CHAPTER 19

The Impact of International Migration on Economic Growth in the Global Economy

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1. INTRODUCTION

One of the remarkable facts of life is that in most countries people enjoy a higher standard of living—measured by real income per capita—now than a decade ago, a generation ago, or at any time earlier.[1] Of course there are huge differences in growth rates between countries. The growth in real income per capita in some highly developed countries has been only around 1–2% per year on average in recent decades, whereas in some developing countries double-digit growth rates have been observed. Theories of growth have a long history that started with the classical economists and early twentieth century contributions by, for example, Ramsey (1928), Harrod (1939), and Domar (1946), followed by the neoclassical growth model of Solow (1956) and Swan (1956). Growth theory witnessed a revival in the second half of the 1980s and the 1990s with the development of

[1] For example, using Penn World Table 1950–2010 data on real income in 149 countries (Heston et al., 2012), we find that on average only 28 countries experienced negative real income growth over a decade while only seven countries had a lower standard of living in 2010 than in 1950.

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endogenous growth models (see, e.g., Acemoglu (2008) and Barro and Sala-i-Martin (2004) for textbook reviews). An extensive body of knowledge has evolved regarding the factors responsible for long-run increases in income per capita. Recent literature on the importance of cities (Glaeser, 2011) and institutions (Acemoglu and Robinson, 2012) has further enhanced our understanding of economic growth. This chapter focuses on the impact of a change in population through international migration on short-run and long-run economic growth. We shall see that this impact is complex and wide ranging.We therefore consider the impact of foreign migration on the rate of economic growth of countries or regions from a range of perspectives.

Cross-country labor migration has become a major international trend in recent decades. Settlement abroad remains highly restricted, in absolute terms but also relative to trade and capital mobility. Nonetheless, migrants account for more than 10% of population in many developed countries and for a quarter or more in some. Migrants are in many cases economic "opportunity seekers" whose spatial choice behavior is determined by more favorable economic conditions in destination areas or countries than "at home". Thus, it is plausible that both richer countries and faster-growing countries attract more migrants. But once such countries have become a destination for flows of foreign migrants, the socio-economic impacts of these migrants on host regions or countries become important issues. The systematic assessment of these impacts is called migration impact assessment (MIA; see Nijkamp et al., 2012).

MIA contains various impact categories, many of which may have implications for levels and growth of real income per capita. These categories include: labor market impacts (e.g., wages, jobs, unemployment); innovation (e.g., patents, product innovations, process innovations); international economic relations (e.g., international trade, tourism, foreign direct investment); entrepreneurship (e.g., ethnic firms, ethnic precincts, competition); social impacts (e.g., trust, cohesion, segregation) and population composition (e.g., cultural diversity, socio-economic diversity). These and other MIA categories have attracted much attention in recent years and various methodological perspectives can be found in the literature (Nijkamp et al., 2012), such as conceptual and theoretical contributions; comparative and meta-analytical research; quantitative and qualitative case studies; mixed method research; and statistical and econometric modeling with micro or macro cross-sectional, time-series, or panel data.

While most countries experience both immigration and emigration, MIA has been mostly applied to countries that have seen a significant volume of net inward migration. Such countries are predominantly highly developed countries or fast-growing emerging economies. However, MIA can be clearly also applied to countries experiencing significant outflows of people. Because migrant sending and receiving countries are often highly dissimilar, it does not follow that an MIA of an emigration country will detect impacts that are of opposite sign but similar magnitude to those found in immigration countries. Indeed, removal of barriers to international migration may generate significant

economic gains to both sending and receiving countries (Clemens, 2011; di Giovanni et al., 2012; Kennan, 2013). This chapter considers the growth impact of both net emigration and immigration, but with greater emphasis on the latter given that the available empirical evidence in that case is more extensive.

The literature frequently emphasizes that the causal link between migration and growth goes in both directions: growth triggers inward migration but any new arrivals may also influence economic growth. While surveys show that people migrate for varied and often multiple reasons, migrants are predominantly of working age and would commonly only migrate if this would make them materially better off—i.e., if their real income increases. Sjaastad (1962) was the first to formally argue that migration is an investment, whereby the migrant incurs cost in order to reap the future benefit of a greater return to his or her human capital by relocation. Rapidly growing economies are attractive destinations for migrants in this respect: they tend to offer an increasing number of job opportunities and the present value of the anticipated stream of future earnings will also be greater than in the home country.

Hence economic growth causes inward migration. But how does migration affect future growth? Unless immigrants remain unemployed, or displace workers one-for-one in the host economy, the presence of additional workers certainly raises Gross Domestic Product through their contribution to output. Since there is extensive empirical evidence that immigrants do not raise the rate of unemployment (e.g., Longhi et al., 2008) and do not fully displace native-born workers (e.g., Cattaneo et al., 2013), net inward migration increases the size of the host economy—i.e., immigration causes economic growth in its "extensive form" of growth in output. However, under the assumptions of an open economy with a high rate of international capital mobility, homogeneous labor, constant returns to scale, and a globally available technology, net immigration does not affect the standard of living. A positive shock to labor supply through immigration simply leads under these assumptions to a capital inflow that restores the original capital–labor ratio. Income per capita is then *ex post* the same as it was before. Alternatively, if we take a regional perspective and account for the spatial concentration of immigrants in one region (usually a large metropolitan area), there are expected to be both a capital inflow into and labor outflow from that region, leading to *ex post* equalization of capital–labor ratios across regions (as described by the one-sector multi-regional growth model—see, e.g., McCann, 2013).

This result is very simple to demonstrate formally, if we assume that production in the macro-economy takes place according to a Cobb–Douglas production function with constant returns to scale, i.e.,

$$Y = F(A, K, L) = AK^{\alpha}L^{(1-\alpha)} \tag{19.1}$$

in which Gross Domestic Product, indicated by Y, is a function of the capital stock K and the labor force L. A represents technology (or "total factor productivity") and α

represents the share of capital income in total income. In growth rates, (19.1) can be rewritten as

$$g_Y = g_A + \alpha g_K + (1-\alpha) g_L \tag{19.2}$$

in which g_Y denotes the growth rate of Y, $(\partial Y/\partial t)/Y$, etc. Hence, if in the short run the capital stock remains fixed and technology is also unaffected, an exogenous increase in the labor force through immigration, $g_L = m$, leads to additional output $g_Y = (1-\alpha)m$, where m refers to the net immigration rate (immigration minus emigration, divided by the initial population). In these circumstances, the standard of living declines by $g_Y - g_L = -\alpha m$ (strictly speaking the standard of living is defined in terms of income per capita rather than income per worker, but if immigration does not have a noticeable impact on labor force participation, and Longhi et al. (2008) showed that it does not on average, growth in real income per worker is equal to growth in the standard of living).

The magnitude of this effect can be easily assessed with data from the OECD, a representative group of higher income immigrant-receiving countries. The share of capital income in total income has been increasing in these countries and is currently about 38% (OECD, 2012, p. 110). The annual rate of net migration per 1000 population can be obtained from UN data.[2] For OECD countries this rate has been increasing from 0.7 over the 1980–90 decade to 3.8 over the 2000–10 decade. This implies that between 2000 and 2010 the average net immigration rate was 0.38% per annum in these countries. Equation (19.2) suggests that the associated short-run impact of this net immigration rate would be a decline in the standard of living of 0.14 percentage points per annum when assuming constant technology and a fixed capital stock. This compares with an observed average increase in real GDP per capita in these countries of 1.2% per annum. We see that, all else being equal, the experienced net inward migration would have lowered in this simple model the per-capita growth rate in the short run in these countries by about one-tenth of the counterfactual growth rate with zero net migration.

However, the net influx of migrants raises the return to capital, which is given by the value of the marginal product of capital, which is

$$\partial Y/\partial K = \alpha A (K/L)^{(\alpha-1)} \tag{19.3}$$

and, hence, the return to capital increases by

$$g_{\partial Y/\partial K} = g_A + (\alpha-1) g_K - (\alpha-1) g_L = (1-\alpha) m \tag{19.4}$$

for given technology and capital stock. With capital freely flowing across countries, this would encourage both a capital influx and increased domestic savings (Ramsey, 1928) and investment up to the point where the local rate of return is again equal to the world rate of return.

[2] See http://esa.un.org/wpp/excel-dat/population.htm.

It is easy to see that for a given population L_c in country c, a given production technology A_c and a given worldwide rate of return to capital i_w, the endogenous capital stock is

$$K_c = [\alpha A_c / i_w]^{(1/(1-\alpha))} L_c \tag{19.5}$$

while real income is given by

$$Y_c = [A_c]^{1/(1-\alpha)} [\alpha / i_w]^{\alpha/(1-\alpha)} L_c \tag{19.6}$$

In this very stylized world, real wages continue to differ between countries as long as inward migration is restricted and cannot respond endogenously to real wage differentials. The wage is

$$w_c = (1-\alpha)[A_c]^{1/(1-\alpha)} [\alpha / i_w]^{\alpha/(1-\alpha)} \tag{19.7}$$

i.e., the wage is higher where total factor productivity is greater, but is independent of the level of net inward immigration, which we assumed to be restricted and therefore exogenous. This very simplistic model of a world of homogeneous labor but with productivity differences across countries is nonetheless consistent with the empirical evidence that net immigration has virtually no impact on wages (Longhi et al., 2005), while immigration also hardly affects the capital–output ratio (Peri, 2012). In that case, a positive immigration shock simply scales up the economy once capital has had the time to adjust, but leaves the standard of living unaffected.

The key issue of interest is therefore how outward or inward migration affects total factor productivity, A. This is the core question of the present chapter. Even if capital did not adjust fully and the wage declines initially following a positive labor supply shock through immigration, this negative effect could be subsequently offset by productivity effects. There are various possible causes of such productivity effects. Firstly, they could be the result of heterogeneous labor: the presence of skilled and unskilled workers, combined with the assumption that capital is not skill neutral. Lewis (2012) showed that when it is assumed that capital complements skilled labor but is a substitute for unskilled labor, an assumption for which empirical labor economics has provided ample evidence, a migration shock has relatively little impact on wages. Secondly, positive technology effects could be the result of external "spillovers" from migration, which in the simple model above is equivalent to saying that $\partial A / \partial m > 0$. For example, there may be knowledge spillovers from the employment of skilled migrants. Moreover, the higher rates of return to capital that result from additional immigrant labor trigger new investment and this investment is likely to embody the latest technologies. The expansion of the local economy, as well as the growing diversity of the workforce, may also trigger product and process innovation. As with any kind of positive growth externalities, even if they raise the rate of growth only slightly, the fact that their impact is permanent may offset the short-run adjustment costs, such as initially lower wages for locally born workers who are

direct substitutes for the immigrants or lower productivity of immigrants due to the non-transferability of some migrant skills from the home to the host country.

The simple growth equations described above apply equally to the case of positive net migration ($m > 0$) or negative net migration ($m < 0$). But are the impacts indeed of opposite sign but of equal magnitude when comparing those cases? Does the magnitude (or even the sign) of $\partial A/\partial m$ depend on the sign of m? In the next section we consider the empirical evidence based on some simple pooled cross-section time-series regressions of growth in most countries of the world for all decades since 1950. Besides measuring the impact of migration on output growth and the standard of living, we also compare the impact of migration with that of natural increase.

We find that positive or negative net migration in a country over a decade is neither harmful nor beneficial to economic growth in that decade. In contrast, natural increase (births minus deaths) over a decade is harmful to growth in that decade. In the long run, robust effects are hard to detect, but there is some tentative evidence that net migration may benefit growth in rich countries after two to three decades, presumably through endogenous technological change. At the same time, migrant-sending countries also experience a positive impact after several decades, in their case from net outward migration. Such a positive impact could be due to remittances to those countries and greater human capital investments (e.g., Docquier and Rapoport, 2010). Natural increase appears to have generated in developed countries a so-called "demographic dividend" for growth after two decades (see, e.g., Bloom et al., 2003). This would be due to an increase in the number of births resulting in an increased number of labor force entrants two decades later. However, our regression models do not detect such a demographic dividend effect on growth in income per capita in developing countries.

In the remainder of the chapter we consider what theoretical models of growth, trade, and agglomeration have to say about our stylized observations regarding the impact of a migration shock on growth. Section 3 focuses on implications for growth of population change through migration in the conventional neoclassical growth models with exogenous technical change. Section 4 then reviews lessons from considering the role of migration in modern theories of the spatial allocation of economic activity and growth that are either referred to as New Economic Geography (NEG) models, theories of agglomeration, or models of endogenous growth. Section 5 focuses in further depth on how the changing composition of the urban population in terms of age distribution, cultural diversity, and skills can affect growth. Migrants are also often seen as positively self-selected, with a willingness to take risks and a keen eye for new business opportunities. Section 6 reviews the links between migration and entrepreneurship.

