaining why results in this section are barely different from the baseline characterized by the flows of migrants. Moreover, it enables to better understand recent trends for countries which have faced change in their pattern of migration. Economies such Ireland, the U.K. or Austria which were severely hit by the outflow of workers in the second half of the XX century managed to rebuild the labor force in the 1990s and benefit recently from migration. Other countries suffering from persistent large emigration (like Portugal, Poland, Mexico or Slovakia) are still facing the adverse effects of the "brain drain". New Zealand, which was always perceived as a demanded target country for migration, in the 1990s saw the occurrence of a reverse situation. The better life perspectives in Australia reinforced emigration which made the citizens of New

Zealand worse off. Even tough our results barely change when considering the stocks of migrants, they help us to understand how some public opinion might have been shaped. The University of Oxford has recently published an overview of attitudes toward immigration in the United Kingdom. They observe that almost 3/4 of British people favours reducing immigration. Such results might coming from the confusion concerning immigrants. Indeed, our results show that considering the stock of migrants as a whole adversly affects the long-run productivity of the British economy. However, the stock of migrants includes well established immigrants who are closer to natives. The UK seems to benefits from the recent immigration. Such results might indicate the importance to clarify the distinction between different types of migrants in the public opinion in order to mitigate confusion that may lead to incomprehension. However, even analysing our model assuming a closer definition of migration from the one existing in the public opinion does not provide us facts close to the public perception. Natives are more willing to accept migrants from their neighboor but from our results this type of migration is more detrimental to the OECD economy because it opens the door to brain drain from these countries.

Our objective is not to assess the public perception but the recent events lead us to try understanding how public opinion is shaped as well as observe if our results are getting close to the perception of natives on migrants. Our exercise helps us to understand that long term trend might define attitudes,even tough the recent patterns, which are not fully perceived by natives, are dissimilar. Furthermore, other factors, such as non-economic issues may play an important role in forming public opinions. Such results lead us to conclude the importance of getting sooner than latter correct estimates of the welfare effect of migrant in order to provide to the public better answers to their legitimated questions.

5.2 Sensitivity with respect to the parameters

The magnitudes of the simulated effects depend on the parameters' identification. This is why we assess the quantitative sensitivity of the presented results to several parameters. As a reminder, we recall their benchmark values in Table 1.

Table 1: The Benchmark Parametrization of the Model

Description of the parameter	Symbol	Default value
Elasticity of substitution between varieties	ϵ	4
Elasticity of TFP w.r.t the ratio of skilled workers to total labor	λ	0.3
Elasticity of substitution between high and low skilled workers	σ	1.75
Elasticity of substitution between natives and migrants	σ_M	20

Table 6 shows the average effect of migration in the first two scenarii described in the previous section for key variables. For each variable, the first colum reports the results derived in the previous section. The second column describes result obtained using a lower value for the

analyzed parameter while the last column displays the outcomes using a higher value.

We see that the change in the elasticity of substitution between varieties does not significantly change the results for the market size, TFP, . On the contrary, higher ϵ strengthens the price effect on P and the nominal wage effect (W). Higher elasticity in the TFP function (reinforcing the skill effect on productivity), λ, raises the nominal wages. The numbers of varieties, skill premium and tax rate are not affected.

Finally, an increase in the elasticity of substitution between high and low skilled workers has a detrimental effect on the changes in GDP (due to the fact that the effective labor aggregate is adversely influenced). Simultaneously, the change in the number of varieties decreases, as it is a linear function of $\bar{L}^T$. Higher σ reduces the wage difference between high and low skilled workers which of course affects the Gini coefficient, and slightly changes the wage composites. A fall in the elasticity of substitution between natives and migrants increases the benefits of migration, improving the effect on the number of varieties that are then more positive after imposing a migration shock. The labor market is somewhat affected, which has an impact on the price levels and inequalities. The changes in both elasticities from the production function: σ and σ_M, have no direct consequence on the TFP variations.

6 Conclusion

The current challenging economic situation facing by many OECD countries have kindled debates over immigration policy. The growing fear against immigration in the public opinion risks jeopardizing the development of migration policy required to tackle the new economic and demographic challenges that most of OECD countries face. It potentially hinders the integration of a growing diverse society. We aim to answer to the questions underlying this aversion towards immigration by assessing the economic effect of global migration on the welfare in the OECD countries. To do so, we develop a simple multi-country mode allowing us to quantify the aggregate welfare effect of migration in the OECD countries. Our model enables to distinguish four channels that determine this aggregate effect: the wage effect, the market size effect, the productivity effect and the fiscal effect. The objective is to understand which of them is driving the aggregate effect.

Using our model, we quantify the welfare effect of migration in 34 OECD countries. We observe that migration increases the real wages in these countries by 0.9% on average. The gains from migration are unequally distributed across OECD countries. Few countries like Australia, Canada or Switzerland reap the benefits from large immigration. Contrary to these economies, countries encountering a sizable outflow of labor suffer from migration. In our complex economy, heterogeneous workers alter the workforce in different way. Our results show that the low-skilled are the most exposed to the migration shocks. In countries gaining from migration, the low skilled are relatively better off than the high skilled in countries gaining from migration. On the

contrary, their real wage drastically falls in countries subject to brain drain. Migrants are the most vulnerable to labor mobility facing on average a fall in their real wage. The literature offers little guidance on the analysis of those aggregate effects from migration. The standard literature has focused in the substitution effect between migrant and natives and then on the change in the nominal wage and usually concerns the United States. However, Docquier et.al (2014) contrast the standard view by showing the rather small importance of this change. Iranzo and Peri (2009) and di Giovanni et al. (2014) recently highlight the importance of the market size effect. Our model enables to quantify these different channels in a unified framework. Our results confirm these new findings. The gains from variety account for the majority of the absolute change in the real wage contrary to wage effect. Moreover, contrary to the perception in the public opinion, we confirm the recent observations by OECD Migration outlook (2013), the fiscal impact of immigration is close to zero on average showing that migration affects cross countries performances but has little effect within country. Moreover, our model also highlights the importance of international trade in distributing gains from migration across countries. International trade coupled with migration might have a welfare enhancing effect on both countries.

