General equilibrium analysis of immigration with cultural good and asset effects

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Abstract

This paper examines the general equilibrium economic impact on a host. country when immigrants differ from natives in terms of consumption behavior and property ownership. The immigrants arrive with a culture different from that of the natives and consume their own cultural goods. The natives own property such as land but the immigrants do not. How immigration affects the natives under such circumstances is analyzed using the product variety approach. If the cultural difference is significant, immigration harms the natives' economic welfare by reducing the range of goods and services offered for the natives. On the other hand, asset effects due to increased demand for property raises the earnings of the natives and works as a pull factor of immigration. In addition, among the various other impacts, immigration can affect the natives in a non-monotonic way. That is, once the immigrants' share within the population exceeds a threshold, immigration impact on the natives switches from negative to positive. In contrast, the immigrants always gain from arrival of new immigrants with their culture. Therefore, immigration can enlarge or reduce inequality between the natives and the immigrants.

Keywords: immigration; variety; monopolistic competition; cultural goods; property; land

JEL classification: F22, J61, Z19

1. Introduction

The home market effect explained by Krugman (1980) suggests that living in a larger economy is usually more beneficial in terms of the greater varieties of goods and services available. In this context there is no economic reason for opposing immigration, if it is considered simply as a population increase that makes the country larger. However, immigration has always been under debate in various parts of the world. This suggests that there are significant differences between a population increase and immigration that need to be taken into account in order to study immigration impacts.

As is well documented by Borjas (2014), the large body of research on immigration focuses on the labor market or wage impacts of immigration. In contrast, this study focuses on general equilibrium, economy-wide impacts of immigration. In this regard, this paper is related to studies by Epstein (1974), McCulloch and Yellen (1977), and Ottaviano and Peri (2006). However, while the pioneering studies by Epstein (1974) and McCulloch and Yellen (1977) are based on competitive models, I use the product variety approach under monopolistic competition in order to incorporate cultural goods. Also, while Ottaviano and Peri (2006) shed light on the diversity that the immigrants bring, which is found to raise wages and rents in U.S. cities, I consider the possibility of immigrants' consumption of cultural goods eroding the product variety for the natives to consume. Cultural goods have been studied, for example, in the context of international trade by Francois and van Ypersele (2002). This paper is concerned with the differences in the preferences for cultural goods that the natives and the immigrants may well have. Another difference I incorporate in the analysis is property. It is assumed that host country property is owned by the natives and, therefore, limited resources such as land need to be shared among the natives and the immigrants.

One might expect an inverted U-shaped relation regarding immigration and its impact on the natives. That is, a small level of immigration may help (or does no harm to) the natives, but they may object when immigration becomes too large relative to the native population. However, if this were the case, then we would observe a convergence in the levels of immigration across countries. In reality, while levels of immigration remain low in some countries, there are countries that keep attracting new immigrants. This suggests that there is a strong pull factor of immigrants at work in some countries, among various factors that influence immigration.

Previewing the results, there are two possible economic outcomes of immigration on the natives. One is that immigration is always welfare improving, and the other is a U-shaped relation between the immigrants’ share within the population and the natives’ economic welfare. That is, initially immigration reduces the natives’ economic well-being but once immigration exceeds a threshold, the impact turns positive. These are results of two opposing forces that immigration brings about under the present setting. One is the crowding out of the variety of cultural goods for the natives due to immigrants demanding and consuming different varieties of their cultural goods. The other force is an increase in land rent (relative to wages), which only the natives receive, due to increased demand for land to satisfy the immigrants’ demands. Whether the latter outweighs the former determines the economic impacts of immigration on the native population. It is also shown that immigrants, in contrast, always gain from new arrival of immigrants with their culture, due to the increase in the variety of their cultural goods. By comparing the situations of the natives and the immigrants, inequality between them can also be studied. It is found that immigration can work in either direction; that is, immigration can increase or reduce inequality, but in a monotonic way. Therefore, in total, four types of outcomes will be shown, when inequality is considered in addition to impact on the natives.

The rest of the paper is organized as follows. After setting the assumptions in Section 2, behaviors of consumers and firms are derived in Section 3. Section 4 solves and explains the equilibrium of the model .The equilibrium is analyzed and welfare implications of immigration is studied and summarized in Section 5, followed by a discussion of the results in Section 6.

2. Assumptions

The population of the economy consists of natives and immigrants. The native population is denoted as L_N and the immigrant population is denoted as L_I. The share of immigrants is therefore $L_I/(L_N + L_I) \equiv \lambda$. Both the natives and the immigrants work and consume. The two groups are homogeneous except for a difference in their preferences. Specifically, they consume different cultural goods in addition to the goods that the natives and the immigrants consume in common.[1] Francois and van Ypersele (2002, p.359) define cultural goods as “goods which are valued differently by consumers at home than by individuals abroad, and which are produced under scale economies." This paper follows their definition of cultural goods and defines them as goods which are valued differently by the natives than by the immigrants, and which are produced under scale economies. The consumers' preferences are described by the two-tier structure detailed below, which is based on the consumers' love of variety originally developed by Dixit and Stiglitz (1977) with constant elasticity of substitution (CES) preferences.