In many of the conventional theoretical models, the cases of immigration and emigration are symmetrical: where the residents of a country benefits from net inward migration they would face a net cost from net emigration. The classic example is that a brain drain from developing countries benefits the developed world but may lower the growth

prospects of the former nations. Yet migrant-sending countries may benefit from remittances or from the networks that diaspora establish. Wages in migrant-sending countries may also be higher than they would be otherwise, leading to greater human capital investments. Section 7 critically assesses the conditions under which international migration yields a "triple win" situation: improved well-being for the migrant, but also a higher standard of living in the host country and in the sending country—jointly leading to enhanced growth prospects for the world as a whole.

The final section of the chapter outlines some implications of the changing nature of international migration, with a growing complexity of migration flows and specifically an increase in various types of temporary migration. We conclude by setting a research agenda for providing new evidence on the multifaceted linkages between international migration and economic growth.

2. ECONOMIC GROWTH AND POPULATION GROWTH ACROSS THE WORLD

Does immigration raise the long-run rate of growth? In a largely non-experimental science such as economics, there is no simple counterfactual. What would the US economy have looked like in the mid-twentieth century if the immigration wave of the late nineteenth and early twentieth centuries had not taken place? What would the economy of Japan be at present if that country had permitted rates of inward net migration in recent decades such as those observed in, for example, Australia and New Zealand?

Boubtane and Dumont (2013) estimated a growth model that extends the simple model discussed in the previous section with the additional consideration of the skills of labor through the production factor human capital. The impact of net immigration on productivity growth in their model is theoretically ambiguous because it depends on foreign-born and native-born relative human capital endowments, the scope of migration, and the production technology. Boubtane and Dumont estimated their growth equation with data from 22 OECD countries over the period 1986–2006 and attempted to control econometrically for reverse causality. Their broad conclusion is that an increase in the net migration rate increases the rate of growth of output per worker slightly. Specifically, an increase in the net migration rate by 1 percentage point in EU15 countries has a positive impact on labor productivity growth that is about 0.1 percentage points (Boubtane and Dumont, 2013, Table 4). Interestingly, this result is identical to the average effect of net migration found in a meta-analysis by Ozgen et al. (2010). The latter used meta-regression modeling to calculate an average effect based on a range of econometric analyses of the impact of net *internal* migration in mostly developed countries on growth. The similarity with the average impact of net international migration in EU15 countries is striking.

However, it should be noted that such a migration shock of 1 percentage point is very large compared with the recent actual experience of a net immigration rate of about 0.5% per annum in these countries (which, in turn, should be compared with a total population growth rate of about 1% per annum). Taking into account the greatly varying rate of net immigration across OECD countries, Boubtane and Dumont (2013) found that a 50% increase in the actually experienced level of net migration of the foreign-born in most OECD countries would have a negligible effect on productivity growth.

But what about the countries that experience net emigration? And does the selection of countries matter? In order to answer these questions, we examine the relationship between growth in purchasing power parity (PPP)-converted real GDP per capita (2005 prices) and the net migration rate for most of the countries of the world between 1950 and 2010. Our analysis is based on data from 149 countries that were selected based on data availability. PPP-converted GDP per capita, population, and investment data were retrieved from the Penn World Table (Heston et al., 2012). Data on net migration rates were retrieved from the United Nations Department of Economic and Social Affairs (UNDESA, 2011). The period between 1950 and 2010 was divided into six decades and the relationship between the real GDP per capita growth rate and the net migration rate was examined by merging the two datasets into a panel data setting (149 countries across six decades). GDP growth is defined as the sum of GDP per-capita growth and population growth. The observed net migration rate is the reported number of immigrants minus the number of emigrants over a five-year period, divided by the person-years lived by the population of the receiving country over that period. This was converted to the average contribution of net migration to population growth over each decade. The rate of natural increase is defined as the decadal rate of population growth minus the decadal rate of net migration. Table 19.1 reports descriptive statistics by decade and for the pooled data.

Table 19.1 Descriptive statistics

Decade	Observations	Mean	Standard deviation	Min	Max
1950–60					
GDP growth	54	0.436	0.187	0.037	0.904
GDP per-cap. gr.	54	0.229	0.191	−0.214	0.695
Investment ratio	108	20.6	12.6	1.6	63.9
Population growth	149	0.210	0.104	−0.100	0.613
Net migration rate	149	−0.009	0.0760	−0.379	0.379
Natural incr. rate	149	0.219	0.090	0.035	0.451
1960–70					
GDP growth	108	0.505	0.225	−0.098	1.023
GDP per-cap. gr.	108	0.293	0.231	−0.283	0.902

Table 19.1 Descriptive statistics—cont'd

Decade	Observations	Mean	Standard deviation	Min	Max
Investment ratio	149	22.9	12.3	2.5	66.8
Population growth	149	0.218	0.100	−0.009	0.572
Net migration rate	149	−0.010	0.069	−0.210	0.358
Natural incr. rate	149	0.228	0.089	0.031	0.399
1970–80					
GDP growth	149	0.418	0.281	−0.739	1.330
GDP per-cap. gr.	149	0.215	0.272	−0.668	0.896
Investment ratio	149	25.6	12.6	2.2	65.5
Population growth	149	0.203	0.116	−0.071	0.597
Net migration rate	149	−0.016	0.087	−0.395	0.455
Natural incr. rate	149	0.219	0.102	−0.009	0.441
1980–90					
GDP growth	149	0.278	0.275	−0.713	1.087
GDP per-cap. gr.	149	0.077	0.283	−0.854	0.810
Investment ratio	149	22.0	10.5	1.9	57.2
Population growth	149	0.201	0.119	−0.112	0.423
Net migration rate	149	−0.014	0.076	−0.371	0.288
Natural incr. rate	149	0.215	0.110	−0.038	0.378
1990–2000					
GDP growth	149	0.314	0.302	−0.802	2.489
GDP per-cap. gr.	149	0.141	0.301	−0.958	2.208
Investment ratio	149	22.0	9.4	1.4	62.8
Population growth	149	0.174	0.109	−0.129	0.493
Net migration rate	149	−0.008	0.063	−0.219	0.238
Natural incr. rate	149	0.182	0.105	−0.075	0.391
2000–10					
GDP growth	149	0.385	0.253	−0.223	1.176
GDP per-cap. gr.	149	0.234	0.227	−0.208	0.927
Investment ratio	149	24.8	10.2	3.1	67.2
Population growth	149	0.151	0.109	−0.090	0.590
Net migration rate	149	0.001	0.068	−0.187	0.488
Natural incr. rate	149	0.150	0.107	−0.078	0.376
Pooled					
GDP growth	758	0.377	0.275	−0.802	2.489
GDP per-cap. gr.	758	0.189	0.270	−0.958	2.208
Investment ratio	853	23.1	11.4	1.4	67.2
Population growth	894	0.193	0.111	−0.129	0.613
Net migration rate	894	−0.009	0.073	−0.395	0.488
Natural incr. rate	894	0.202	0.104	−0.078	0.451

Population growth over 1950–2010 has been on average 19.3% per decade, equivalent to about 1.8% per year. Due to the global demographic transition, with declining mortality preceding declining fertility, population growth peaked during the 1960s. This was also the decade of the highest GDP growth and GDP per-capita growth. The investment to GDP ratio averaged about 23% over the six decades.

By definition, global net migration is zero in every decade as net inflows in some countries must be balanced by net outflows in others. However, taken as a rate of population, the mean net migration rate is not zero but slightly negative in most decades (except for 2000–10). Because the global average of net migration rates is the weighted average level of net migration of each country, weighted by the reciprocal of population of the country, a negative global average implies that smaller countries are expected to have had on average relatively more negative net migration rates than larger countries. The data show that this is indeed the case.

Figure 19.1 simply pools the data and shows the scatter plot of decadal GDP growth versus the net migration rate (a) and of decadal GDP per-capita growth versus the net migration rate (b). The scatter plots show diverse experiences across countries that are not suggestive of a positive correlation in either case. However, there is a positive and statistically significant, but weak, correlation between GDP growth and the net migration rate (with a correlation coefficient of about 0.2), whereas the correlation between GDP per-capita growth and the net migration rate is non-existent (0.03).

While the careful and full specification of a global panel model of economic growth is beyond the scope of this chapter, we will fit some illustrative regression models to test for the impact of net migration. The selected models are arguably quite robust to underspecification of the growth model. While there is undoubtedly some omitted variable bias, we will minimize the impact by the assumption of country-specific growth persistence and by introducing country fixed effects. To the extent that there is remaining omitted variable bias, it is not a priori clear that such omitted variables are highly correlated with the rate of net migration. In contrast with Boubtane and Dumont's (2013) panel data analysis for the OECD, our main omission is that we do not consider the education and skills of the migrants, but for the world as a whole it is not obvious that a country's net migration rate is correlated with a country's rate of human capital accumulation. However, the available data allow us to control for neoclassical convergence by including the level of real income per capita in the previous decade and by either introducing "convergence club" dummies (Africa, Asia, Europe, Latin America and the Caribbean, North America, and Oceania) or country fixed effects. Period dummies are also used. The regression results are reported in Table 19.2.

The first column of Table 19.2 reports a simple OLS regression of GDP growth on the net migration rate and the rate of natural increase, while allowing for fixed effects for each decade. The coefficients are consistent with what neoclassical production theory as described in the introductory section predicts. An increase in the net migration rate of

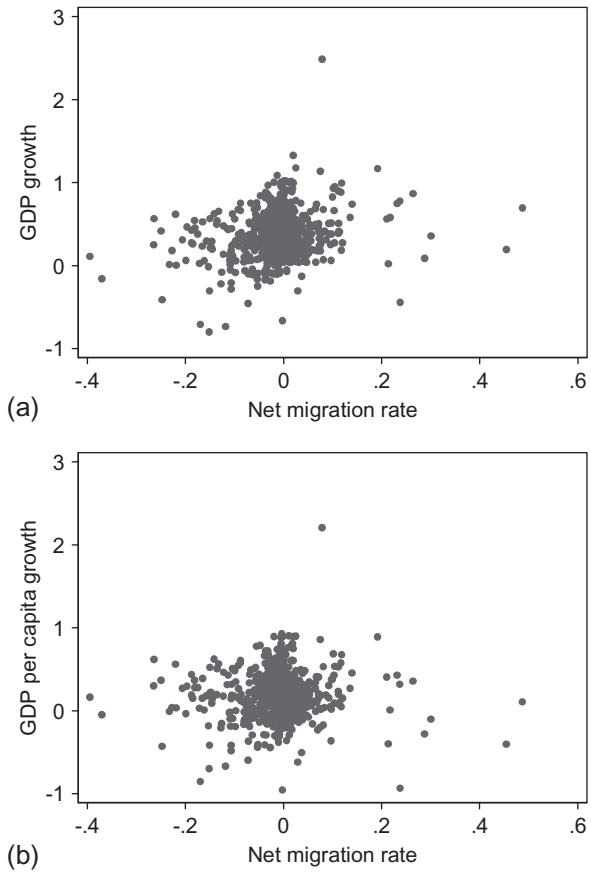

Figure 19.1 ***1950–2010 net migration and real GDP growth in 149 countries.*** (a) Pooled decadal real GDP growth and the decadal net migration rate. (b) Pooled decadal real GDP per-capita growth and the decadal net migration rate.

1 percentage point increases GDP by close to 1 percentage point (0.913)—i.e., the economy roughly scales up. This would imply that net inward migration, with migration being predominantly undertaken by young adults, leads to additional capital accumulation that leaves the capital–labor ratio and income per capita rather unaffected, at least in the concurrent decade. In contrast, the increase in the rate of natural increase of 1 percentage point also triggers an expansion of the economy, but to a far lesser extent: by only about 0.5 percentage points. This is also as expected because a shock to births minus deaths increases the total dependency ratio (the ratio of those aged under 15 or 65 and over divided by those aged 15–64) or, conversely, lowers the aggregate labor force participation rate. This lowers output per capita for given output per worker. In contrast, migrants are predominantly of working age.