The recent literature analyzing the effect of migration on the native's welfare has focused on the migration between significantly different countries in terms of productivity since this migration forms the majority of actual stock of migrants. However, migration within the OECD countries is not only growing, it is also favoured and targeted by recent immigration policies. We then decompose the effect between migration within the OECD countries and outside the OECD countries in order to assess the countervailing force determining the aggregate welfare effect and to assess the effect of the recent migration. Contrary to expectation in the public opinion, gains from migration are driven by labor mobility coming from dissimilar countries and they are reduced by the migration within the OECD countries. Indeed, labor mobility within OECD countries is characterized by the emergence of a brain drain in developed economies deteriorating the market size and the long run productivity in most of OECD countries. Moreover, our results show that countries should not fear from immigration but from emigration. migration within the OECD (characterizing by larger emigration rates) increases inequalities while migration coming from less developed economies reduces wage gap by expanding the number of contributors to the social system.

Our results shows that countries should not only focus on shaping immigration policies but should seriously consider the emigration of their human capital. The common negative effect assigned to immigration such as a growing inequality within country is mistakenly imputed to thei nflows of workers while it mostly results from the growing outflow of the high skilled workers faced by most of OECD countries. OECD countries should then ensure to keep their stock of human capital by stimulating the education of their workers and/or by triggering qualitative immigration.

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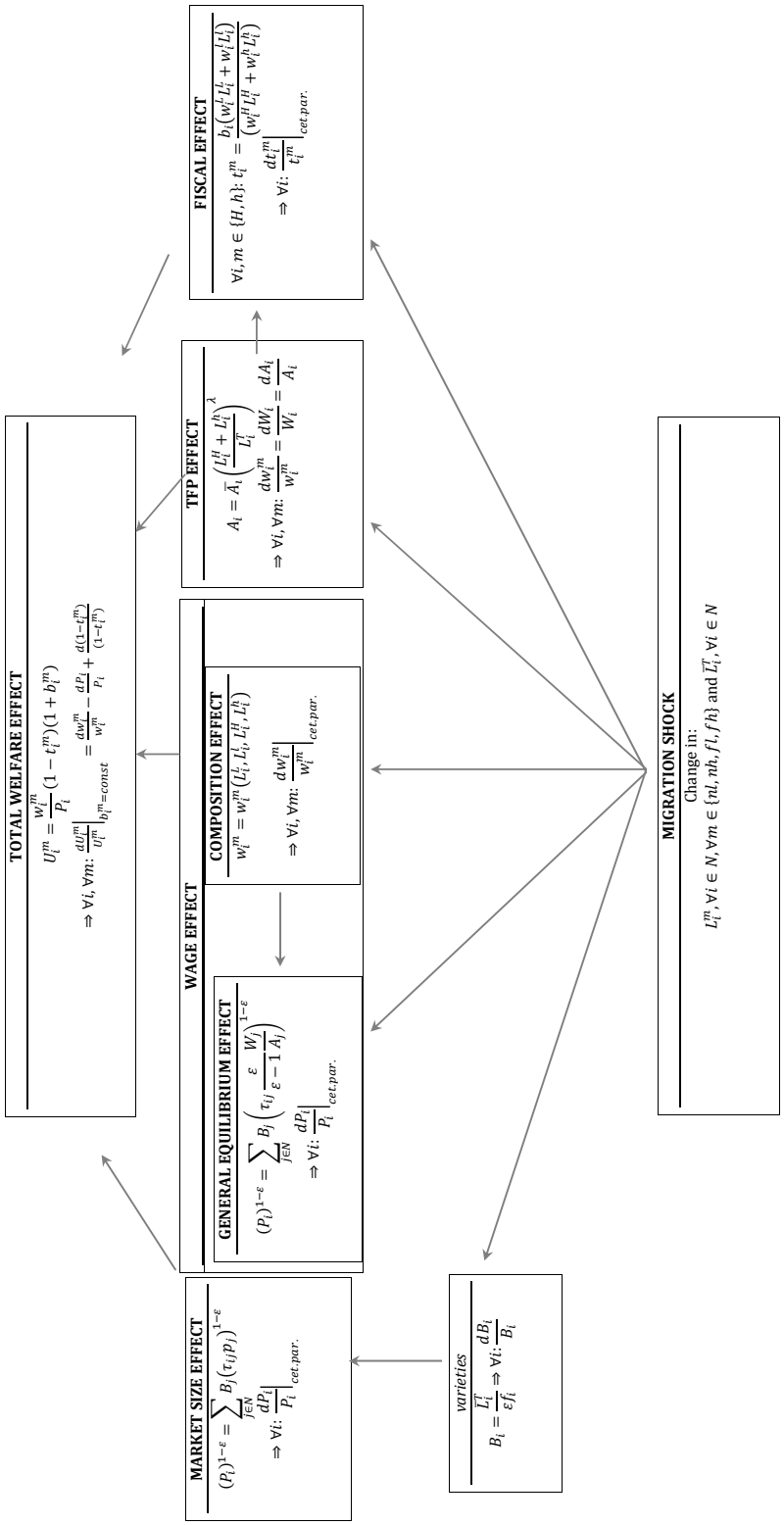