For the natives, the utility function is

$$U_N \equiv X^{\mu} C_N^{1-\mu}, \tag{1}$$

where $X = \left[\int_0^{n_X} x(i)^{\rho}\, di\right]^{1/\rho}$ and $C_N = \left[\int_0^{n_{CN}} c_N(i)^{\gamma}\, di\right]^{1/\gamma}$.[2] U_N is a Cobb-Douglas function of the consumption of an aggregate of the common goods (X) and the cultural goods for the natives (C_N). The second tier defines X to be a CES function such that $x(i)$ is the consumption of each variety of the common goods. It is assumed that $0 < \rho < 1$ to ensure that the varieties are imperfect substitutes. X is therefore a CES composite of the total mass of the varieties of the common goods, n_X. The elasticity of substitution between any two varieties of the common goods is $1/(1-\rho) \equiv \sigma$ ($\sigma > 1$). Similarly, C_N is a CES composite of the total mass of the varieties of the cultural goods for the natives (n_{CN}), and the elasticity of substitution between any two varieties of the cultural goods is $1/(1-\gamma) \equiv \delta$ ($\delta > 1$).

Turning to the immigrants, their utility function is

$$U_I \equiv X^{\mu} C_I^{1-\mu}, \tag{2}$$

where $X = \left[\int_0^{n_X} x(i)^{\rho}\, di\right]^{1/\rho}$ and $C_I = \left[\int_0^{n_{CI}} c_I(i)^{\gamma}\, di\right]^{1/\gamma}$. The only difference between the natives and the immigrants is in the consumption of the cultural goods. C_I is the immigrants' CES composite of the total mass of the varieties of the cultural goods for the immigrants (n_{CI}). The elasticity parameters are assumed to be the same between the natives and the immigrants.

[1] The common goods can include services such as housing, but these will be labelled 'goods' throughout. And, of course, the cultural goods can include cultural services.

[2] $\mu = 0$ and $\mu = 1$ are two extreme cases. $\mu = 0$ implies there are no common goods and all goods consumed are cultural goods. $\mu = 1$ implies there are no cultural goods and the natives and the immigrants consume only the common goods. This can be interpreted as a case of complete cultural assimilation.

On the production side, both the common goods and the cultural goods are produced by monopolistically competitive firms using land and labor as inputs. The economy is endowed with a fixed area of land ($\overline{T}$) and, importantly, land is entirely owned by the natives. A firm producing a variety of the common goods needs a unit of land and m_X units of labor per unit output. The firm thus faces increasing returns to scale. Its total cost for producing a given amount q_X is then

$$c(q_X) = t + wm_X q_X , \tag{3}$$

where t is land rent and w is wage. A firm producing a variety of the cultural goods for the natives needs a unit of land and m_{CN} units of labor per unit output. Hence its total cost for producing a given amount q_{CN} is

$$c(q_{CN}) = t + wm_{CN} q_{CN} . \tag{4}$$

Similarly, a firm producing a variety of the cultural goods for the immigrants needs a unit of land and m_{CI} units of labor per unit output. Its total cost for producing a given amount q_{CI} is then

$$c(q_{CI}) = t + wm_{CI} q_{CI} . \tag{5}$$

3. Consumer and firm behavior

3.1 Consumers

For a given income (y) and the prices of the common and the cultural goods, which are p_X and p_{CN}, respectively, a native consumer's problem is to maximize her utility subject to the budget constraint

$$\int_0^{n_X} p_X(i)x(i)di + \int_0^{n_{CN}} p_{CN}(i)c(i)di = y . \tag{6}$$

Since the preferences of the common and the cultural goods are separable and their second tiers are homothetic in $x(i)$ and $c(i)$, the problem can be solved in two steps. The first step comprises the decisions to choose $x(i)$ and $c(i)$. The second step is to allocate expenditure between X and C_N. First, the consumer should choose $x(i)$ to minimize the cost of consuming X. This implies minimizing expenditure $\int_0^{n_X} p_X(i)x(i)di$ subject to

$$\left[\int_0^{n_X} x(i)^{\rho} di\right]^{\frac{1}{\rho}} = X . \tag{7}$$

The first-order condition of the problem is that the marginal rate of substitution between any two varieties i and j is equal to its price ratio, that is,

$$\frac{x(i)^{\rho-1}}{x(j)^{\rho-1}} = \frac{p(i)}{p(j)}. \tag{8}$$

Substituting (8) into (7), the following compensated demand function for variety j of X is obtained:

$$x(j) = \frac{p(j)^{\frac{1}{\rho-1}}}{\left[\int_0^{n_X} p_X(i)^{\frac{\rho}{\rho-1}} di\right]^{\frac{1}{\rho}}} X . \tag{9}$$