Table 19.2 Cross-country growth and migration regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	GDP growth	GDP per-capita growth	Neoclassical growth	Positive net mig.	Negative net mig.	Dynamic	Dynamic	Africa, Asia, Latin Am. and Caribb.; dynamic	Europe, North Amer. and Oceania; dynamic	High income; dynamic
Variables	**OLS**	**OLS**	**OLS**	**OLS**	**OLS**	**OLS**	**FE**	**FE**	**FE**	**FE**
Lagged log (GDP)			−0.073***	−0.083***	−0.051***	−0.043***	−0.581***	−0.558***	−0.829***	−0.620***
			(0.017)	(0.029)	(0.020)	(0.016)	(0.072)	(0.074)	(0.102)	(0.080)
Decadal change in investment ratio			0.694***	0.665**	0.764***	0.780***	0.223	0.143	0.653***	0.125
			(0.145)	(0.318)	(0.170)	(0.193)	(0.158)	(0.165)	(0.230)	(0.196)
Asia (a)			0.183***	0.172**	0.184***	0.177***				
			(0.035)	(0.074)	(0.035)	(0.038)				
Europe (a)			0.119**	0.041	0.146**	0.004				
			(0.047)	(0.093)	(0.068)	(0.053)				
Latin America and Caribbean (a)			0.132***	0.065	0.118***	0.030				
			(0.035)	(0.072)	(0.038)	(0.037)				
North America (a)			0.140***	0.101		0.045				
			(0.048)	(0.087)		(0.053)				
Oceania (a)			0.106***	0.089	0.124**	0.065				
			(0.039)	(0.083)	(0.054)	(0.041)				
Net migration rate	0.913***	−0.087	0.216	−0.650	0.576*					
	(0.191)	(0.191)	(0.280)	(0.542)	(0.313)					
Natural increase rate	0.472***	−0.528***	−0.782***	−1.032***	−0.749***					
	(0.091)	(0.091)	(0.186)	(0.355)	(0.217)					
Lagged GDP per-capita growth			0.236***	0.225***	0.229***	0.160***				
			(0.047)	(0.075)	(0.059)	(0.055)				
Net migration rate lagged 10 years						0.463	0.665	0.726	−1.003*	−0.117
						(0.393)	(0.551)	(0.564)	(0.545)	(0.622)
Net migration rate lagged 20 years						−0.596	−0.116	−0.239	0.391	1.024**
						(0.363)	(0.279)	(0.312)	(0.379)	(0.398)

Net migration rate lagged 30 years						−0.495**	−0.648***	−0.729***	0.812*	−0.072
						(0.216)	(0.193)	(0.220)	(0.416)	(0.206)
Natural incr. rate lagged 10 years						−0.944***	−0.422	−0.328	−0.460	−0.124
						(0.267)	(0.286)	(0.316)	(0.385)	(0.519)
Natural incr. rate lagged 20 years						0.272	0.180	0.143	0.098	1.753**
						(0.335)	(0.347)	(0.384)	(0.624)	(0.798)
Natural incr. rate lagged 30 years						−0.175	−0.422*	−0.475*	−0.440	0.002
						(0.296)	(0.229)	(0.249)	(0.421)	(0.334)
Constant	0.338***	0.338***	0.784***	0.985***	0.615***	0.599***	4.998***	4.596***	8.041***	5.862***
	(0.030)	(0.030)	(0.159)	(0.275)	(0.178)	(0.162)	(0.624)	(0.623)	(0.934)	(0.750)
Observations	758	758	609	251	342	447	447	342	105	108
R-squared (within country for FE)	0.140	0.109	0.241	0.221	0.294	0.283	0.479	0.502	0.699	0.671

Robust standard errors in parentheses. ***$p<0.01$, **$p<0.05$, *$p<0.1$. All regressions include time fixed effects for each decade. (a) The reference continent is Africa.

Both coefficients are highly significant, but of course there is considerable "noise" across time and countries. *R*-squared is only 14%. Column 2 redoes the regression but now with growth in the standard of living as the dependent variable. Because, firstly, we define the natural increase rate as the population growth rate minus the net migration rate and, secondly, the per-capita growth rate is the GDP growth rate minus the population growth rate, it can be easily shown that the coefficients in the second column are simply those of the first column minus 1. Column 2 shows therefore even more clearly the contrast between the impacts of net migration and natural increase on growth: net migration leaves GDP per-capita growth unaffected while a 1 percentage point shock to natural increase lowers the income per-capita growth rate by about half a percentage point.

In column 3 we introduce continental "convergence club" effects. We test for neoclassical convergence by regressing decadal economic growth on the natural logarithm of real income per capita at the beginning of the decade. We account for capital deepening by including the change in the investment ratio. We also take into account that our model excludes many country-specific determinants of growth that may be time-varying (and therefore cannot be captured by country fixed effects) but that nonetheless exhibit considerable temporal persistence. To capture this effect, we include the rate of economic growth in the previous decade as an additional variable. The coefficient of the latter variable (0.236) is indeed highly significant, but shows relatively modest autocorrelation in the growth process. The change in the investment ratio is also significant at the 1% level (with a coefficient of 0.694) and there is evidence of neoclassical convergence. With a coefficient of −0.073 with decadal data, this implies convergence at the rate of 0.7 per annum—as expected much slower than the 2% detected by Barro and Sala-i-Martin (2004) across regions of developed countries (see also Abreu et al., 2005).[3] All continental dummies are significant (with Africa being the reference category). The main point from regression 3 is that despite the much fuller specification, the results from the simple regression of column 2 still hold: net inward migration leaves GDP per-capita growth unaffected but natural increase lowers GDP per-capita growth. Given that total population growth around the world is predominantly driven by natural increase (the correlation coefficient in our pooled data is 0.8), the coefficient of −0.782 can be compared with coefficients of population growth in a meta-analysis of the effect of population growth on economic growth by Heady and Hodge (2009). These authors reported many coefficients of a similar magnitude.

Columns 4 and 5 investigate a potential asymmetry between cases of positive and negative net migration rates. Column 4 reports regression coefficients obtained from decadal

[3] However, the introduction of the lagged dependent variable in the regression implies that the long-run coefficients are larger than those reported.

observations with positive net migration rates, while column 5 shows the case of negative net migration. The regressions are quite similar in terms of growth convergence, persistence, and capital deepening effects. Some of the continental fixed effects change somewhat (and North America is absent from the sample of observations with negative migration). The statistically significant negative impact on growth of natural increase is found in both net migration "regimes", with the impact being of larger magnitude in the case of positive net migration. However, more importantly for this chapter is that we see that net migration leaves the standard of living unaffected in countries with positive net migration. For countries with net emigration, the net migration rate has a positive coefficient (0.576), which is statistically significant at the 10% level. This provides some, albeit weak, evidence that countries that experienced net outward migration in a decade saw their per-capita income growth in that decade diminished, presumably due to disproportional emigration of highly skilled or highly productive workers, a "brain drain", that is not fully compensated by the receipt of remittances.

Of course these results may be biased if there is reverse causality from growth to net migration rates. Rather than embarking on a quest for strong instruments, that are often elusive in this context, we take a much simpler distributed lag approach and estimate in column 6, a dynamic model in which the concurrent decadal net migration rate and rate of natural increase are replaced by distributed lags of these variables, with up to three lags.[4] This captures some of the persistence effect (the coefficient of lagged growth declines from 0.229 to 0.160) and the estimated speed of convergence also declines somewhat (from −0.051 to −0.043), but the effect of decadal change in the investment ratio remains roughly the same. Of most interest, however, are the coefficients of the distributed lags. For net migration, the coefficients start positive but then turn negative and significantly so (at the 5% level) for a lag of three decades. While we will not take these results too literally, this pattern and the sum of the coefficients do suggest a long-run downward effect of net inward migration on growth in income per capita. The rate of natural increase also impacts negatively on growth, with a coefficient of −0.944 for a lag of one decade, but this effect fades out for longer lags (although the sum of coefficients is clearly negative). In general these results would suggest that, for a randomly selected country, a positive population shock—either through net migration or natural increase—does lower the rate of growth of the standard of living somewhat, with the effect being larger for natural increase than net migration.

Sceptics among the readers will maintain that this simple dynamic model is likely to suffer from potentially damaging omitted variable bias and cross-country heterogeneity. In the remaining columns, 7–10, we therefore switch from OLS to country fixed effects

[4] The number of lags is obviously limited by the number of available decades of data and the need to maintain a panel structure. Varying the lags does not materially change the conclusions. The data and results are available upon request from the authors.

(FE) models. In this context, we assume that a country FE captures the "growth persistence" effect of specific countries and we drop the lagged GDP per-capita growth variable.[5] The continental "club convergence" dummies are now redundant. Column 7 shows that "within" countries there is considerable evidence of neoclassical convergence. The coefficient of −0.581 can be interpreted as follows: an increase in real GDP per capita of 1% lowers the GPD per-capita growth rate by about 0.6 percentage points per decade, or 0.06 percentage points per year. The decadal change in the investment ratio is no longer statistically significant (but we shall see that this depends strongly on the selection of countries).

Switching from OLS to country FE leaves the conclusion with respect to the impact of net migration unaffected: there does appear to be a negative impact on income growth per capita in the long run (the coefficient of net migration lagged three decades is statistically significant at the 1% level). However, the impact of a change in natural increase on growth has largely vanished.

To what extent are these results driven by heterogeneity across continents? To investigate this, we split the 149 countries into those in Africa, Latin America and the Caribbean, and Asia (predominantly developing) in column 8, and those in Europe, North America, and Oceania (predominantly developed) in column 9. The convergence effect is highly significant in both sets of countries, but stronger in the latter. The capital deepening effect also becomes significant for the latter group of countries. Furthermore, the impact of demographic change varies across the two groups. For the "developing" countries (column 8), both net migration and natural increase yield negative effects on growth, with the latter being of smaller magnitude and less significant. However, among the "developed countries", the effect of net migration is initially negative but then turns positive in the long run. Among these countries, the impact of natural increase is basically zero.

To sharpen the effect of this cross-country heterogeneity, we finally select in column 10 a set of 36 "rich countries" around the world that have high income and/or are known as high net inward migration countries.[6] For these countries, column 10 shows an impact of net migration that is positive (at a lag of two decades and in terms of the sum of coefficients if we considered the other two coefficients to be statistically significant), while the impact of natural increase is positive as well. In the former case, the effect at a lag of two decades would be consistent with the integration of new migrants taking between 10 and 20 years, while any endogenous productivity growth through new investment etc. may take a similar time. The large effect of the rate of natural increase lagged two decades

[5] When included, the lagged GDP per-capita growth rate has an insignificant coefficient in the FE regressions. The conclusions with respect to the other variables remain the same.

[6] These countries are: Argentina, Australia, Austria, Bahamas, Bahrain, Belgium, Bhutan, Brunei, Canada, Costa Rica, Denmark, Finland, France, Germany, Greece, Hong Kong, Iceland, Iran, Ireland, Israel, Italy, Japan, Jordan, Luxembourg, Macao, Malaysia, Netherlands, New Zealand, Norway, Singapore, South Africa, Spain, Switzerland, UK, and US.

would be consistent with a wave of births being followed by an increased labor force participation rate two decades later—i.e., a demographic dividend.

We conclude that population growth lowers growth in GDP per capita, but that the negative impact of natural increase is predominantly short-run and is driven by the fact that many badly performing countries in the developing world have high fertility rates. Once we account for heterogeneity and focus on a sample of rich countries only, the impacts of net migration and natural increase turn positive in the long run, presumably linked to immigrant integration and endogenous technological change in the former case and a demographic dividend in the latter case.[7] Column 8 suggests that an increase in net emigration may actually raise the growth rate of developing countries. Combining these results provides tentative evidence that a redistribution of population from developing to developed countries raises the world's long-run growth rate. In the remainder of the chapter we review how these stylized empirical facts fit in a range of macro- and micro-economic theories of the impact of immigration and emigration on the standard of living.

3. MIGRATION IN NEOCLASSICAL GROWTH MODELS

The finding that net migration in any decade leaves income per-capita growth unaffected in that decade but potentially affects growth in subsequent decades is consistent with the standard neoclassical growth model in which migration simply contributes in the short run to convergence of real wage differentials across regions and countries (e.g., McCann, 2013), while in the long run migration may impact on real wage growth through technological change. Before elaborating in the remainder of the chapter on potential channels through which migration can affect long-run productivity growth, we first outline in this section the main results of neoclassical theory.

In the standard neoclassical one-sector model of factor (homogeneous labor and capital) mobility and growth, migration occurs in response to real wage differentials between regions and contributes to factor price equalization. The speed of adjustment depends on costs of migration and the mobility of labor (see, e.g., Barro and Sala-i-Martin, 2004, Chapter 9). This applies equally to regions and countries, but in the latter case cross-border mobility is highly regulated and the responsiveness of net migration to wage differentials, as well as the impact of net migration on convergence, is much smaller.[8]

[7] While intuitively plausible, the findings are rather sensitive to the selection of countries, as the comparison of columns 9 and 10 suggests. Morley (2006) found, using 1930–2002 time-series data from Australia, Canada and the US, that GDP per-capita growth causes immigration but not vice versa—i.e., there is no effect of immigration on productivity growth at the macro level in his data.

[8] Even if cross-border migration is unregulated for citizens of the relevant countries, there may be other significant barriers to migration such as language and cultural differences. Compare, for example, the relatively small south-to-north migration flows in response to relatively large north–south real wage differential within the European Union with the relatively large migration flows from New Zealand to Australia in response to relatively small real wage differentials within Australasia (Poot, 2010).