Figure 1: Welfare Decomposition

Table 2: Structure of migration and skill composition

Country	Share immigrants	Share Emigrants	Population change from the counterfactual	Share skilled stayers	Share skilled immigrants	Share skilled emigrants
Australia	0.28	0.03	0.35	0.21	0.45	0.55
Austria	0.14	0.08	0.07	0.13	0.13	0.35
Belgium	0.13	0.06	0.08	0.25	0.20	0.36
Canada	0.22	0.06	0.22	0.38	0.59	0.61
Chile	0.00	0.03	-0.03	0.16	0.16	0.41
Czech Rep.	0.06	0.03	0.03	0.10	0.11	0.35
Germany	0.08	0.05	0.04	0.24	0.22	0.41
Denmark	0.06	0.05	0.01	0.21	0.17	0.41
Estonia	0.25	0.18	0.14	0.12	0.31	0.37
Finland	0.02	0.08	-0.05	0.26	0.24	0.27
France	0.09	0.03	0.07	0.20	0.16	0.36
Greece	0.06	0.12	-0.05	0.14	0.15	0.21
Hungary	0.01	0.05	-0.04	0.12	0.13	0.40
Ireland	0.12	0.34	-0.15	0.15	0.41	0.34
Iceland	0.12	0.12	0.02	0.12	0.31	0.39
Israel	0.45	0.34	0.37	0.13	0.34	0.16
Italy	0.02	0.06	-0.04	0.08	0.15	0.17
Japan	0.01	0.01	0.00	0.24	0.28	0.60
Rep. of Korea	0.00	0.04	-0.04	0.26	0.37	0.50
Luxembourg	0.33	0.13	0.32	0.20	0.22	0.31
Mexico	0.00	0.14	-0.12	0.11	0.45	0.15
Netherlands	0.16	0.07	0.12	0.18	0.22	0.43
Norway	0.07	0.04	0.04	0.20	0.29	0.39
New Zealand	0.21	0.19	0.07	0.17	0.42	0.49
Poland	0.03	0.06	-0.03	0.11	0.14	0.38
Portugal	0.02	0.20	-0.15	0.08	0.19	0.12
Spain	0.05	0.04	0.02	0.11	0.18	0.19
Slovak Rep	0.00	0.11	-0.10	0.11	0.28	0.18
Slovania	0.11	0.11	0.02	0.13	0.12	0.22
Sweden	0.12	0.03	0.10	0.24	0.26	0.47
Turkey	0.02	0.06	-0.04	0.08	0.21	0.09
United Kingdom	0.09	0.09	0.00	0.15	0.35	0.48
United States	0.13	0.01	0.14	0.46	0.43	0.59
Switzerland	0.24	0.06	0.23	0.12	0.22	0.42

Source: Docquier et al. (2013). The first column presents the percentage of migrants in total population of the country. The second one presents the share of emigrants from each country, as a share of the remaining population. The third column presents the percentage change in the population between the Counterfactual with no migration to the actual migration. The last three columns present the shares of skilled among the native stayers, immigrants, and emigrants repsectively.