Using (9), the minimum expenditure to consume X is

$$\int_0^{n_X} p_X(j)x(j)dj = \left[\int_0^{n_X} p_X(i)^{\frac{\rho}{\rho-1}} di\right]^{\frac{\rho-1}{\rho}} X . \tag{10}$$

The term $\left[\int_0^{n_X} p_X(i)^{\frac{\rho}{\rho-1}} di\right]^{\frac{\rho-1}{\rho}}$ in (10) is called the price index (G_X), and

$$G_X \equiv \left[\int_0^{n_X} p_X(i)^{\frac{\rho}{\rho-1}} di\right]^{\frac{\rho-1}{\rho}} = \left[\int_0^{n_X} p_X(i)^{1-\sigma} di\right]^{\frac{1}{1-\sigma}}. \tag{11}$$

Using G_X, (9) can be simplified as

$$x(j) = \left[\frac{p_X(j)}{G_X}\right]^{-\sigma} X . \tag{12}$$

Similarly for the cultural goods, we obtain

$$c_{CN}(j) = \left[\frac{p_{CN}(j)}{G_{CN}}\right]^{-\delta} C_N , \tag{13}$$

where G_{CN} is the price index of the natives' cultural goods, and

$$G_{CN} \equiv \left[\int_0^{n_{CN}} p_{CN}(i)^{\frac{\gamma}{\gamma-1}} di\right]^{\frac{\gamma-1}{\gamma}} = \left[\int_0^{n_{CN}} p_{CN}(i)^{1-\gamma} di\right]^{\frac{1}{1-\gamma}} . \tag{14}$$

The second step of the solution for the consumer's problem is to allocate income between X and C_N, that is, to maximize the upper-tier utility function (1) subject to the budget constraint

$G_X X + G_{CN} C_N = y$. The first-order conditions give us that μy should be spent on the composite of the common goods, and $(1-\mu)y$ on the composite of the cultural goods. Therefore, the demand functions for each variety of the common goods and the cultural goods, respectively, are

$$x(j) = p_X(j)^{-\sigma} G_X{}^{\sigma-1} \mu Y_N , \tag{15}$$

and

$$c_{CN}(j) = p_{CN}(j)^{-\delta} G_{CN}{}^{\delta-1} (1-\mu) Y_N , \tag{16}$$

where Y_N is total income of the natives. Also from (15), the price elasticity of demand $[dx(j)/dp_X(j)]/x(j)/p_X(j)$ can be derived as $\sigma + \left[p_X(j)^{1-\sigma}(1-\sigma)\right] / \int_0^{n_X} p_X(j)^{1-\sigma} dj$, but $n \to \infty$ with a continuum of varieties of the common goods, so the second term approaches zero. Therefore, the price elasticity of demand is simply σ. Similarly, the price elasticity of demand for the natives' cultural goods is δ.

The immigrant consumers' behavior is derived similarly, and the demand functions for each variety of the common goods and the cultural goods for the immigrants, respectively, are

$$x(j) = p_X(j)^{-\sigma} G_X{}^{\sigma-1} \mu Y_I , \tag{17}$$

and

$$c_{CI}(j) = p_{CI}(j)^{-\delta} G_{CI}{}^{\delta-1} (1-\mu) Y_I , \tag{18}$$

where Y_I is total income of the immigrants and G_{CI} is the price index of the immigrants' cultural goods, that is,

$$G_{CI} \equiv \left[\int_0^{n_{CI}} p_{CI}(i)^{\frac{\gamma}{\gamma-1}} di\right]^{\frac{\gamma-1}{\gamma}} = \left[\int_0^{n_{CI}} p_{CI}(i)^{1-\gamma} di\right]^{\frac{1}{1-\gamma}} . \tag{19}$$

Summarizing the consumption behaviors of the natives and the immigrants, the demand for variety j of the common goods (X) is $\mu p_X(j)^{-\sigma} G_X{}^{\sigma-1}(Y_N + Y_I)$, the demand for variety (j) of the cultural goods for the natives (C_N) is $(1-\mu) p_{CN}(j)^{-\sigma} G_{CN}{}^{\sigma-1} Y_N$, and the demand for variety j of the cultural goods for the immigrants (C_I) is $(1-\mu) p_{CI}(j)^{-\sigma} G_{CI}{}^{\sigma-1} Y_I$.