Wage differentials continue as long as there are spatial differences in labor productivity. Of course there are many reasons for spatial differences in labor productivity: even with the same production technology and the same capital stock in two countries, an unequal distribution of population would be sufficient for wages to differ. However, there might also be different production technologies or differences in the availability of natural resources. As a result of this, trade theory suggests that different countries will therefore specialize in various goods and services in which they have a comparative advantage. As long as factor prices vary across countries, labor and capital flows are—to the extent permitted—expected.[9] The rate of technological progress could also be unequally distributed, giving again incentives for factors to migrate.

Differences in capital intensities of production are seen in the above exclusively from the production perspective. However, the classical works of Ramsey (1928), Cass (1965), and Koopmans (1965) showed how the time preference of households with respect to consumption now and in the future impacts on saving behavior. Differences in time preference between countries can lead to varying capital accumulation and thus to different wages and returns to capital. Additionally, cultural and social differences among countries and differences in the social security systems could have an impact on labor supply, savings, and the organization of family life. In turn, this could lead to different fertility behavior and thus population growth rates across countries.

The country features introduced above have important implications for the distribution of capital and labor, migration flows, and cross-country differences in economic growth. In the following we introduce the basic mechanisms in a diagrammatic manner. First we analyze migration flows in a short-run growth model in which factor prices between two countries differ but technology and the capital stocks are fixed. The next part focuses on the long-run effects of population growth on real income and the steady-state growth rate.

The production technology in the neoclassical world has constant returns to scale, using capital and labor as inputs. Because of the constant returns assumption there must be diminishing returns to each input. As there are assumed to be no market imperfections, the marginal product of labor equals the wage. We extend the discussion of labor mobility of Bodvarsson and Van den Berg (2009) and consider not just the destination but also the sending country.

Consider two countries between which labor can move freely. One can visualize expected migration flows in the two-country case, as is given in Figure 19.2. This figure

[9] The famous factor prize equalization theorem shows that free trade in product markets leads to factor prize equalization even with borders closed to factor movements (Samuelson, 1948). However, inter-country wage differences and therefore migration incentives may remain when there are inter-country efficiency differences in the labor input. In this case wages are equalizing in terms of efficiency units of labor, but not per worker (Kennan, 2013).

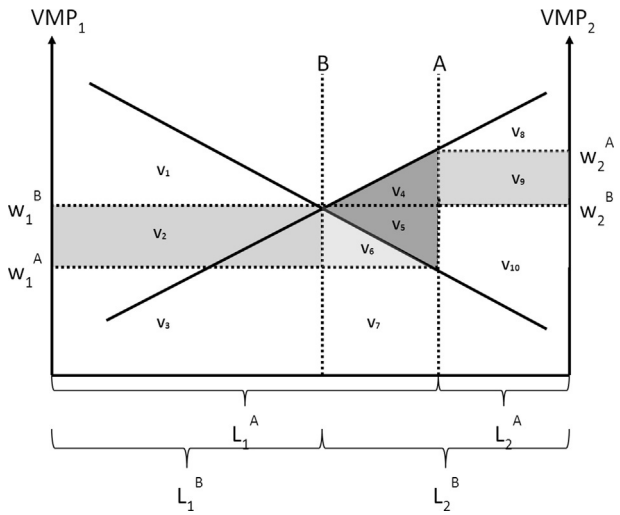

Figure 19.2 ***Migration incentives and distributional impacts in a neoclassical world.***

draws the stock of labor on the horizontal axis. The left vertical axis measures the value of the marginal product of labor for country 1 whereas the right vertical axis shows the value for country 2. We allow varying production technologies between the two countries such that the slopes of the curves may differ. Given that this is a short-run analysis, we assume that the stock of capital is fixed. The model represents the stylized case of a developing country 1 (with a large population and low wages) and a developed country 2 (with a small population and high wages). The total amount of labor in the "world" is assumed fixed at $L_1 + L_2$.

In situation A most labor is located in country 1 (L_1^A) and relatively few workers are located in country 2 (L_2^A). The market clearing wages in the countries are w_1^A and w_2^A respectively. Assuming free labor mobility and no migration costs, workers from country 1 have an incentive to migrate to country 2, where wages are higher. When permitted, migration occurs until the value of the marginal product of labor is equal in the two countries (situation B). If the available production technology is identical for both countries, then there will be an equal distribution of labor.

Figure 19.2 highlights the gain in allocative efficiency—i.e., the gain in aggregate GDP—resulting from the migration. However, the figure also shows the, potentially large, distributional impacts of migration.[10] These are given in Table 19.3. The dark gray triangles V_4 and V_5 represent the gain in welfare in the world (sum of GDP in the two countries) after migration takes place. Of this, V_4 is received by the owners of the capital

[10] Benhabib and Jovanovic (2012) argued that, even though liberalization of international migration yields winners and losers (with the latter predominantly found in rich countries), current levels of migration are far less than what would be optimal from a global welfare perspective.

Table 19.3 Short-run welfare impacts of migration

Group	Area in Figure 19.2	Loss/gain in aggregate income	% change in income per capita	Loss/gain in income per capita
Migrant-sending country				
Owners of capital	$-V_2-V_6$	Loss		
Workers	V_2	Gain		
Residents (incl. non-citizens)	$-V_6$	Loss	$100\alpha\frac{\left(L_1^A-L_1^B\right)}{L_1^A}$	Gain
Citizens (incl. migrants)	V_5	Gain		
Migrant-receiving country				
Owners of capital	V_4+V_9	Gain		
Workers	$-V_9$	Loss		
Migrants	V_5+V_6	Gain		
Residents (incl. non-citizens)	$V_4+V_5+V_6$	Gain	$-100\alpha\frac{\left(L_2^B-L_2^A\right)}{L_2^A}$	Loss
Citizens	V_4	Gain		
World				
	V_4+V_5	Gain	$100\frac{V_4+V_5}{\left(\sum_{i=1}^{10}V_i\right)-V_4-V_5}$	Gain

stock in country 2. It is referred to as the immigration surplus by Borjas (1999). The triangle V_5 is captured by migrants from country 1 who moved to country 2. Capitalists in country 1 lose V_2 (to workers who stay behind in the sending country) and V_6 (to the emigrants). Hence the non-migrant workers of "developing" country 1 gain V_2 in total. Migrants gain V_5 plus V_6. The native-born workers in the destination country lose V_9. Capitalists in the host country gain V_4 plus V_9. Overall, remaining residents of the developing country 1 are worse off due to the migration (by amount V_6) while developed country 2 residents (including migrants) gain $V_4+V_5+V_6$. If, instead, we take the perspective of citizens of each country irrespective of their location, citizens of country 1 gain V_5 while citizens of country 2 gain V_4. These are the "extensive" growth effects on GDP of the migrant home and host countries. On an income per-capita basis, we already saw in the introductory section that the impact on country 1 per remaining resident is positive, while the impact on country 2 per capita (native born and migrants) is negative due to the assumed fixed capital stocks and

technology. However, world income per capita has increased. The sizes of these income changes are also given in Table 19.3.

This short-run analysis is standard in migration literature and can be extended to the case of different skill levels and the effect of capital movements. These extensions reveal interesting features that make it possible to study the income distribution among various types of labor in more detail. For instance, let there be an inflow of unskilled labor into a country. Under the assumption of full employment, there will be downward wage pressure on unskilled natives due to the increase in the unskilled labor stock. At the same time, the *relative* proportion of skilled labor is reduced and therefore the relative wage of skilled to unskilled labor will increase (see Johnson, 1980). At the same time, the shift in factor endowments of the host country increases the output of the sector that is using unskilled labor more intensely. This is known as the Rybczynski theorem in trade theory (see, e.g., Hanson and Slaughter, 1999).

The impact on capital in the host country was already outlined in the introductory section. Due to the inflow of labor, capital is becoming relatively scarce in the short run. Then there will be relatively higher returns to capital that raise incentives to invest. In the long run, such an effect will disappear: capital comes in from abroad and households adjust their intertemporal saving decisions. Ottaviano and Peri (2008) discussed the expected adjustment mechanisms until convergence to the long-run value is achieved.

So far we have mainly discussed impacts from a destination country point of view. The reverse effects are expected for sending countries: the outflow of specific groups reduces the amount of these types of labor. This changes relative factor prices. In the neoclassical setting, the "stayers" of a mobile group will be better off, at least in the short run. For example, Bouton et al. (2011) and Elsner (2013) provided evidence from Moldova and Lithuania respectively that emigration indeed increases wages of stayers. The long-run impact can be negative in the presence of a brain drain, but Beine et al. (2001) argued theoretically and empirically that outward migration may increase investment in human capital. If it does, the average educational level of a migrant-sending country might increase the more liberal the country is in terms of allowing emigration.

Figure 19.2 illustrates the static, relatively short-run, impact. In this situation migration flows will stop when the incentives for further migration vanish. That is when payments to factors are equalized between countries. Now suppose that two countries have permanently different population (labor) growth rates. Then the distribution of population will change at each moment in time. With the larger and developing country having the higher rate of natural increase, this creates a tendency for the economy to move in the direction of situation A in Figure 19.2, thereby leading to a continuing pressure on the border authorities to permit more migration from country 1 to country 2.

To discuss more carefully the dynamic impact of differential population growth between countries, we now focus on a Solow-type model of neoclassical growth (see, e.g., Aghion and Howitt, 1998; Barro and Sala-i-Martin, 2004). For the sake of simplicity

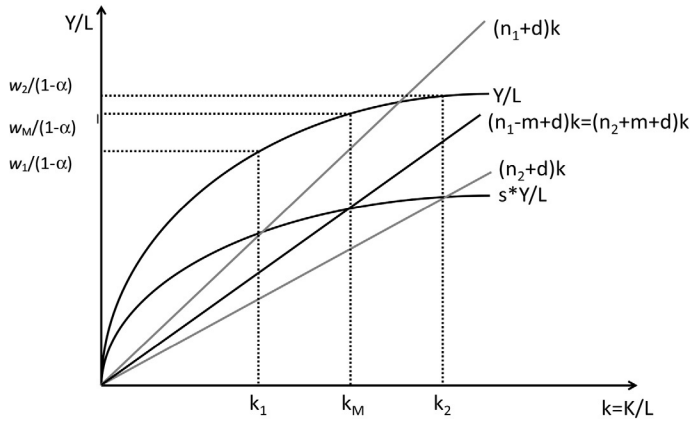

Figure 19.3 ***Migration and long-run income effects.***

we assume that both countries produce with the same production technology and exhibit constant returns to scale. The corresponding per-capita production function Y/L as a function of K/L is drawn in Figure 19.3. Using our notation of Section 1, $Y/L = A\,(K/L)^{\alpha}$. The steady-state capital–labor ratio can be derived by equalizing savings and investment. It is assumed that a constant share $s^{\star}$ of total production Y is invested. Differences in fertility are the only source of heterogeneity between the two countries. They are assumed behaviorally the same in all other respects, including preference of current over future consumption. Figure 19.3 shows the relationship between savings per worker $s^{\star}Y/L$ and capital per worker K/L, also referred to as the capital–labor ratio, k. Investment in new capital must compensate for population growth (n) and depreciation of existing capital (d) to keep the capital–labor ratio constant over time.

Consider that developing country 1 has the higher population growth rate, n_1, with n_2 the population growth rate of country 2. The lines $(n_1 + d)k$ and $(n_2 + d)k$ represent for each k the required level of investment that leaves the capital ratio constant in the two countries respectively. Any savings are assumed to be fully applied to gross fixed capital formation. Hence if savings, and thus investment, are above the $(n + d)k$ lines, then there will be an increase in the capital stock per worker. If savings and investment are lower than the $(n + \mathrm{d})k$ lines, the capital stock per worker will be reduced. Hence, the intersections of the savings/investment curve and the $(n + d)k$ lines represent stable equilibria. This determines the steady-state value of the capital–labor ratio k. Given this ratio, the long-run steady-state level of income per worker can be read off the graph. The value given on the vertical axis is also proportional to the wage paid to workers, which is the marginal product of labor $(1 - \alpha)Y/L$. As Bodvarsson and Van den Berg (2009) argued and formally showed, the growth rate of population matters but the scale of population is irrelevant in the conventional neoclassical model (scale effects are considered in

the next section). Doubling the stock of capital and the labor force leads to the same outcome because everything in Figure 19.3 is in per-capita terms.

We now turn to the effects of permanent differences in (exogenous) population growth. Consider country 1, the country with faster population growth. The steady-state capital–labor ratio is k_1 and the resulting income per worker is $w_1/(1-\alpha)$. For country 2 with slower population growth we find k_2 and $w_2/(1-\alpha)$ as steady-state values as long as there is no migration. Hence, both countries converge into different steady-state equilibria (also referred to as conditional convergence).