Table 3: The aggregate welfare effects for the flows of migrants

Country	Total Effect					Non OECD					Within OECD				
	W/P	w^L/P	w^H/P	w^l/P	w^h/P	W/P	w^L/P	w^H/P	w^l/P	w^h/P	W/P	w^L/P	w^H/P	w^l/P	w^h/P
Mean OECD	**0.59**	**1.05**	**0.60**	**-0.09**	**-2.15**	**0.98**	**1.66**	**0.54**	**0.89**	**-0.65**	**-0.39**	**-0.61**	**0.06**	**-0.98**	**-1.50**
Israel	16.83	33.79	4.12	33.00	-1.29	15.55	30.73	4.19	29.67	-0.41	1.28	3.06	-0.06	3.34	-0.88
Australia	3.82	7.43	1.08	7.51	-0.55	2.10	3.36	1.34	2.92	0.56	1.73	4.07	-0.26	4.59	-1.11
Switzerland	2.89	5.28	1.37	5.26	-0.75	1.22	1.64	1.13	1.10	0.53	1.67	3.64	0.24	4.16	-1.28
Canada	2.70	4.92	1.57	4.65	-0.32	2.77	4.64	1.93	3.79	0.32	-0.07	0.28	-0.36	0.85	-0.64
Iceland	2.65	4.08	1.54	2.30	-1.77	1.85	2.71	1.05	1.65	-0.26	0.80	1.36	0.49	0.66	-1.51
Luxembourg	2.53	2.65	3.71	1.03	0.71	0.47	0.22	1.01	-0.24	0.66	2.07	2.43	2.70	1.27	0.04
Austria	2.19	2.06	3.14	-1.39	-1.76	0.88	0.78	1.29	-0.76	-0.19	1.31	1.28	1.85	-0.63	-1.57
UK	1.80	2.97	1.33	2.67	-2.22	2.07	3.47	1.17	2.91	-0.79	-0.28	-0.51	0.16	-0.24	-1.43
Ireland	1.61	0.64	4.06	-1.29	-1.69	2.04	2.93	1.62	2.39	0.69	-0.43	-2.29	2.44	-3.68	-2.39
Czech Repub.	1.25	2.11	-0.07	2.13	-4.32	0.39	0.60	0.06	0.61	-0.68	0.86	1.51	-0.12	1.52	-3.64
United States	1.22	1.03	1.70	-1.00	-0.62	0.98	1.24	1.04	0.22	-0.71	0.24	-0.21	0.66	-1.22	0.09
Sweden	1.16	1.73	0.82	0.99	-1.90	1.10	1.46	0.96	0.40	-0.82	0.06	0.27	-0.14	0.59	-1.08
Norway	1.15	1.35	1.26	-0.63	-1.41	0.58	0.65	0.70	-0.98	-0.34	0.57	0.70	0.56	0.34	-1.07
Netherlands	1.15	1.73	0.82	1.32	-1.05	0.88	1.24	0.68	0.80	-0.17	0.26	0.49	0.14	0.51	-0.88
Spain	0.94	1.02	1.32	-2.04	-2.26	1.01	1.40	0.91	-0.72	-1.20	-0.06	-0.37	0.42	-1.33	-1.05
Belgium	0.76	1.01	0.86	0.37	-2.04	0.61	0.79	0.62	0.21	-0.61	0.15	0.22	0.24	0.16	-1.43
France	0.62	1.05	0.33	0.97	-2.27	0.53	0.76	0.41	0.39	-1.10	0.08	0.28	-0.08	0.57	-1.18
Turkey	0.54	1.25	-0.26	0.29	-3.99	0.68	1.13	0.16	0.65	-1.87	-0.15	0.12	-0.42	-0.36	-2.12
Germany	0.49	0.43	0.83	-1.04	-1.90	0.34	0.47	0.30	-0.03	-0.93	0.14	-0.05	0.53	-1.01	-0.97
Japan	0.15	0.18	0.18	-1.97	-2.84	0.15	0.19	0.16	-1.85	-1.99	0.00	0.00	0.02	-0.12	-0.85
Denmark	0.02	-0.34	0.76	-2.42	-2.30	0.29	0.22	0.53	-1.46	-1.01	-0.26	-0.57	0.23	-0.96	-1.29
Hungary	-0.18	-0.31	-0.02	0.77	-1.02	-0.16	-0.28	-0.01	0.13	-0.42	-0.02	-0.03	-0.01	0.64	-0.60
Finland	-0.20	-0.93	0.67	-4.76	-4.50	0.21	0.20	0.30	-1.41	-1.22	-0.42	-1.12	0.38	-3.35	-3.28
Italy	-0.44	-1.03	0.19	-3.51	-2.31	0.27	0.34	0.31	-1.80	-1.10	-0.71	-1.37	-0.12	-1.71	-1.21
Chili	-0.86	-1.28	-0.26	-3.27	-3.43	-0.15	-0.19	-0.07	-2.12	-1.92	-0.71	-1.09	-0.18	-1.15	-1.52
Greece	-1.10	-1.95	0.03	-2.11	-0.32	-0.09	-0.18	0.05	-0.35	-0.12	-1.01	-1.77	-0.02	-1.76	-0.20
Slovak Rep.	-1.40	-1.70	-0.96	-1.79	-1.77	0.42	0.75	0.05	0.82	-0.25	-1.82	-2.45	-1.02	-2.61	-1.51
Rep. of Korea	-1.40	-2.34	-0.57	-1.94	-1.43	-0.02	-0.01	-0.03	0.31	-0.56	-1.38	-2.32	-0.55	-2.25	-0.87
New Zealand	-1.53	-3.11	1.39	-4.63	-0.41	2.56	3.61	1.95	2.50	0.94	-4.09	-6.72	-0.56	-7.14	-1.35
Slovak Rep.	-1.72	-2.75	0.07	-6.39	-5.44	0.22	0.29	0.14	-0.68	-1.03	-1.95	-3.04	-0.08	-5.72	-4.40
Poland	-2.38	-3.70	-0.65	-1.91	-0.10	-0.30	-0.35	-0.34	1.01	0.39	-2.08	-3.34	-0.31	-2.92	-0.49
Portugal	-3.41	-5.71	-1.34	-10.45	-5.71	0.51	0.66	0.57	-3.59	-1.90	-3.93	-6.37	-1.91	-6.86	-3.81
Mexico	-3.44	-4.05	-2.63	-4.61	-5.37	0.06	0.11	0.01	0.06	-0.71	-3.50	-4.15	-2.64	-4.67	-4.66
Estonia	-8.47	-11.79	-6.14	-9.26	-4.90	-6.74	-9.07	-5.83	-6.39	-3.99	-1.72	-2.73	-0.31	-2.87	-0.91

For all the countries we present the percent change in the real wage of the total efficient labor composite ($\bar{L}^T$)as well as for each type $m \in \{H; L; h; l\}$.
Countries are ranked according to their aggregate gains from migration.