3.2 Firms

The firms engaging in the Dixit-Stiglitz monopolistic competition are identical, and take no strategic actions against other firms because the mass of firms is large. This simplifies the supply side, and it is sufficient to consider a typical firm's behavior in the three sectors. Hereafter, therefore, subscripts i and j will be omitted. A typical profit-maximizing monopolistically competitive firm producing a variety of the common goods will set its price so that marginal revenue equals marginal cost, that is,

$$p_X\left(1-1/\sigma\right)=m_X\,. \tag{20}$$

Similarly, a variety of the cultural goods for the natives and the immigrants will be priced as

$$p_{CN}\left(1-1/\delta\right)=m_{CN}\,, \tag{21}$$

and

$$p_{CI}\left(1-1/\delta\right)=m_{CI}\,, \tag{22}$$

respectively. These pricing behaviors are known as mark-up pricing, where firms always set their prices above their marginal costs. Since rival firms are producing more or less substitutable varieties, the mark-up depends on σ or δ: if the varieties are close substitutes (or the consumers' love of variety is weak), i.e., if σ or δ is high, then the consumers are sensitive to price and prices are closer to the marginal costs. By substituting (20) into (11), the mark-up pricing by each firm leads to the price index of the common goods being

$$G_X=\left(n_X\right)^{\frac{1}{1-\sigma}}\frac{\sigma m_X}{\sigma-1}\,, \tag{23}$$

and those for the natives' and the immigrants' cultural goods being

$$G_{CN}=\left(n_{CN}\right)^{\frac{1}{1-\delta}}\frac{\delta m_{CN}}{\delta-1}\,, \tag{24}$$

and

$$G_{CI}=\left(n_{CI}\right)^{\frac{1}{1-\delta}}\frac{\sigma m_{CI}}{\delta-1}\,, \tag{25}$$

respectively.

4. Equilibrium

We can now consider the equilibrium. An equilibrium is defined as a situation in which, allowing free entry, the goods and factor markets clear. The profit of a typical firm producing a variety of the common goods (π_X) is

$$\pi_X = p_X q_X - t - w m_X q_X . \tag{26}$$

Under free entry, the firms bid up the land rent (t) until π_X is zero. Then in equilibrium, operating profit $p_X q_X - w m_X q_X$ equals t. Substituting (20) into (26) and setting it equal to zero, we have

$$q_X = \frac{t(\sigma - 1)}{m_X} . \tag{27}$$

This indicates a positive linear relation between the land rent (t) and q_X, which is per firm output (or size). It also indicates that a higher σ, that is, weaker love of variety, gives a larger q_X. Similarly, free entry in the cultural goods leads to

$$q_{CN} = \frac{t(\delta - 1)}{m_{CN}} , \tag{28}$$

and

$$q_{CI} = \frac{t(\delta - 1)}{m_{CI}} . \tag{29}$$

Market clearing in the common goods market requires

$$q_X = \mu p_X{}^{-\sigma} G_X{}^{\sigma-1}(Y_N + Y_I), \tag{30}$$

where $Y_N = wL_N + t\overline{T}$ and $Y_I = wL_I$. Hereafter, the wage (w) will be set equal to 1 so that $Y_N = L_N + t\overline{T}$ and $Y_I = L_I$. Market clearing in the natives' and the immigrants' cultural goods markets requires

$$q_{CN} = (1-\mu) p_{CN}{}^{-\delta} G_{CN}{}^{\delta-1} Y_N , \tag{31}$$

and

$$q_{CI} = (1-\mu) p_{CI}{}^{-\delta} G_{CI}{}^{\delta-1} Y_I , \tag{32}$$

respectively. The factor market clearing conditions are

$$n_X m_X q_X + n_{CN} c_{CN} q_{CN} + n_{CI} m_{CI} q_{CI} = L_N + L_I \tag{33}$$

for the labor market, and

$$n_X + n_{CN} + n_{CI} = \overline{T} \tag{34}$$

for the land market. (33) and (34) imply full employment in the labor market and the land market, respectively.

Using (27) and (30), we obtain an expression for the mass of the firms producing the common goods as

$$n_X = \frac{\mu(Y_N + Y_I)}{\sigma t}, \tag{35}$$

which is equivalent to the mass of varieties of the common goods available for the natives and the immigrants. Similarly, using (28) and (31), the mass of the firms producing the natives' common goods is

$$n_{CN} = \frac{\mu Y_N}{\delta t}, \tag{36}$$

and, using (29) and (32), the mass of the firms producing the immigrants' common goods is

$$n_{CI} = \frac{\mu Y_I}{\delta t}. \tag{37}$$

The expressions (35), (36), and (37) state that rises in incomes support new firm (and variety) creation, but rises in the land rent hinder it. The former is the income effect and the latter is the cost effect that determines the masses of firms.