As wages differ between both countries, there are incentives for workers to migrate from country 1 to country 2. The outflow of people yields a slower growing population in country 1—i.e., the net population growth rate is n_1 minus the migration rate m. Therefore the $(n+d)$ k line becomes flatter. As a result of the emigration, in the long run the capital–labor ratio increases and wages in this country are expected to rise as well. In the simple model outlined here the migrants settle down in country 2, where total change in population equals n_2+m. Hence in country 2 the investment-requirement line becomes steeper because the economy has to compensate for population growth of the own country and additionally for the growing population due to an influx of migrants. As a result, the capital–labor ratio decreases in country 2 in the long run. Now the question is what the "open border" equilibrium looks like. In this neoclassical setup, there is permanent migration, even in equilibrium (due to exogenous differences in natural increase between the two countries) and the equilibrium migration rate is simply $m=(n_1-n_2)/2$.[11] The expected long-run migration rate is achieved when the lines for both countries overlap. Then the new capital–labor ratio equals k_M and the new equilibrium wage rate is w_M in both countries. Inter-country (net) migration will continue as long as population natural increase rates differ. Allowing for capital mobility increases the speed of convergence even more: capital flows from the developed country 2 (with the higher capital–labor ratio) to the developing country 1 (with the lower capital labor ratio) because capital's rate of return is higher in the latter country.

The model of Figure 19.3 describes convergence to a static standard of living $w_M/(1-\alpha)$. As every textbook shows, the model can be easily extended to the more realistic case of a long-run steady-state growth in the standard of living at an exogenous rate g. This merely requires replacement of labor L in Figure 19.3 by effective labor units $\overline{L}$, with $\overline{L}=A_0e^{gt}L$. The long-run steady state is then still characterized by k_M and w_M, with steady-state net migration $m=(n_1-n_2)/2$ and wages and incomes per capita growing at rate g.

[11] If fertility is endogenous, the rate of migration is likely to be lower. The increase in the wage in developing country 1 resulting from emigration lowers the demand for children because the increased opportunity cost of time devoted to children more than offsets the income effect (e.g., Schultz, 1997). Lower fertility leads to a lower rate of natural increase n_1. At least in theory, the reverse could be observed in developed country 2, leading to a higher rate of natural increase n_2 following a migration influx. Together this would lead to a lower equilibrium migration rate $m=(n_1-n_2)/2$.

From the perspective of an immigration country, the neoclassical model outlined above predicts a negative impact on native workers. Quantitatively, meta-analysis shows that the impact on wages in host economies turns out to be very small (see Longhi et al., 2005). Additionally, meta-analytic evidence provided by Ozgen et al. (2010) suggested a slightly positive effect of net inward migration on growth in income per capita. Huber and Tondl (2012) considered European regions and provided evidence of a weak but positive effect on labor productivity while correcting for endogeneity issues. Similarly, Boubtane and Dumont (2013) found that the contribution of immigrants to human capital accumulation dominates the capital dilution effect, but that the net effect is again fairly small. Such findings can only be reconciled with the neoclassical model when migrants and natives are different inputs in production, or when inward migration triggers positive technological change.

The literature suggests that the absence of notable downward effects of net immigration on income per capita and wages is primarily due to immigrants and natives not being perfect substitutes, for which there is considerable evidence. Different approaches to problem solving and differences in education and experience make both groups distinct. There is also evidence in the literature that migrants (self-)select into occupations and tasks that are typically not favored by the natives. A lack of transferability of skills, combined with positive self-selection, might also lead migrants to be undereducated or overeducated for the jobs they work in (e.g., as shown by Chiswick and Miller (2009) and Beckhusen et al. (2013) for the US). All these arguments lead to imperfect substitutability between natives and migrants. A negative effect on natives' wages due to immigration is then no longer theoretically necessary. Using European Union data, Brunow and Brenzel (2012) provided evidence that when regions are more diverse in cultural terms this leads to higher regional income. This may be seen as evidence of segregated labor markets and imperfect substitutability. It is in line with the evidence of Huber and Tondl (2012). However, to the extent that there exist "closely overlapping" groups, negative impacts on some natives might still be present. Evidence for that can be found in Borjas (2003), Suedekum et al. (2014), and the meta-analysis by Longhi et al. (2005). Hence Figure 19.3 is appropriate to the case in which there is a common labor market for migrants and natives who compete for the same jobs and tasks.

It was noted earlier that country-specific differences in the time preference of households may lead to differences in saving behavior (Ramsey, 1928). Then the $s^{\star}Y/L$ lines vary among countries and thus differences in equilibrium wages will occur even if the countries have the same population growth rates and the same rates of depreciation. Differences in the depreciation rate among countries, e.g., because of different laws or differences in political stability, would affect the $(n+d)k$ lines such that countries would converge into distinct autarkic steady states. Wage disparities may then occur, creating incentives for migration. Therefore, parameter heterogeneity between countries leads to long-run differences in wages and as long as labor is allowed to cross borders, migration flows are expected.

Whether this migration leads to convergence to a common steady state or divergence depends on the specific configuration of the parameters of the two countries.

When there are different types of labor, it is also useful to consider the different goods and services that are being produced. If the migration shock is not too big, it is likely that in the short run relative price effects are marginal. The Rybczynski effect would shift production in the immigration country more in the direction of the commodities that use the type of labor the immigrants belong to more intensively. Given this, a permanent influx of people with a specific skill level could therefore lead to a strong shift in production towards the product or service that uses the skill intensively, leading to structural change in the economy.

What happens to the economies of sending countries? This is the other side of the Rybczynski effect: in the short run the sector that uses the skills of the "leavers" more intensively would shrink more than other industries. Suppose that "leavers" are higher skilled and only a relatively small group in the country. Then their outflow could have serious effects on the economy. On the other hand, as the group is relatively small, their wages should be relatively high and incentives to leave could be small. However, in the long run prices will adjust and a decline in the number of workers from which emigrants are drawn leads to an increase in their wage. Thus, the distributional effects on income are those that have already been discussed.

The neoclassical approach highlights several important implications of the effect of migration on economic growth and the structure of economic activities in countries. So far our focus has been on an uneven distribution of wages across countries that drives international migration. This static perspective suggests that migration will stop when real wages are equalized across countries. We then argued that different population growth rates across countries could lead to permanent migration flows. In both static and dynamic settings it is clear that income distribution effects emerge and, depending on the migrant characteristics, there exist non-migrant groups that are positively or negatively affected by migration.

Although the neoclassical models offer a set of unambiguous results that have potentially important policy implications, they are at the same time of limited practical use. Firms are assumed to operate under constant returns to scale and the total output of a sector is assumed to be produced by many firms in perfect competition. The technology is either given (as in Figures 19.2 and 19.3) or productivity increases at an exogenous rate g, in which case net migration, while itself endogenous and responding to inter-country differences in wages, has no impact on the long-run rate of growth in income per capita. However, this contradicts the stylized findings of the previous section and of other recent literature. Consequently, we need to consider the cases in which productivity growth is a function of the scale and density of population, as well as the rate of population growth—with potentially different effects from migration as compared with natural increase.

It has also been implicitly assumed in this section that consumers have no specific preferences for various products or services, including in terms of the extent which migrants contribute to producing these outputs. Additionally, the theory reviewed above assumes no market imperfections, neither at a firm nor at a sector level. In the real world, distance between markets and the scale of production affect trade and migration opportunities. We consider therefore in the next section the impact of geography, and specifically the potential for migration to influence agglomeration, as developed in theories of the New Economic Geography launched by Krugman (1991). We also focus on simple mechanisms of endogenous growth.

4. MIGRATION, GEOGRAPHY, AND ENDOGENOUS GROWTH

In the previous section we considered the case in which total factor productivity A is either constant or grows at an exogenous rate g. In that case, income per capita is not determined by endogenous migration but by consumer preferences, technology, depreciation, and the rate of natural increase. The evidence of Section 2 suggested that a country's economic growth in a decade is uncorrelated with net migration in that decade. This is consistent with the neoclassical model. However, we also saw that positive net migration in rich countries and negative net migration in developing countries raised growth in the respective countries in the long run. This suggests that m impacts on A in the long run.

Consider again Figure 19.3 and the initial two equilibria k_1 (low-wage country) and k_2 (high-wage country), but now $\partial A/\partial m > 0$. In that case, outward migration from country 1 has two opposite effects: it rotates that country's $(n + d)k$ line down (as before), but it also pushes the $s^{\star}Y/L$ curve for country 1 down. Emigration increases the wage due to more capital per worker being available, but it lowers the wage due to lower total factor productivity. The existence of an equilibrium with migration then depends on the relative strength of these two forces (see also Nijkamp and Poot, 1998).

If, on the other hand, $\partial A/\partial m < 0$, a steady state is assured because the emigration country now experiences a wage increase due to increased capital per worker but also due to higher total factor productivity and vice versa in the immigration country. This case appears consistent with the evidence for developing countries (column 8 of Table 19.2) but it is not consistent with the evidence for rich countries, where we observed a positive impact of net migration in the long run (column 10 of Table 19.2). The latter would require the lower capital per worker resulting from immigration to be more than offset by a positive productivity effect $\partial A/\partial m > 0$. The theory and empirics combined suggest an important asymmetry in the effect of net migration on developing and developed countries and a positive impact of international migration on global economic growth. In this section we consider theories that may explain $\partial A/\partial m > 0$ in high- and middle-income countries that have large net inward migration. We briefly review the theory and evidence of $\partial A/\partial m < 0$ in developing countries in Section 7.

Migrants are predominantly attracted to large cities, not only because of the greater job opportunities (Harris and Todaro, 1970), but also because of the benefits of agglomeration, including higher wages and greater amenities (Glaeser, 2011). The theories of New Economic Geography (NEG), initiated by Krugman's (1991) seminal contribution, provide a relatively simple but powerful way of using the assumption of increasing returns as the mechanism through which a core region may grow relatively faster than a periphery, reinforced by inward migration.

The presence of increasing returns at the firm level violates a key assumption of the neoclassical growth model. When firm output increases, average cost declines and this gives a firm operating in a specific sector monopoly power. In the long run, only one firm would be in the market, namely the one that exploits the increasing returns the most and therefore crowds competitors out of the market. However, such a situation may not occur when consumers have a "love for variety" in that particular sector. This means that consumers prefer various products over only one single product from that market, even if each single product of such a consumption palette is relatively more expensive than having only one product. This makes the market heterogeneous in products and violates another assumption of the previous section, namely the production of a homogeneous good.

In this context, the impact of migration is straightforward. An influx of migrants raises product demand of a single firm which then can set a lower (average) price due to the increasing returns. Lower prices imply an increase in the real wage and this provides further incentives to immigrate. Increasing returns in models of monopolistic competition with product variety are clearly an agglomeration force. Migration of mobile workers (some workers, such as farmers, may be considered immobile) then changes the relative market sizes of regions and countries. All other things being equal, an influx of people raises the total amount of expenditure in the host economy, making this market larger. Larger markets attract firms because revenues are expected to be higher.

The presence of trade cost makes distant markets less attractive to firms, because of transportation and transaction costs that increase with distance. Being located in a small and remote region (or country) and sending a large amount of products to a larger region (or country) is then less attractive compared to being in a bigger market. This effect is called the "home market" or "market access" effect (Baldwin et al., 2003). There are also gains for workers and consumers to be located in larger markets. The amount of income that has to cover trade cost is relatively lower, which increases the real wage and therefore utility, *ceteris paribus*. This is the so-called "cost-of-living" effect (Baldwin et al., 2003) that makes larger agglomerations more attractive for workers to migrate to, although an opposite effect is the higher cost of (scarce) land and housing that is reinforced by inward migration (e.g., Saiz, 2007).

Both the market access and cost-of-living effects promote agglomeration while migration occurs. In the long run income and prices adjust to their steady-state values and the growth rate becomes zero in the absence of capital accumulation and

technological change. Agglomeration forces may lead in emigration countries to a loss in welfare due to a higher amount of money that has to be spent on trade costs and due to a loss of industry. On the other hand, the immigration country enjoys additional agglomeration rents and welfare is on average higher. Depending on the importance of trade costs, NEG models can contradict the convergence prediction of the neoclassical world with respect to the impact of migration.

NEG models also have interesting implications for the impact of migration on trade. When all firms are located in an agglomeration, they will sell some of their products to the periphery. A net migration inflow into a core region would then lead to an increase in exports because further agglomeration advantages emerge and products manufactured in the agglomerating region are shipped to other regions. In the long run, the effect of further immigration on trade will be smaller because most of the consumers are at that stage already located in the agglomeration, leading to a decline in sales in other regions. Meta-analytic evidence of the effects of immigration on trade is consistent with these theoretical predictions (Genc et al., 2012).