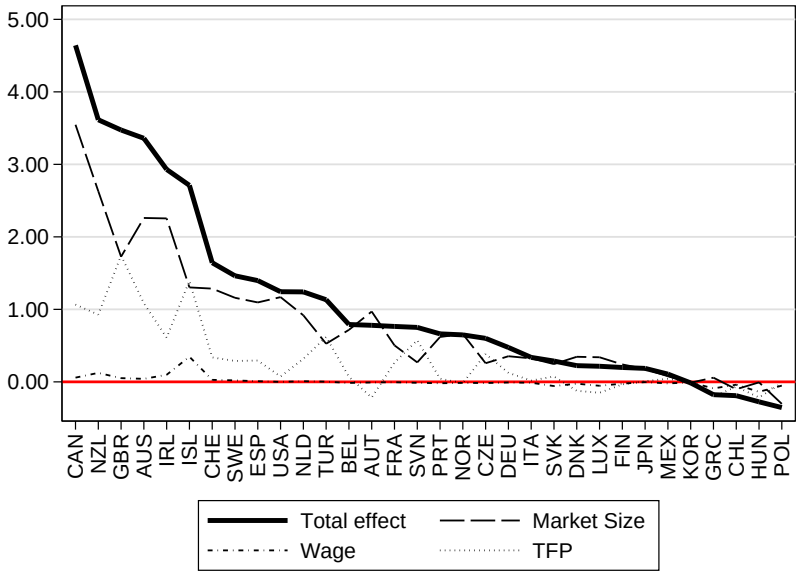

Figure 2: Welfare effect from Non-OECD migration for low-skilled workers

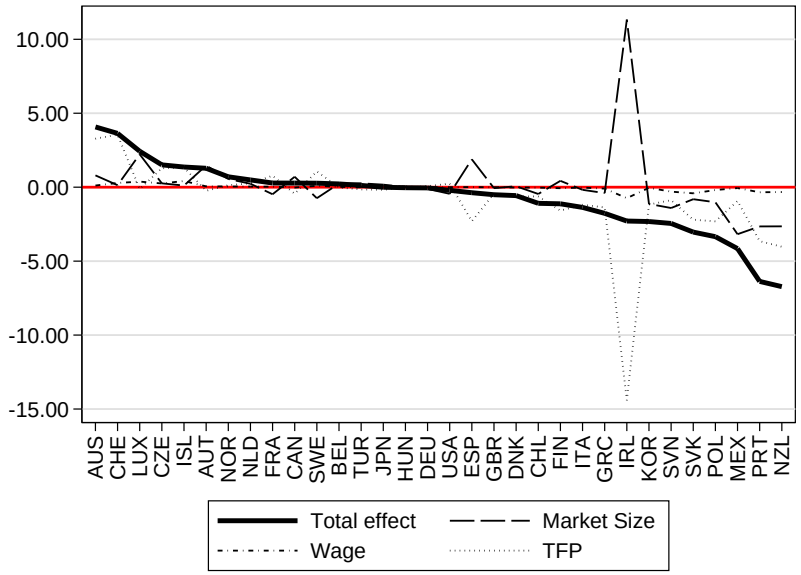

Figure 3: Welfare effect from migration within OECD for low-skilled workers

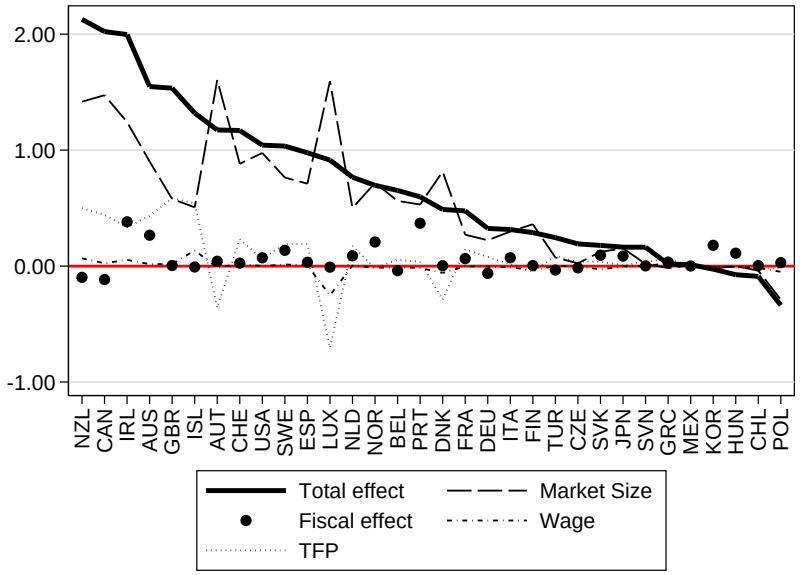

Figure 4: Welfare effect from Non-OECD migration for high-skilled workers

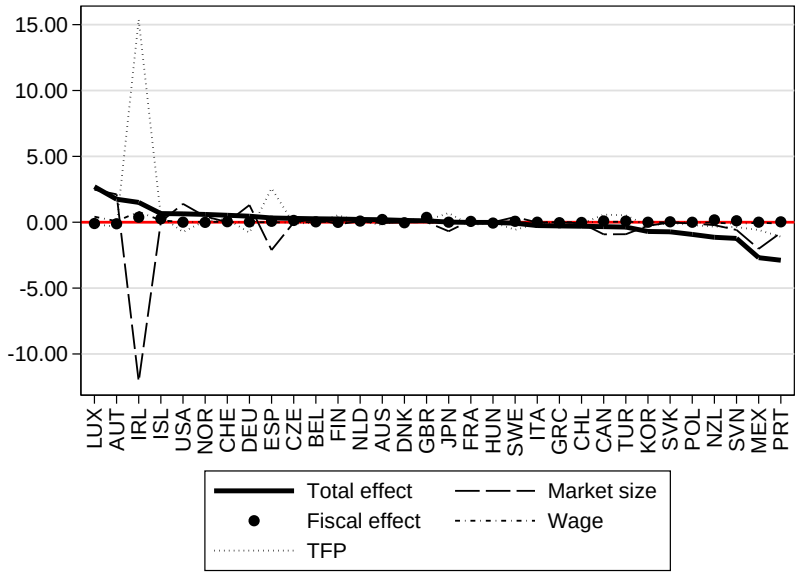

Figure 5: Welfare effect from Non-OECD migration for high-skilled workers

Table 4: Role of International trade

Country	Flow of Migrants Non OECD			Flow of Migrants within the OECD		
	Benchmark	Gain due to IT	Autarky	Benchmark	Gain due to IT	Autarky
Australia	2.10	1.00	2.11	1.73	0.99	1.74
Austria	0.88	3.04	0.91	1.31	3.10	1.40
Belgium	0.61	3.02	0.61	0.15	3.03	0.16
Canada	2.77	1.03	2.80	-0.07	1.00	-0.08
Chile	-0.15	2.38	-0.18	-0.71	2.40	-0.72
Czech Republic	0.39	5.66	0.35	0.86	5.73	0.90
Germany	0.34	0.92	0.34	0.14	0.93	0.15
Denmark	0.29	3.29	0.27	-0.26	3.30	-0.26
Estonia	-6.74	11.96	-8.44	-1.72	13.30	-2.02
Finland	0.21	3.11	0.19	-0.42	3.13	-0.41
France	0.53	1.10	0.53	0.08	1.11	0.08
Greece	-0.09	3.11	-0.12	-1.01	3.13	-1.04
Hungary	-0.16	5.93	-0.23	-0.02	6.00	-0.02