Substituting (30), (31), and (32) into (33), we obtain the equilibrium land rent (relative to wage) as

$$t = A\left(\frac{L_N + L_I}{\overline{T}}\right), \tag{38}$$

where A is a composite of the parameters defined as

$$A \equiv \frac{\mu(\delta - \sigma) + \sigma}{\mu(\sigma - \delta) + \sigma(\delta - 1)}, \tag{39}$$

and $A > 0$.[3] Importantly, (38) indicates that the land rent (t) linearly increases with population including immigrants ($L_N + L_I$). This implies that immigration always increases the natives' nominal income through a rise in the land rent. Further, it is found that

$\partial A/\partial \sigma = -\delta^2 \mu / [\delta(\mu - \sigma) + \sigma - \mu\sigma]^2 < 0$ and $\partial A/\partial \delta = -(1-\mu)\sigma^2 / [\delta(\mu - \sigma) + \sigma - \mu\sigma]^2 < 0$. These imply that if σ and/or δ increases then A decreases, so the effect of immigration on driving up the land rent is weakened. This is because larger σ and/or δ implies weaker demand for variety, meaning that the mass of the firms is less important, and that the prices are more important than variety. Lower demand for firms then leads to lower demand for land. It is also found that $\partial A/\partial \mu = \delta(\delta - \sigma)\sigma / [\delta(\mu - \sigma) + \sigma - \mu\sigma]^2$. Therefore, if $\delta > \sigma$ ($\delta < \sigma$) then $\partial A/\partial \mu > 0$ ($\partial A/\partial \mu < 0$), so a higher μ implies a stronger (weaker) impact of immigration on driving up the land rent. The intuition is as follows. If $\delta > \sigma$ ($\delta < \sigma$) then the consumers' love of variety is stronger in the common goods (cultural goods). Recalling that μ is the expenditure share on the common goods, an increase in μ will shift demand towards the common goods (cultural goods), which leads to increased (decreased) demand for the firms and, correspondingly, for land.

Substituting (38) into (35), (36), and (37) gives the equilibrium masses of the firms in the three sectors,

$$n_X = \frac{\mu\delta\overline{T}}{\mu\delta + \sigma(1-\mu)}, \tag{40}$$

$$n_{CN} = \frac{(1-\mu)\overline{T}}{\delta A}(1-\lambda) + \frac{(1-\mu)\overline{T}}{\delta}, \tag{41}$$

and

$$n_{CI} = \frac{(1-\mu)\overline{T}}{\delta A}\lambda, \tag{42}$$

which can be confirmed to satisfy (34). (40) indicates that the equilibrium mass of the firms producing the common goods (n_X) is neutral to population. The reason for this can be understood by inspecting (35), recalling the equilibrium land rent in (38). Population increase (including immigrants) drives up the land rent, which raises the natives' income (Y_N). This itself supports creation of new firms, but at the same time the increase in the land rent raises the cost of setting up new firms. These two effects cancel out, and any change in population does not affect the equilibrium mass of the firms in the common goods sector. In other words, irrespective of

[3] See appendix for proof.

population, equilibrium n_X is constant. The equilibrium mass of the firms producing the cultural goods for the natives (n_{CN}) in (41) has two terms. The first term indicates that n_{CN} linearly decreases with the immigrants' share (λ) within the population, meaning that immigration crowds out the production of the cultural goods for the natives. However, there is a second term which is constant. These facts imply that immigration lowers n_{CN} towards its minimum, $(1-\mu)\overline{T}/\delta$. On the other hand, as (42) indicates, the equilibrium mass of the firms producing the cultural goods for the immigrants (n_{CI}) linearly increases with λ.

Particularly important in evaluating the economic impact of immigration on the natives are the land rent (t) and the mass of firms producing the cultural goods for the natives (n_{CN}). The natives' economic welfare depends on whether the increase in t is large enough to compensate for the decrease in n_{CN}.

5. Patterns of immigration impacts

5.1 Possibility of U-shaped non-monotonicity

In this section, using the equilibrium results obtained in Section 4, we analyze the natives' economic welfare based on indirect utility which is their real income. The natives' per capita real income (ω_N) is

$$\omega_N = \frac{Y_N / L_N}{{G_X}^{\mu} {G_{CN}}^{1-\mu}}. \tag{43}$$

Substituting the results obtained in equilibrium into (43), we obtain

$$\omega_N = \frac{(1-\lambda+A)}{(1-\lambda)\left[\frac{\sigma c_X}{\sigma-1}\right]^{\mu}\left(\frac{\mu\delta\overline{T}}{\mu\delta+\sigma(1-\mu)}\right)^{\frac{\mu}{1-\sigma}}\left[\frac{\sigma c_{CN}}{\sigma-1}\right]^{1-\mu}\left[\frac{(1-\mu)\overline{T}}{\delta}\left(\frac{1-\lambda+A}{A}\right)\right]^{\frac{1-\mu}{1-\delta}}} \tag{44}$$

and

$$\frac{\partial\omega_N}{\partial\lambda} = \frac{\left\{\frac{(1-\mu)(1-\lambda+A)\overline{T}}{\delta A}\right\}^{\frac{1-\mu}{1-\delta}}\{(\delta-1)A+(\lambda-1)(1-\mu)\}}{\left[\frac{\sigma c_X}{\sigma-1}\right]^{\mu}\left(\frac{\mu\delta\overline{T}}{\mu\delta+\sigma(1-\mu)}\right)^{\frac{\mu}{1-\sigma}}\left[\frac{\sigma c_{CN}}{\sigma-1}\right]^{1-\mu}(\delta-1)(\lambda-1)^2}. \tag{45}$$