There are of course also dispersion forces that prevent an industry from agglomerating. Krugman (1991) emphasized the competition or market crowding effect: being in larger markets reduces the market power and expected profits of a firm. Leaving an agglomerating region and locating in a peripheral region could in that case increase profits. Suppose there is no firm in the periphery. Local consumers have to then spend a higher share of income to cover trade cost (relative to an agglomerated region). Also, because of trade cost, prices for these commodities are higher. If trade costs are sufficiently high, being the first firm in the periphery then attracts a high demand from local consumers.

The market crowding effect generates firm incentives to relocate but does not necessarily affect workers' migration decisions. Individuals migrate in response to spatial real wage or utility differences. If living in agglomerations generates disutility, then another dispersion force may exist. Especially in the presence of local amenities (parks, recreation areas) or consumption goods with an inelastic supply, such as a housing market (Pflueger and Suedekum, 2008), a higher degree of agglomeration restrains individual consumption possibilities. When the market gets denser, demand increases for a given supply and prices of such urban amenities are expected to rise. Less consumption and higher prices represent a disutility for workers and therefore reduce incentives to migrate into agglomerations. To conclude, there are both gains and costs of migration into an agglomeration.

Trade costs play a crucial role in NEG models to explain whether agglomeration or dispersion forces dominate. The NEG counterpart to Figure 19.2 is presented in Figure 19.4, but in Figure 19.4 we normalize the "global" labor supply to be 1. It is frequently called the "wiggle diagram" and shows that the real wage gap between two countries would depend on the distribution of mobile workers across the two and the level of trade cost. Figure 19.4 is especially suitable for identifying expected

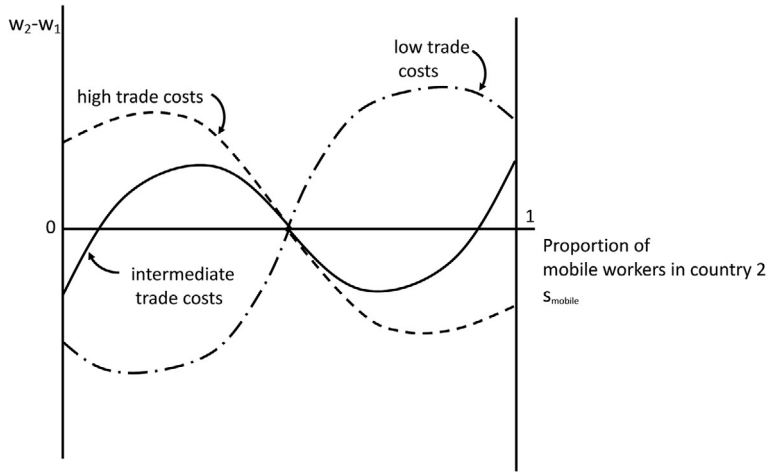

Figure 19.4 ***Real wage differences in NEG models.***

migration flows. On the horizontal axis we measure the proportion of mobile workers resident in country 2. If all mobile workers are initially located in country 1, then $s_2 = 0$. Now consider high trade costs: in that case the real wage is higher in country 2 than in country 1 and workers will migrate from country 1 to country 2. This increases s_2. The inflow initially increases (due to increasing returns) and then lowers the wage gap until wages are equalized (with $s_2 = 0.5$ in the case of symmetric countries). With very low trade costs, the agglomeration forces dominate and $w_2 - w_1 < 0$ when $s_2 = 0$, i.e., country 1 is the core economy and there will be no migration to the periphery country 2. Both core–periphery and dispersion outcomes are possible long-run equilibria when trade costs are at intermediate levels (with long-run wage equalization as long as s_2 is neither close to 0 nor close to 1). The figure can also be used to consider again the income distribution effects. For mobile workers these can be read off directly from the vertical axis of Figure 19.4. However, because of trade costs, immobile workers in a peripheral country would have to pay relatively more for products as these have to be imported.

The "first generation" of NEG models considered static worlds without population growth, technological progress, and other growth-driving aspects. One crucial driver of economic growth is the profit seeking by firms that leads to technological progress, product improvements, or the introduction of new products and services. However, we saw that in the Solow (1956) model technological progress is considered exogenous. In contrast, in endogenous growth theories the rate of technological progress can be derived and explained by the model. It is widely accepted that human capital and research and development (R&D) activities are the drivers for technological progress, innovation, and the increase in the stock of knowledge. Mankiw et al. (1992) introduced human capital as another input in production in the neoclassical framework. However, some of the

new knowledge obtained by an innovator is also observable by others. Human capital and especially knowledge can be then interpreted as a public good (Arrow, 1962). This has important implications, because exclusive property rights are then violated and knowledge can "spill over", with the cost of obtaining new knowledge decreasing with the stock of existing knowledge. Endogenous economic growth results.

Firms will employ some human capital to do R&D that improves the quality of products, introduces new products to the market, or reduces the costs of production. R&D aims to achieve a competitive advantage and leads to additional rents. For instance, patents give monopoly power to firms and some of the assumptions of the neoclassical growth model are then again violated. This strengthens the forces that already have been discussed in the NEG theories. The output of R&D, patents or new knowledge generally becomes more important for researchers and firms when this output is publicly available, which can often be achieved at very little cost. This makes knowledge a public good and the better the available existing knowledge is, the cheaper the development of new knowledge becomes (Arrow, 1962; Romer, 1986). As a result of this, positive externalities emerge that also contribute to agglomeration economies and endogenous growth.

For that reason much empirical work has been devoted in recent years to the estimation of urban agglomeration economies. Melo et al. (2009) provided meta-analytic evidence of the existence of agglomeration economies. They concluded that major differences between studies in terms of the magnitude of agglomeration effects are due to country differences, the industrial coverage, the specification of agglomeration economies, and the set of control variables.

From a production point of view, a 1% increase in the factor that creates positive externalities would increase output by more than 1%.[12] Suppose this factor is human capital. Immigration of human capital, and thus knowledge, would increase output and strengthen positive externalities. Such an agglomeration economy yields above average factor returns. If mobile labor earns a higher wage the higher the degree of industrial concentration, then additional immigration may be expected. The long-run outcome would be total agglomeration of the economy at one location. Bond-Smith and McCann (2013) concluded in their review of models of NEG and endogenous growth that whenever labor is assumed to be mobile in such models, there is a tendency for the economy to move towards total agglomeration at one location.

The location-related effects discussed in NEG theories have little to do with endogenous growth at first. They highlight aspects that increase or reduce incentives to migrate from a worker's perspective or to relocate from a firm's perspective. The interplay between the level of trade freeness and the distribution of producers, consumers, and workers in space are key drivers of agglomeration in the NEG literature. Many models of endogenous growth show how growth depends on the distribution of workers, and

[12] Ozgen et al. (2010) provided meta-analytic evidence that this is indeed the case with respect to migration.

especially on the distribution of high-skilled workers. Both explanations for agglomeration are therefore likely to reinforce each other: the distribution of economic activities in space then matters for the strength of economic growth and vice versa.

There are several aspects of endogenous growth theory that explain permanent income growth. Lucas (1988, p. 18) suggested that increasing returns result from human capital accumulation. Lucas argued that there are spillover effects in "knowledge production": the change in human capital depends on the time devoted to learning as an individual but also on the current stock of existing knowledge. When there are no diminishing returns in knowledge production, then endogenous growth results, irrespective of the type of external effect modeled in the aggregate production function.

There are a range of other theories that make growth in real income per capita an endogenous outcome. First, there is the idea of Schumpeterian "creative destruction" being responsible for innovation. In this case a rent-seeking firm aims to improve the quality of output by means of innovation. At the same time, competitors lose market power because of innovation. In contrast to the Schumpeterian idea, there are also models of expanding product variety that are also grounded in rent seeking. In this second class of models a new variety, patent, or blueprint is added to the existing stock of varieties and leads to above average productivity or welfare. When there are no diminishing returns to the introduction of new varieties, endogenous growth again results.

The models of endogenous growth typically consider innovation and learning as drivers of growth. It is also widely accepted that human capital is an important input for innovation. Human capital can be accumulated through learning-by-doing or schooling that uses existing human capital and the additional human capital then also becomes an input into production. There is also path dependence: the cost of innovation falls permanently when the stock of knowledge becomes larger. In this case a more developed region or country has an advantage over others and therefore attracts new firms and workers. As a result of the path dependency, agglomeration might occur. Additionally, there is a debate about how far knowledge spreads across space. Is the "public good" part of knowledge only observable locally or also in other regions and countries? Again, distance may matter here but in a very different way as compared with the NEG models.

Path dependencies, increasing returns, and non-linearities make the analysis of the impact of migration on economic growth quite complex from a theoretical but also from an empirical point of view. From the NEG point of view, migration reinforces agglomeration and leads to a shift of expenditures and economic activities in an interplay with changing transportation costs. In endogenous growth theories agglomeration tendencies can be explained by human capital and scale externalities. In either branch of literature, a greater stock of people typically strengthens productivity growth and agglomeration. On the other hand, dispersion effects become more important the denser a country or region is. There also exist threshold effects. A marginal change in model parameters can lead to a different steady-state distribution of economic activities in space.

The long-run impact of a change in population due to migration is therefore not unambiguous in NEG and endogenous growth models. Also, analytical solutions are often rather difficult to obtain due to the non-linearities in the models. Fortunately, there exist some studies that link concepts of endogenous growth and NEG resource allocation. Martin and Ottaviano (1999) and Baldwin et al. (2001) formulated models of innovation activities that include a knowledge production function and may lead to an unequal distribution of firms. However, although there is mobility of firms due to destruction in one and creation in the other region or country, their models cannot explain the mobility of workers. The model of Fujita and Thisse (2002, Ch. 11) extended this class of models and explicitly considered migration of high-skilled workers.

All these models build on Romer's model of expanding product variety. Workers are employed in the production of goods in either a competitive sector, in R&D, or in a "modern" sector that is assumed to operate under monopolistic competition. The research sector generates spillover effects and endogenous growth results. The output of R&D activity is a new blueprint for the horizontally diversified "modern" industry. Each single firm needs one blueprint to operate and pays a fixed amount as a factor reward. A classical investment decision has to be met: If the cost of invention of a new blueprint in the R&D sector today is at most as high as the present value of the discounted income stream of the operating profits in future, a new blueprint is developed.

All models consider two regions or trading countries. In the models of Martin and Ottaviano (1999) and Baldwin et al. (2001), firms operate where they are started. Thus, they are immobile. Therefore, redistribution of economic activity is due to depreciation of firms in one region and startup of a firm in the other region. This only happens when the cost–benefit calculation on invention is in favor of the other region. Also, there is only one type of labor. It is immobile between regions but mobile among sectors within the region. In contrast, the model of Fujita and Thisse (2002) assumed that the R&D sector employs skilled labor that may migrate and that the other sectors employ immobile unskilled labor. Also, blueprints can be mobile or are localized as was the case in the former models.

The aim of this chapter is to study the long-run impact of migration and therefore the model of Fujita and Thisse (2002) suits the purpose of this chapter better, although the other models derive similar conclusions in the case of immobile blueprints. As in most NEG models, both agglomeration and dispersion can be long-run outcomes of economic activities in space. The crucial variable in this respect is again the level of trade cost. There is an R&D sector that produces blueprints for the "modern" sector that also features spillover effects of R&D activities. A parameter describes the strength of those spillovers. Finally, the actual values of parameters for trade freeness and spillovers describe the long-run outcome: either agglomeration or dispersion. The model can deal with two types of mobility, namely the migration of high-skilled workers and the mobility of blueprints. The relocation of blueprints goes along with a redistribution of production in the modern sector. Therefore, there is the possibility of the agglomeration of high-skilled people, blueprints, or both.

For this reason Fujita and Thisse (2002) derived two possible types of agglomeration for the case of fully mobile blueprints. Type 1 is a full concentration of R&D activities and a partial concentration of production of the "modern" sector. This outcome emerges for higher values of trade costs. In type 2 both R&D and blueprints are agglomerated in the same region. In this case trade costs are relatively low. The dispersion of economic activities is an unstable equilibrium as long as blueprints are fully mobile. In contrast, agglomeration or dispersion may occur when blueprints are immobile. In such a case the location where the blueprint is developed is also the place of production. Here it turns out that dispersion is a long-run outcome when spillover effects in R&D between both regions are strong. There is another interesting feature: If spillovers become even stronger, which means a liberalization of knowledge transfers, then the dispersion of researchers and production is valid also for higher levels of trade freeness. Thus, knowledge economies with strong spillover effects prevent agglomeration.