Ireland	2.04	4.01	2.12	-0.43	4.05	-0.30
Iceland	1.85	10.60	1.97	0.80	10.54	0.85
Israel	15.55	3.09	15.97	1.28	2.75	1.30
Italy	0.27	1.13	0.26	-0.71	1.13	-0.71
Japan	0.15	0.32	0.15	0.00	0.32	0.00
Rep. Of Korea	-0.02	1.16	-0.03	-1.38	1.15	-1.40
Luxembourg	0.47	12.13	0.50	2.07	12.62	2.67
Mexico	0.06	1.06	0.04	-3.50	1.02	-3.55
Netherlands	0.88	2.35	0.89	0.26	2.35	0.27
Norway	0.58	2.91	0.58	0.57	2.93	0.59
New Zealand	2.56	2.87	2.64	-4.09	2.69	-4.20
Poland	-0.30	3.06	-0.35	-2.08	3.05	-2.14
Portugal	0.51	3.18	0.51	-3.93	3.06	-4.05
Slovak Rep.	0.22	7.72	0.17	-1.95	7.64	-2.08
Slovenia	0.42	9.28	0.35	-1.82	9.10	-2.08
Spain	1.01	1.50	1.01	-0.06	1.50	-0.05
Sweden	1.10	2.46	1.12	0.06	2.44	0.06
Switzerland	1.22	2.72	1.24	1.67	2.72	1.69
Turkey	0.68	2.06	0.68	-0.14	2.06	-0.15
UK	2.07	1.04	2.09	-0.28	1.03	-0.28
United States	0.98	0.22	0.98	0.24	0.22	0.24
OECD	0.98	3.54	0.94	-0.39	3.57	-0.40
ROW	-1.46	0.26	-1.47	0.00	0.27	0.00
std with trade		2.99	3.20		1.49	1.58

OECD stands for the average for all the OECD countries, ROW stands for the Rest of the World.

The last row shows the cross-country standard deviations of the changes in overall welfare.