Inspecting (45), the sign of $\partial \omega_N / \partial \lambda$ is ambiguous, because $\{(\delta - 1)A + (\lambda - 1)(1 - \mu)\}$ can take either sign. Importantly, therefore, immigration can affect ω_N in both directions. If $\{(\delta - 1)A + (\lambda - 1)(1 - \mu)\}$ is positive and correspondingly $\partial \omega_N / \partial \lambda > 0$, then an increase in the share of the immigrants within the population (λ) will always increase the natives' per capita real income (ω_N). That is, ω_N monotonically increases with immigration. However, if $\{(\delta - 1)A + (\lambda - 1)(1 - \mu)\}$ is negative, then $\partial \omega_N / \partial \lambda < 0$.[4] Specifically, if condition

$$\lambda = 1 - \frac{(\delta - 1)A}{1 - \mu} > 0 \tag{46}$$

holds, then a U-shaped non-monotonic relation between λ and ω_N exists as illustrated in figure 1. There is a turning point at $\lambda_{TP} = 1 - (\delta - 1)A/(1 - \mu)$. If $\lambda < \lambda_{TP}$ ($\lambda > \lambda_{TP}$), then $\partial \omega_N / \partial \lambda > 0$ ($\partial \omega_N / \partial \lambda > 0$), meaning that an increase (decrease) in the immigrants share reduces (raises) the natives' welfare. Hence, if $\lambda < \lambda_{TP}$ ($\lambda > \lambda_{TP}$) then the natives are likely to take anti- (pro-) immigration positions. The result suggests that once a country's share of λ exceeds a certain level (λ_{TP}), immigration impact on the natives turns positive and the natives' attitudes may well change from anti- to pro-immigration. Otherwise, the country stays anti-immigration and low immigration level persists.

What is the economic meaning of the non-monotonicity condition in (46)? Satisfaction of this condition requires $(\delta - 1)A/(1 - \mu) < 1$. First, therefore, A must be small. Small A means, as presented in (38), the positive impact of immigration on the land rent is weak. This implies that satisfaction of condition (46) is likely to reduce the natives' income gain from immigration. Second, $(1 - \mu)/(\delta - 1)$ must be large, which requires low μ and/or low δ. Low μ means higher expenditure share on the cultural goods, whereas low δ means that the love of variety of the cultural goods is strong. Therefore, the inevitable loss of variety of the cultural goods for the natives caused by immigration, as presented in (41), is stronger.

In summary, condition (46) is likely to be satisfied when 1) the two cultures are heterogeneous in consumption and/or 2) the variety of cultural goods is important.

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[4] $\partial \omega_N / \partial L_N > 0$. Therefore, a native population increase always raises their per capita real income.

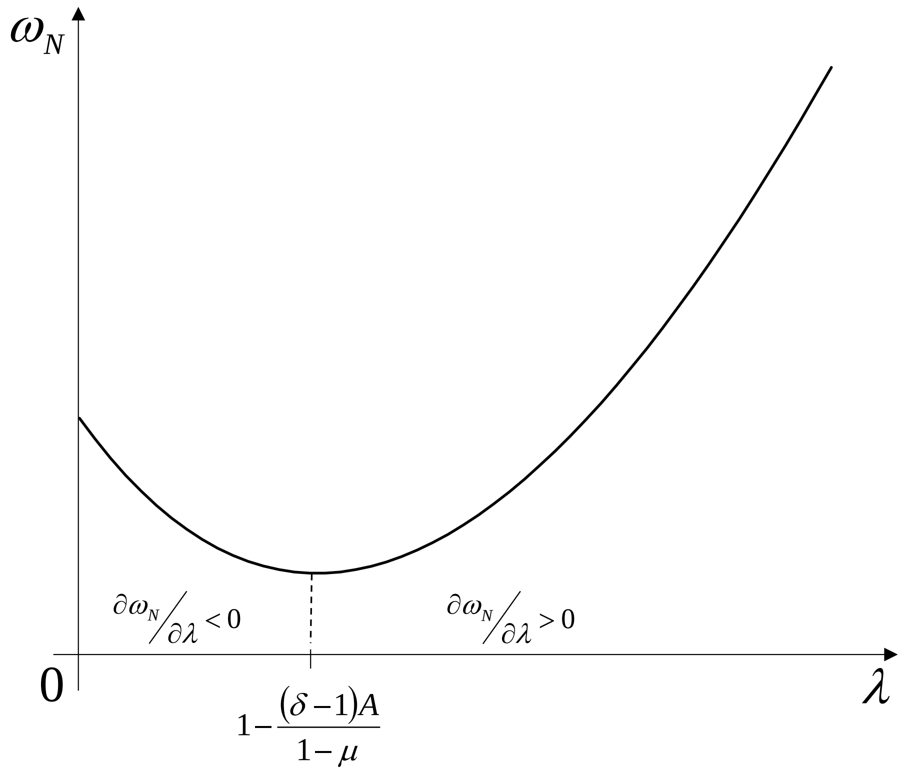


Figure 1. Case of a U-shaped impact of immigration on the natives

5.2 Inequality between the natives and the immigrants

Up to this point, the welfare of the immigrants has not been presented. The immigrants' per capita real income (ω_I) is

$$\omega_I = \frac{Y_I / L_I}{G_X{}^{\mu} G_{CI}{}^{1-\mu}} = \frac{1}{G_X{}^{\mu} G_{CI}{}^{1-\mu}}. \tag{47}$$