Who are gainers and losers of international migration in a theoretical world described by such forces? For residents in a core country, agglomeration is favorable because of lower costs that have to be spent on transportation of "modern" products. This result coming from the NEG literature is independent of endogenous growth. On the other hand, unskilled workers in a peripheral country have to cover a higher fraction of their income on transport and are therefore negatively affected by agglomeration outcomes. The crucial question here is whether the gains of agglomeration and especially the localized spillovers in R&D can overcompensate for higher expenditures on trade costs. During a transition period a slightly higher growth rate in one country increases incentives for further immigration of human capital. Then, location drives growth and vice versa. In a situation where growth overcompensates trade costs, residents in the periphery can also enjoy better living conditions compared to dispersion. However, there exists a permanent gap in welfare between the countries in the case of agglomeration.

To summarize the sections on neoclassical and endogenous growth: The effect of migration on income distribution and welfare cannot be answered unambiguously from theoretical perspectives. It all depends on the selected theoretical model. Therefore, empirical evidence is very important to reveal the actual impact of migration. The estimates reported in Section 2 suggest that the neoclassical perspectives are a useful mechanism to explain the impact of migration on growth in the short to medium term. In the long run, we found some evidence of growth-enhancing positive impacts on both developed and developing countries.

5. THE IMPACT OF MIGRANT HETEROGENEITY ON GROWTH

The growth theories discussed in the previous two sections consider migrants predominantly as homogeneous agents responding to spatial real wage differentials and acting as close substitutes for native-born workers. In reality, migration is a complex phenomenon

with socio-economic, cultural, and educational determinants that lead to specific location patterns across and within countries of destination. Migrants are characterized by a high degree of heterogeneity regarding their initial conditions, their motives, their cognitive skills, their geographic origins, and so forth. It is therefore no surprise that migration patterns are complex and that the foreign-born in a country are a highly diverse group. The geography of migration mirrors a multifaceted spatial development, which is prompted by a differentiated set of various mechanisms that include: push and pull factors; segmented labor market structures; world-systemic and political-economic developments; human capital determinants; social capital and network mechanisms; and cumulative causation processes (for more details on this, see Baycan and Nijkamp, 2013).

Explanatory frameworks from a range of theories and disciplines—sometimes complementary, sometimes competing—form the foundation stones for understanding the spatial patterns of migration and its various impacts. The spatial distribution of migrants is characterized by two dominant factors: their urban orientation and their spatial concentration in certain urban districts. With respect to impacts on productivity and growth, the concentration of diverse groups of migrants in cities is one of the most important factors. The urban space-economy is rife with externalities caused by density, proximity, and connectivity economies. The regional and urban economics literature has shown that the spatial concentration of human and industrial activity is usually driven by agglomeration advantages—including so-called Marshall–Arrow–Romer, Porter and Jacobs externalities (see, e.g., de Groot et al., 2009)—which encourage the geographical clustering of people and economic activity, as was already discussed in the previous section. Examples of clustering are: industrial clusters, health care, educational facilities, job opportunities, finance, infrastructure, and social capital. Clearly, there may also be negative externalities related to crowding effects, as exemplified by environmental decay, congestion, and inter-ethnic conflict or criminality.

Such positive and negative externalities are all affected by the dynamics of population in cities, including population aging and inward/outward migration. In particular, immigrants into a certain area exert various behavioral impacts on social, productive, and cultural capital that influence the economic performance of the economy concerned. In other words, the growth impact of international migration is not only dependent on the volume of migrants, but also on the composition of the flows and the places where they settle down. But their locational choice is clearly co-determined by economic attractors such as: new job opportunities, gains in expected income, favorable supply of dwellings in the housing market, or special local amenities. Additionally, there are social parameters that determine the migrants' spatial choice, such as social or ethnic networks, common language or culture, and so forth.

The spatial behavior of migrants is strongly influenced by the above-mentioned spatial externalities, which manifest themselves prominently in large urban agglomerations. Consequently, urban areas tend to act as magnets for international migrants. More

specifically, in many cases we observe that urban districts function as pull areas for specific migrant groups, leading to segregation. An interesting exposition on such urban enclaves is given by Edin et al. (2003). It is still an open question whether such enclaves are sustainable as a result of ethnic-cultural factors, or whether in the long run socio-economic motives will lead to dispersion, especially among second- and third-generation migrants (see also Cutler et al., 2008). Clearly, this depends on spatial self-selection of migrants, in particular in relation to the strength of social-cultural bonds (or, more generally, social capital: see Alesina and La Ferrara, 2005; Putnam, 2007) or the average skill and education levels found in certain urban districts (see, e.g., Bartel, 1989; Cascio and Lewis, 2012). The geographical socio-economic clustering of migrants is, in general, clearly determined by their common origin (reflected inter alia in a common language, culture, amenities, or consumption patterns). Their spatial juxtaposition and socio-cultural linkages are critical for their general economic and business performance (see also Bassett-Jones, 2005; Foley and Kerr, 2011). In conclusion, migration is an important spatial allocation mechanism in an open world, and is ultimately reflected in the great variety of migration patterns among and within urban agglomerations. As a whole, the externalities involved with agglomeration formation and existence prompt productivity advantages—and hence growth effects—in which migrants play a critical role, in particular if they have the necessary skills.

The effects of urban demographic change may differ depending on the nature of this change: we saw in Section 2 that natural increase over a certain period has a different impact on growth compared with immigration. This has to do with phenomena such as fertility, savings, consumption and labor force participation changes over the life cycle, and with long-run productivity effects of population change, cause by age composition, cognitive skills, routines, on-the-job training, cultural traits, and various externalities (see also Poot, 2008). To assess the impact of migrant heterogeneity on growth we must therefore consider separately the various engines of growth, such as human and physical capital accumulation and innovation. Table 19.4 shows various channels through which heterogeneous migrants can positively or negatively affect innovation and thereby long-run productivity growth.

On the one hand, migrant traits such as positive self-selection, a willingness to take risks, youthfulness, resilience, and origins in a wide range of cultural settings are expected to boost innovation. On the other hand, too much diversity leads to fractionalization (Alesina and La Ferrara, 2005), communications problems, and a lack of trust. At the same time, an abundant supply of migrant workers may encourage firms to adopt labor-intensive production technologies that offer fewer opportunities for the implementation of productivity-enhancing new capital investments (Lewis, 2011). Additionally, there are also positive and negative production externalities associated with migrant settlement such as the benefits of agglomeration outlined above but also the potential costs of segregation.

Table 19.4 The impacts of immigration on innovation: a classification of channels of influence

Positive channels	Negative channels
Within firm	
• *Positive self-selection of immigrants*: e.g., intelligence, creativity, willingness to take risks, entrepreneurship, "star" knowledge workers (e.g., trained in host country universities) • *Youthfulness of immigrants*: Increased mobility, creativity, progressivity • *Cultural diversity among immigrants*: Knowledge spillovers, new ideas and practices, trade facilitation (networks, trust, institutional knowledge) • *Resilience of immigrants*: Enhances decision making • *Immigrant supply enables firm expansion*: Reduces shortages/vacancies of key personnel	• *Fractionalization of employees*: Cultural and language differences and barriers, leading to communication problems, less trust, greater potential for conflict among staff, discrimination • *Greater labor intensity of production*: Lower reservation wages of immigrant workers lead to lower wage costs and, hence, lower capital investment in the short run (substitution effect), possibly offset by firm expansion in the long-run (output effect)
Externalities	
• *Cultural diversity as an amenity*: Increased availability of ethnic goods and services in the community • *Population growth*: Agglomeration advantages, greater demand and gross fixed capital formation, with new technology embodied in new capital • *Community cohesion*: Bridging-type social capital leads to cross-cultural cooperation	• *Sorting*: Residential and labor mobility leads to greater spatial segregation: less cross-cultural relations and trade, lower spatial mobility, and knowledge transfers • *Polarization*: Bonding-type social capital leads to between-group conflicts • *Representation*: Political fragmentation and instability

Source: Ozgen et al. (2013).

While there is little evidence as yet on how each of these channels individually affects innovation and economic growth, a body of evidence is now emerging that the impact of migrant diversity is on balance positive, although perhaps not quantitatively large. Borjas (1999) already noted that from the allocative efficiency perspective the economic gains from migration are the larger the more different the migrants are from the native population. Several empirical studies now also point to migrant diversity leading to long-run innovation and productivity gains.

One set of studies focused on whether positive human capital traits of migrants, particularly scientists and highly skilled workers, either have a direct impact on innovation or alternatively "rub off" on native-born workers. Hunt and Gauthier-Loiselle (2010)

found that immigrant graduates in the US hold more patents than the native-born. Direct productivity effects are nonetheless hard to detect and often relate to narrowly defined cases. For example, Alvarez et al. (2011) found that in professional sport (European basketball) imported star players improve the performance of the teams. In contrast, Borjas and Doran (2012) found that the influx of mathematicians into the US from the former Soviet Union had negative productivity effects on their American counterparts.

When assessing the impact of immigration on innovation and productivity, an important distinction must be made between quantity/size and diversity effects. Alesina et al. (2013) and Ozgen et al. (2012, 2013) provided evidence that increasing diversity among migrants boosts development. On the other hand, an increasing share of foreigners in the labor market lowers innovation and growth, probably because in practice such a greater share coincides with larger numbers of unskilled migrants, which lowers labor productivity. The empirical evidence is on balance supportive of positive effects of the recruitment of diverse migrants on: income (Brunow and Brenzel, 2012); consumption and product diversity (Bakens et al., 2013; Mazzolari and Neumark, 2012); firm-level innovation (Nathan and Lee, 2010; Ozgen et al. 2013); regional-level R&D and innovation (Niebuhr, 2010; Ozgen et al. 2012); regional-level productivity (Ottaviano and Peri, 2006); plant-level productivity (Trax et al., 2012; Paserman, 2013); and entrepreneurship and decision-making (Page, 2007; Audretsch et al., 2010; Nathan and Lee, 2013). However, some studies, such as Maré et al. (2014), found no evidence of positive impacts of immigrants in local labor markets on innovation. Moreover, Parrotta et al. (2014) found that educational diversity may enhance productivity whereas ethnic diversity lowers it. In any case, positive effects of diversity are likely to be quantitatively modest as compared with other sources of productivity growth, such as human capital improvements (see also Ozgen et al., 2013).

In conclusion, inward migration leads to size effects and composition effects that impact differentially on growth. Evidence on the impact of larger shares or numbers of migrants appears to confirm neoclassical theory: declining productivity growth or at best a neutral effect. Productivity gains from migrant diversity depend on the nature of the composition effect. The youthfulness of migrants and high skills are likely to have major positive impacts, particularly in societies with rapidly aging labor forces (e.g., Poot, 2010). Ethnic and cultural diversity also have many positive spillover effects at the community and firm level. However, the quantitative impact on productivity has been estimated to be small and is likely to be non-linear: too much diversity leads to additional transaction costs, fractionalization, and segregation.

6. MIGRANT ENTREPRENEURSHIP AND ECONOMIC GROWTH

Entrepreneurship has become a prominent issue in many recent research publications. It is attracting a lot of attention, in particular in our age of turbulent business environments

and global competition. Audretsch and Thurik (2004) claimed in this context: "Entrepreneurship has emerged as the engine of economic and social development throughout the world." Entrepreneurship is the source of progress through job creation, knowledge spillovers, stimulation of competitive behavior, and permanent change. A wide variety of studies on entrepreneurship and its foundation can be found in the economics literature of the last four decades (see, e.g., Kirzner, 1973; Cohen and Levinthal, 1989; Hébert and Link, 1989; Sharma and Chrisman, 1999; Thurik, 2009). There is an abundance of definitions of entrepreneurship, but common elements are normally a search for new opportunities, risk-taking behavior, efficient use of scarce resources in a competitive environment, and innovation orientation.

More recently, a new concept has gained much popularity, namely ethnic entrepreneurship, often also called migrant entrepreneurship or minority entrepreneurship. This new phenomenon distinguishes itself from traditional entrepreneurship through its orientation on migrant products, migrant customers, or indigenous migrant business strategies. This new form of entrepreneurship is often the outgrowth of self-employment trends among migrants, as their specific cultural and human capital profile (e.g., host country language deficiency or non-recognition of qualifications) may hamper a smooth entry into the regular labor market. Thus, starting a business is a rational survival strategy for many foreign migrants.

This phenomenon has been extensively studied by Sahin (2012). She argued that the merits of migrant entrepreneurs have been recognized by many host societies, which have subsequently introduced various policy measures to stimulate self-employment among migrants and create a business environment where ethnic enterprises can thrive. Among the most well-known merits of migrant entrepreneurship are the stimulation of new job creation and the promotion of diversity which, according to Jacobs (1969), is the main cause of the prosperity of urban economies. Audretsch et al. (2010) found, using German data, that migrant diversity has a positive impact on business startups, particularly technology-oriented ones. Consequently migrant entrepreneurship is a separate channel through which immigration can foster economic growth in host societies. Furthermore, immigrant entrepreneurship may also improve the economic position of especially immigrants from non-Western countries and support the general integration of these immigrant groups in the host society.