Table 5: The aggregate welfare effects for the stocks of migrants

Country	Total Effect					Non OECD					Within OECD				
	W/P	w^L/P	w^H/P	w^l/P	w^h/P	W/P	w^L/P	w^H/P	w^l/P	w^h/P	W/P	w^L/P	w^H/P	w^l/P	w^h/P
OECD mean	**0.9**	**1.1**	**2.4**	**-7.9**	**-6.3**	**2.5**	**3.6**	**2.2**	**-1.5**	**-1.9**	**-1.6**	**-2.5**	**0.2**	**-6.4**	**-4.4**
Israel	23.0	39.2	16.0	25.4	4.9	22.5	39.4	13.3	26.9	4.2	0.5	-0.2	2.7	-1.6	0.7
Australia	15.7	22.3	13.8	13.9	6.2	7.6	12.1	5.0	10.0	1.8	8.1	10.1	8.8	3.9	4.4
Canada	9.2	12.8	9.3	5.3	1.7	6.1	9.0	5.4	5.4	1.2	3.1	3.8	3.8	0.0	0.5
Estonia	7.7	12.3	7.8	-12.7	-13.4	10.8	16.8	8.9	-7.9	-11.4	-3.1	-4.5	-1.1	-4.8	-2.0
Switzerland	6.8	7.9	8.8	-0.3	-0.5	2.4	2.9	2.8	1.1	1.2	4.3	5.1	6.0	-1.4	-1.7
New Zealand	4.6	7.0	5.9	-0.7	-3.1	5.3	7.7	4.0	4.8	1.6	-0.7	-0.7	1.9	-5.5	-4.7
Luxembourg	4.5	3.2	10.2	-7.8	-2.2	0.9	0.6	1.7	-0.1	1.1	3.6	2.6	8.5	-7.7	-3.3
United States	3.0	2.3	4.5	-4.7	-2.8	2.1	2.4	2.4	-0.5	-2.5	1.0	-0.2	2.1	-4.2	-0.3
Netherlands	1.9	1.1	5.3	-6.1	-2.4	2.8	2.9	3.8	-1.1	0.2	-0.8	-1.9	1.5	-5.0	-2.5
Sweden	1.7	1.3	3.5	-5.9	-3.7	1.5	1.8	1.8	-0.8	-1.1	0.2	-0.5	1.8	-5.1	-2.6
Spain	1.6	2.4	1.7	-5.2	-5.6	1.8	2.6	1.6	-2.8	-2.8	-0.2	-0.2	0.1	-2.4	-2.8
Norway	0.9	1.0	1.7	-6.0	-6.0	1.0	1.1	1.3	-2.3	-0.7	-0.1	-0.1	0.5	-3.7	-5.3
Belgium	0.9	-0.5	3.6	-8.2	-3.9	1.2	1.2	1.5	-0.6	-1.1	-0.3	-1.7	2.1	-7.7	-2.8
France	0.3	-0.6	2.0	-7.5	-5.2	0.9	0.8	1.4	-2.4	-2.7	-0.6	-1.4	0.6	-5.1	-2.5
Turkey	0.1	1.1	-0.8	-8.2	-8.3	1.3	2.0	0.8	-6.0	-4.3	-1.2	-0.9	-1.6	-2.2	-4.0
Japan	0.0	-0.2	0.3	-7.0	-6.6	0.2	0.3	0.2	-3.4	-3.2	-0.2	-0.4	0.1	-3.7	-3.4
Germany	-0.4	-1.3	1.4	-9.1	-5.9	0.7	0.9	0.8	-0.8	-2.1	-1.1	-2.2	0.6	-8.3	-3.9
Iceland	-1.1	-2.1	2.2	-9.3	-6.6	2.7	3.7	1.9	1.0	-0.2	-3.7	-5.8	0.3	-10.3	-6.4
UK	-1.3	-2.3	1.1	-9.9	-7.1	3.5	5.3	2.7	-0.1	-1.7	-4.8	-7.6	-1.7	-9.8	-5.4
Czech Republic	-1.4	-2.5	1.7	-11.3	-6.3	0.6	0.8	0.6	-0.3	-1.5	-2.0	-3.3	1.2	-11.0	-4.8
Finland	-1.6	-1.6	-1.2	-9.0	-9.1	0.3	0.2	0.4	-2.1	-1.4	-1.8	-1.9	-1.6	-7.0	-7.7
Slovenia	-1.6	-3.1	1.5	-16.2	-9.6	1.8	1.4	3.5	-11.0	-6.3	-3.4	-4.5	-2.0	-5.2	-3.3
Denmark	-1.7	-3.0	0.6	-9.9	-6.9	0.4	0.2	0.9	-3.2	-1.5	-2.1	-3.2	-0.3	-6.7	-5.4
Chile	-2.6	-3.8	-0.8	-12.1	-7.9	-0.3	-0.4	-0.1	-7.3	-3.9	-2.3	-3.4	-0.7	-4.8	-4.1
Italy	-2.6	-3.6	-1.4	-13.1	-8.9	0.7	0.9	0.8	-7.6	-3.5	-3.3	-4.4	-2.2	-5.6	-5.3
Greece	-2.6	-3.4	-0.7	-15.1	-9.6	1.3	1.4	1.9	-9.4	-5.1	-3.9	-4.8	-2.5	-5.7	-4.6
Austria	-2.7	-6.0	1.5	-12.9	-6.8	0.7	-0.1	1.9	-3.3	-0.2	-3.3	-5.9	-0.4	-9.6	-6.6
Rep. of Korea	-2.7	-4.1	-1.4	-15.5	-8.5	0.1	0.1	0.1	-10.7	-3.7	-2.8	-4.2	-1.5	-4.8	-4.8
Slovak Rep.	-4.5	-5.6	-2.6	-13.3	-11.0	0.2	0.2	0.2	-1.5	-1.4	-4.7	-5.8	-2.8	-11.8	-9.6
Ireland	-4.9	-4.7	-2.6	-15.4	-13.8	1.9	3.2	1.2	2.5	0.1	-6.9	-7.9	-3.8	-17.9	-13.9
Poland	-5.0	-7.7	-0.7	-16.4	-11.3	0.8	0.9	1.0	-6.5	-8.1	-5.8	-8.6	-1.6	-9.9	-3.3
Mexico	-5.0	-5.6	-4.2	-13.2	-12.1	0.2	0.4	0.1	-1.7	-1.9	-5.3	-6.0	-4.2	-11.6	-10.1
Hungary	-5.2	-7.9	-1.4	-14.8	-9.2	-0.1	-0.3	0.1	-2.7	-2.1	-5.0	-7.6	-1.5	-12.1	-7.2
Portugal	-5.9	-6.6	-4.9	-16.4	-12.7	0.5	0.9	0.4	-7.3	-3.5	-6.3	-7.5	-5.3	-9.1	-9.2

For all the countries we present the percent change in the real wage of the total efficient labor composite ($\bar{L}^T$)as well as for each type $m \in$ {H; L; h; l}. Countries are ranked according to their aggregate gains from migration.