Given result (42) that an increase in the share of immigrants (λ) within the population always increases the variety of the immigrants' cultural goods (n_{CI}), immigration always reduces the price index of their cultural goods (G_{CI}). Therefore, the immigrants always gain from further inflow of new immigrants. In other words, $\partial\omega_I / \partial\lambda > 0$ always holds, hence the existing immigrants always gain from the arrival of new immigrants.

The present model also speaks to inequality between the natives and the immigrants. It can be measured by the relative real income, ω_N / ω_I. Using (43) and (47), it is

$$\frac{\omega_N}{\omega_I} = \left(\frac{1-\lambda+A}{1-\lambda}\right)^{\frac{\sigma+\mu-2}{\sigma-1}}, \tag{48}$$

and $\omega_N / \omega_I > 1$. Therefore, the natives, on average, always enjoy higher real incomes than the immigrants. Further,

$$\frac{\partial(\omega_N/\omega_I)}{\partial\lambda} = \frac{(A+1)\left(\frac{1-\lambda+A}{\lambda}\right)^{\frac{\mu-1}{\sigma-1}}(2-\mu-\sigma)}{(\sigma-1)\lambda^2}. \tag{49}$$

Inspecting (49), its sign depends on μ and σ. Specifically, if $\mu+\sigma<2$ then $\partial(\omega_N/\omega_I)/\partial\lambda > 0$, that is, immigration monotonically enlarges inequality. On the other hand, if $\mu+\sigma>2$ then $\partial(\omega_N/\omega_I)/\partial\lambda < 0$, that is, immigration monotonically reduces inequality between the natives and the immigrants. Why does immigration enlarge the inequality when μ and/or σ is small? This can be explained by recalling the analysis of the equilibrium land rent in (38). Smaller σ means that the variety of the common goods is important for the consumers. This leads to larger demand for firms and, correspondingly, for land. This raises the land rent, which works to the advantage of the natives through their income increase. In addition, a smaller μ with smaller σ means that the consumers' expenditures shift to the common goods in which the demand for variety is large. This also increases the land rent and equivalently the natives' income, to enlarge the inequality between the natives and the immigrants.

In summary, immigration impact on inequality between the natives and the existing immigrants is monotonic, but can act in either direction.

5.3 The four patterns of immigration impacts

Summarizing the results obtained, we find that there are four patterns in terms of the impacts of immigration on the natives and on the inequality between the natives and the immigrants (Table 1).

The existence of U-shaped non-monotonicity suggests that economies can be separated into two groups. One group comprises the countries that keep accepting new immigrants, since immigration is self-reinforcing. The other group comprises those that sustain only a low level of immigration, because additional immigration harms the natives economically.

Table 1. Four possible patterns of immigration impacts on welfare and inequality

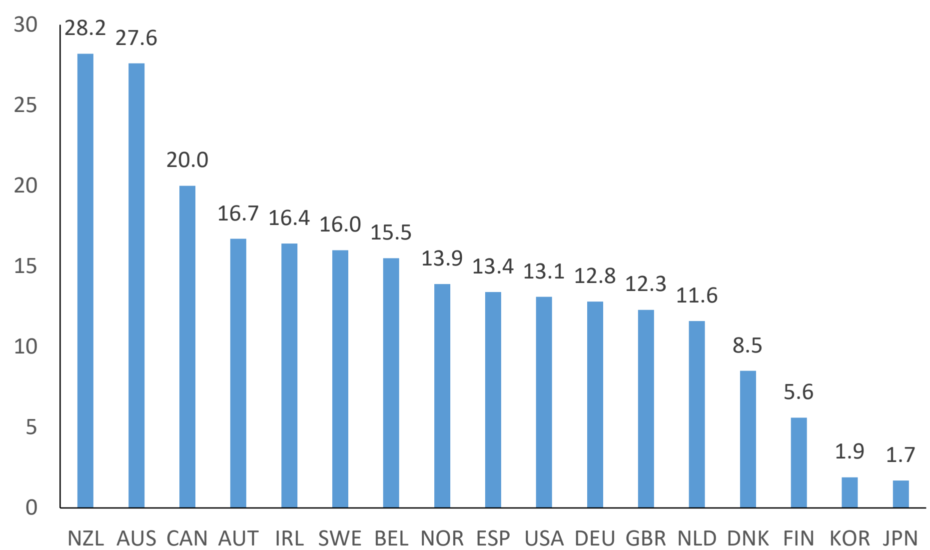
	Impact on the natives	Inequality between the natives and the immigrants
1) Non-monotonic (U-shaped) impact and increasing inequality	$\frac{\partial \omega_N}{\partial \lambda} > 0$, $\frac{\partial \omega_N}{\partial \lambda} < 0$	$\frac{\partial(\omega_N / \omega_I)}{\partial \lambda} > 0$
2) Non-monotonic (U-shaped) impact and decreasing inequality	$\frac{\partial \omega_N}{\partial \lambda} > 0$, $\frac{\partial \omega_N}{\partial \lambda} < 0$	$\frac{\partial(\omega_N / \omega_I)}{\partial \lambda} < 0$
3) Monotonic (positive) impact and increasing inequality	$\frac{\partial \omega_N}{\partial \lambda} > 0$	$\frac{\partial(\omega_N / \omega_I)}{\partial \lambda} > 0$
4) Monotonic (positive) impact and decreasing inequality	$\frac{\partial \omega_N}{\partial \lambda} > 0$	$\frac{\partial(\omega_N / \omega_I)}{\partial \lambda} < 0$

6. Discussion

Figure 2 shows the share of foreign born within the population of various OECD member countries. There are, of course, various reasons for the variation observed in these data, and they cannot be explained solely by the theory presented in this paper. However, at first glance, Korea and Japan are outliers given their low shares of immigrants within their populations. Korea and Japan are both Asian OECD countries, and likely to be culturally different from larger cultural groups in the rest of the world. Japan, in particular, was analyzed by Huntington (1996) as an ‘isolated culture’, meaning that the nation does not share its culture with any foreign country, or does not belong to any other cultural groups of nations. If such is the case, the present theory suggests that Japan (and probably Korea) is more likely to be classified in the non-monotonic impact group in Table 1. This will then explain why in Japan the share of immigrants is relatively low, and more importantly, suggests that the trend may reverse and the native population will enjoy the economic gains from having more immigrants. This forecast becomes more likely when one takes into account that the native population is now decreasing in Japan. In the present model, a decrease in native population implies an automatic rise in the share of immigrants, λ. Recalling Figure 1, then, a native population decrease in Japan raises λ, leading to a rise in the real wages of the natives (ω_N) so that the natives’ attitudes towards immigration change from negative to positive.

There is growing concern in Japan that the nation's population will keep decreasing, accompanied by a rapid aging of the society. The present theory, however, suggests that there is an opposite force that may put a brake on the population decrease: if the Japanese situation can be classified as the non-monotonic or the U-shaped type, then the natives' attitudes towards immigration are likely to turn positive (at least from economic grounds) as the share of immigrants rises in Japan. After crossing the turning point as illustrated in figure 1, the self-reinforcing pull factor of immigration sets in to bring in new immigrants, potentially leading to a population increase in Japan.

Some limitations of the analysis should be noted. First, external trade was ignored. This rules out potential effects of people's movement between countries on international flow of goods and services. Second, the analysis assumed only two different cultures, those of the natives and the immigrants. Therefore, it may not capture the real-world complexity that arises when immigrants arrive from multiple cultures. Third, the model assumed homogeneous workers. That is, the analysis abstracted from possible differences in skills between the natives and the immigrants. Finally, in the very long run, immigrants may assimilate to the native culture, in which case, the crowding-out problem of the cultural goods that the analysis incorporates may become less important.



Source: OECD (2015) and Japanese Ministry of Health, Labor and Welfare

Figure 2. Share of foreign born within the population, %

Appendix

Proof of $A \equiv \dfrac{\mu(\delta-\sigma)+\sigma}{\mu(\sigma-\delta)+\sigma(\delta-1)} > 0$:

Recall assumptions $\sigma > 1$, $\delta > 1$, and $0 < \mu < 1$.

a. If $\sigma > \delta$

Both the denominator and the numerator of A are positive, that is, $\mu(\sigma-\delta)+\sigma(\delta-1) > 0$ and $\mu(\delta-\sigma)+\sigma > 0$. Therefore, $A > 0$.

b. If $\sigma < \delta$

The denominator of A can be rearranged as $\delta(\sigma-\mu)-\sigma(1-\mu)$. By the assumptions, $\sigma-\mu > 1-\mu > 0$. In addition, $\sigma < \delta$. Hence, $\delta(\sigma-\mu)-\sigma(1-\mu) > 0$. The numerator of A can be rearranged as $\sigma(1-\mu)+\delta\mu$. Given the assumptions, it is positive. Therefore, $A > 0$.

c. If $\sigma = \delta$

Then $A = \dfrac{1}{\delta-1} > 0$

From a, b, and c, therefore, $A > 0$.

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