Table 6: Sensitivity analysis with respect to the parameters

The elasticity of substitution between varieties, ϵ

	Varieties			Price Index			Wage			TFP			w^{nh}/w^{nl}			Gini		
	Benchmark (ϵ =4)	ϵ =3	ϵ=5	Benchmark (ϵ =4)	ϵ =3	ϵ=5	Benchmark (ϵ =4)	ϵ =3	ϵ=5	Benchmark (ϵ =4)	ϵ =3	ϵ=5	Benchmark (ϵ =4)	ϵ =3	ϵ=5	Benchmark (ϵ =4)	ϵ =3	ϵ=5
Outside	6.4	6.4	6.4	-2.0	-2.8	1.3	0.4	0.2	3.3	0.5	0.5	0.5	-1.1	-1.1	-1.1	0.6	0.6	0.6
	(9.4)	(9.4)	(9.4)	(1.6)	(1.7)	(2.8)	(2.5)	(2.3)	(2.8)	(1.7)	(1.7)	(1.7)	(3.6)	(3.6)	(3.6)	(3.0)	(3.0)	(3.0)
Within	-1.1	-1.1	-1.1	0.4	0.2	2.0	-1.3	-1.6	0.4	-1.2	-1.2	-1.2	2.9	2.9	2.9	3.0	3.0	3.0
	(9.3)	(9.3)	(9.3)	(1.7)	(2.0)	(2.9)	(1.7)	(1.7)	(2.6)	(0.9)	(0.9)	(0.9)	(2.2)	(2.2)	(2.2)	(4.4)	(4.4)	(4.4)

The elasticity of TFP with respect to the ratio of skilled workers to total labor: λ

	Varieties			Price			Wage			TFP			w^{nh}/w^{nl}			Gini		
	Benchmark (λ=0.3)	λ=0.2	λ=0.4	Benchmark (λ=0.3)	λ=0.2	λ=0.4	Benchmark (λ=0.3)	λ=0.2	λ=0.4	Benchmark (λ=0.3)	λ=0.2	λ=0.4	Benchmark (λ=0.3)	λ=0.2	λ=0.4	Benchmark (λ=0.3)	λ=0.2	λ=0.4
Outside	6.4	6.4	6.4	-2.0	-2.0	-2.0	0.4	0.2	0.5	0.5	0.3	0.7	-1.1	-1.1	-1.1	0.6	0.6	0.6
	(9.4)	(9.4)	(9.4)	(1.6)	(1.5)	(1.6)	(2.5)	(2.0)	(3.0)	(1.7)	(1.1)	(2.3)	(3.6)	(3.6)	(3.6)	(3.0)	(3.0)	(3.0)
Within	-1.1	-1.1	-1.1	0.4	0.0	0.5	-1.3	-1.3	-1.6	-1.2	-0.8	-1.6	2.9	2.9	2.9	3.0	3.0	3.0
	(9.3)	(9.3)	(9.3)	(1.7)	(1.6)	(1.7)	(1.7)	(1.5)	(1.9)	(0.9)	(0.6)	(1.2)	(2.2)	(2.2)	(2.2)	(4.4)	(4.4)	(4.4)

The elasticity of substitution between high and low skilled workers: σ

	Varieties			Price			Wage			TFP			w^{nh}/w^{nl}			Gini		
	Benchmark (σ=1.75)	σ=1.5	σ=2	Benchmark (σ=1.75)	σ=1.5	σ=2	Benchmark (σ=1.75)	σ=1.5	σ=2	Benchmark (σ=1.75)	σ=1.5	σ=2	Benchmark (σ=1.75)	σ=1.5	σ=2	Benchmark (σ=1.75)	σ=1.5	σ=2
Outside	6.4	6.5	6.4	-2.0	-2.0	-2.0	0.4	0.4	0.4	0.5	0.5	0.5	-1.1	-1.3	-1.0	0.6	0.2	0.9
	(9.4)	(9.7)	(9.3)	(1.6)	(1.6)	(1.5)	(2.5)	(2.5)	(2.5)	(1.7)	(1.7)	(1.7)	(3.6)	(4.2)	(3.2)	(3.0)	(3.4)	(2.9)
Within	-1.1	-1.2	-1.0	0.4	0.3	0.2	-1.3	-1.5	-1.5	-1.2	-1.2	-1.2	2.9	3.3	2.5	3.0	3.3	2.8
	(9.3)	(9.3)	(9.2)	(1.7)	(1.7)	(1.6)	(1.7)	(1.7)	(1.7)	(0.9)	(0.9)	(0.9)	(2.2)	(2.6)	(1.9)	(4.4)	(4.4)	(4.5)

The elasticity of substitution between natives and migrants: σ_M.

	Varieties			Price			Wage			TFP			w^{nh}/w^{nl}			Gini		
	Benchmark (σ_M=20)	σ_M=15	σ_M=30	Benchmark (σ_M=20)	σ_M=15	σ_M=30	Benchmark (σ_M=20)	σ_M=15	σ_M=30	Benchmark (σ_M=20)	σ_M=15	σ_M=30	Benchmark (σ_M=20)	σ_M=15	σ_M=30	Benchmark (σ_M=20)	σ_M=15	σ_M=30
Outside	6.4	6.7	6.2	-2.0	-1.6	-2.4	0.4	0.9	-0.1	0.5	0.5	0.5	-1.1	-1.1	-1.2	0.6	0.6	0.2
	(9.4)	(9.6)	(9.2)	(1.6)	(1.6)	(1.5)	(2.5)	(2.5)	(2.5)	(1.7)	(1.7)	(1.7)	(3.6)	(3.6)	(3.7)	(3.0)	(3.2)	(2.4)
Within	-1.1	-0.9	-1.3	0.4	2.7	-0.2	-1.3	-1.0	-1.9	-1.2	-1.2	-1.2	2.9	2.9	2.8	3.0	2.9	2.3
	(10.6)	(9.1)	(9.3)	(1.7)	(1.7)	(1.6)	(1.7)	(1.7)	(1.7)	(0.9)	(0.9)	(0.9)	(2.2)	(2.2)	(2.2)	(4.4)	(4.1)	(3.0)

In each group of columns we show the percent changes in key variables (i.e.the averages across 34 OECD countries and the standard deviation in the paranthesis below) after imposing a migration shock on the stock of migrants (either from outside the OECD or from the OECD).