Sahin (2012) stated that many migrants who are "on the move" worldwide seem to be more inclined towards risk-taking behavior in self-employment than their compatriots who remain behind in the home country. Those who migrate have usually a strong desire for socio-economic advancement, and are thus more likely to take risks and become self-employed. In addition, the difficulty of finding a job in the regular economy of a host country has encouraged many migrants to set up their own businesses. Their geographic concentration in large urban agglomerations and their response to specific demands for ethnic products and services by their own ethnic or socio-cultural groups, and later on by the host population, have enabled many migrant businesses to flourish,especially in urban

areas. This has led to rising market shares of migrant entrepreneurs within the ethnic community itself, since migrant groups have specific needs and preferences that can be satisfied more easily by migrant entrepreneurs who know the preferences of their own ethnic community or clientele. Furthermore, the contribution of immigrant entrepreneurs to employment creation is often not limited to ethnic and niche markets, but is increasingly expanding into new sectors ("break-out strategies"), for example the creative industries. Consequently, migrant businesses have significantly contributed to urban economic growth in recent years.

In the world of ethnic entrepreneurship, urban diversity is important for providing both business facilities and knowledge-sharing. Diversity will lead to Schumpeterian innovative combinations, which in turn will attract new businesses and talent. Because of their diversity, immigrant entrepreneurs tend to develop a differentiated urban economy, and thus contribute to stimulating its further growth (see Sahin et al., 2007). For example, more and more urban districts in Western European countries are developing a multicultural character. The presence of ethnic shops and restaurants brings vibrancy and diversity and can also enrich the neighborhoods. In these ethnically colorful neighbourhoods, migrants can experience their own identity, express themselves, and maintain their culture. They will find the necessary informal support, security, and solidarity in social networks to pursue economic activities and to take some risks. Ethnic precincts therefore offer unique opportunities for immigrants to start their own business. Enterprising immigrants are of great importance for the economic potential of the city and, in their own way, contribute to the diversity of the neighborhood, thereby strengthening the local economy. Thanks to the positive development of immigrant entrepreneurship, ethnic neighborhoods are nowadays often the scene of thriving enterprise and a good quality of life, enabling more customers (both locals and foreigners) to find and visit specific stores in a particular neighborhood setting.

It is of course an empirical question whether migrant entrepreneurs offer a significant contribution to urban economic growth. Therefore, it is necessary to undertake a solid performance analysis in which critical success factors are thoroughly analyzed. This calls for an operational measurement model. The structure of such a model can be found in Sahin (2012). She lists in a figure four sets of factors that can be used to explain the growth contribution of migrant entrepreneurs. This figure is reproduced in Figure 19.5. Besides socio-economic contextual factors, the model also links entrepreneurship with policy factors, motivational factors, and the business environment.

The findings from various empirical analyses using the above conceptual model or similar frameworks bring to light that migrant minorities are often a highly motivated and qualified entrepreneurial group. The ambition to start a business is usually higher than that of the natives. They are especially prominently presented in the small and medium enterprise (SME) sector in urban agglomerations and are a source of urban vitality and dynamics. Their businesses are often based on informal networks and relationships.

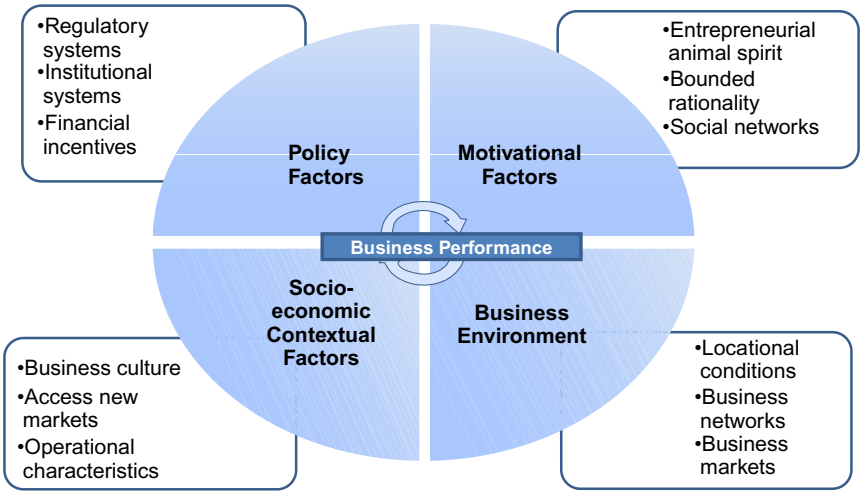

Figure 19.5 ***A conceptual model for migrant entrepreneurial performance.*** Source: *Sahin (2012, p. 309)*.

A new phenomenon is the second-generation migrant entrepreneur. He or she is less focused on traditional (e.g., ethnic) products, but is more business-oriented, with a clear sense of a modern product orientation and innovation. This break-out strategy positions migrant entrepreneurs much more clearly at the center of mainstream business activities. More information on this new business strategy of particularly second-generation migrant entrepreneurs can be found in Kourtit and Nijkamp (2012). The conclusion of the latter study is that migrant entrepreneurs will gradually evolve towards a more generic modern entrepreneurship, so that the specific traits of migrant entrepreneurship are gradually lost. Either as a distinct group or as a major force among the host economy entrepreneurs, migrant entrepreneurs create a great potential for wealth creation in modern urban economies.

7. ECONOMIC GROWTH IN COUNTRIES WITH NET EMIGRATION

The large real wage differentials that can still be observed between developed and developing countries are indicative of the economic gains that can be achieved in terms of global welfare when workers would be allowed to freely cross borders to where their human capital has its greatest return. These welfare gains and the impacts for the distribution of income across owners of capital, workers in migrant-sending countries, the native-born in host countries, and the migrants were already discussed earlier in this chapter by means of Figure 19.2 and Table 19.3. The overall gains are much larger than those that would result from a further reduction of trade barriers between countries. Clemens (2011) reviewed the available evidence and concluded that a removal of barriers to international movement could conservatively add 20–60% to global GDP. Similarly,

Kennan (2013) estimated that the net gains from open borders, taking migration costs into account, could be more than double the income level in less-developed countries. Of course, the societal impacts of free global labor mobility in terms of, for example, population size and distribution, social development, cultural identities, and national sovereignty are potentially huge as well. Walmsley and Winters (2005) calculated that a more realistic additional emigration rate of 1.6% from developing countries might add another 1.2% to world GDP.

Such gains in global welfare are the result of a one-off improvement in spatial distribution, and therefore the allocative efficiency, of the world's labor force. However, an important question from a long-run perspective is whether such short-run gains also lead to higher "dynamic efficiency"—that is, higher rates of global economic growth. Growth models such as formulated by Klein and Ventura (2009) suggest that the dynamic gains can also be very large. The neoclassical and endogenous growth theories discussed in this chapter make it clear that long-run growth effects would depend on the strength of a range of potentially favorable flow-on effects that would be triggered by greater integration of the world's labor markets. Such flow-on effects would include greater agglomeration, FDI, trade, and innovation. Since the empirical evidence reviewed in this chapter suggests that such flow-on effects are indeed plausible, it can be expected that a more integrated global labor market may achieve an endogenously determined higher rate of long-run growth.

However, the extent to which such additional growth leads to convergence or divergence between countries and regions is not a priori clear. Several theoretical mechanisms were discussed earlier in the chapter that could lead to either outcome. In the remainder of this section we consider briefly the implications of greater cross-border mobility for migrant-sending countries that are likely to lose a significant proportion of their labor force, skilled or unskilled.

Columns 4 and 5 were suggestive of population redistribution from migrant-sending countries to migrant-receiving countries leaving the former countries worse off in the short to medium term (a statistically significant positive coefficient of the net migration rate in column 5), while leaving growth in income per capita in the latter largely unaffected (an insignificant coefficient in column 4). In the longer run, migrant-sending countries in the developing world could expect higher growth in income per capita (a negative coefficient in column 8 at a lag of three decades), while there are long-run growth benefits for the high-income countries as well (a positive coefficient in column 10 at a lag of two decades). Using a multi-sectoral model calibrated with data from 60 developed and developing countries, di Giovanni et al. (2012) also detected an asymmetry between the long run and short run. With their model, they found that migrant-receiving countries benefit from larger scale and variety (as in the models we reviewed in Section 4), but only in the longer run. The potentially negative impact of a smaller scale production with less variety in countries that send migrants is overcompensated by remittances, which raise the incomes of the population left behind both in the short run and in the long run.

As Figure 19.2 suggested, emigration is expected to lead initially to a higher wage in the migrant-sending country. Studies of, for example, migration from Mexico to the US (Mishra, 2007) or from Lithuania to the European Union (Elsner, 2013) and emigration from Moldova (Bouton et al., 2011) suggested that this is indeed the case. Any short-run decline in growth in income per capita in migrant-sending countries would then be due to lower aggregate demand or due to positive self-selection of emigrants in terms of skills and unmeasured ability—the so-called brain drain (e.g., Bhagwati, 1976)—lowering aggregate productivity. Clearly, endogenous models of growth would suggest that selective emigration of the high skilled would also lower long-run growth (see also Chen, 2006).

However, in recent years the literature is increasingly seeing net emigration of skilled people from developing countries in a more positive light (e.g., Duncan, 2008; Gibson and McKenzie, 2011). First of all, higher returns obtainable abroad to investments in education and training may encourage a greater proportion of the workforce to invest in human capital than otherwise. Not all of these higher educated workers will actually emigrate. The potential opportunities abroad therefore generate a positive spillover from human capital accumulation in the source country.

Another major benefit for the home country is the receipt of remittances, particularly when these trigger domestic investment rather than consumption of imported commodities. Remittances can also have positive effects on income distribution. Adams and Page (2005) found that international migration and remittances lead to a sharp reduction in poverty in the developing world. Although some researchers argue that highly skilled migrants are often less committed to their home country, Bollard et al. (2011) found that the more educated migrants in fact remit more than average. The impacts of remittances are discussed in detail in Chapter 20 of this Handbook.

Another benefit from emigration is that it appears to trigger foreign direct investment (FDI) in the home country by firms from the migrants' host country (Foley and Kerr, 2011). Additionally, Nijkamp et al. (2011) found that immigration has a positive impact on FDI investment in both directions (inward and outward). They also concluded that these impacts are greater when migrants are relatively highly educated. Similarly, the ties between home and host countries forged by migration also increase bilateral trade, as is demonstrated by the meta-analysis of Genc et al. (2012). However, the meta-analysis showed a slight trade balance benefit in favor of a migrant host country. This would imply trade balance deterioration in the sending country, but such a negative impact might be offset by the growth in remittances.

An important aspect of emigration for economic growth in the home country is the impact of the resulting networks and ties between migrants and businesses in the home country. The impacts from diaspora for innovation in the home country have been recently highlighted by various case studies, particularly with respect to diaspora from China and India. Agrawal et al. (2011) argued that the emigration of highly skilled

individuals has a detrimental effect on innovation and local knowledge networks in the home country but, once such emigrants contribute to innovation activity in the host country, personal networks with innovators back home can contribute to dissemination of new knowledge and practices.

Besides benefitting from network ties with high-skilled diaspora, it should be noted that developing countries can also benefit from increasing temporary migration, return migration and circulation, encouraged by lower real costs of air transportation and by cheaper information exchange through new information and communication technologies. It is estimated that up to about one-third of migrants may return to the home country in the long run, where the return of diaspora may raise human capital levels and entrepreneurship. This is another channel through which emigration can be a source of growth for the home country (Dos Santos and Postel-Vinay, 2003).

8. CONCLUSION

International migration is a multifaceted phenomenon that has a broad range of effects that can be quantified by migration impact assessment (MIA) techniques.The impact of cross-border movement on economic growth is just one of these effects, although an important one—given the potential consequences for the standard of living of present and future generations. This chapter has shown that the ways in which population change through international migration affect growth are complex and often ambiguous, not least because they depend on the time span and the geographical range considered. Furthermore, the impact of economic growth of migration depends strongly on the composition of migrant flows in terms of ethnicity, age, intended duration of stay, skill levels, etc.

At a very broad level, the net impact of migration on the rate of economic growth appears consistent with the evidence on many other economic effects as cataloged by MIA (see Nijkamp et al., 2012): negligible or slightly positive for the host country, but at least not strongly negative. The cross-country growth regressions in this chapter suggested a lack of association between the rate of net migration over a given decade and growth in income per capita over that decade. In contrast, natural increase has a detrimental impact on short-run growth, just as neoclassical theory predicts. In the long run, some—albeit fairly weak—evidence was presented that net outward migration from developing countries and inward migration into high-income countries increase growth in both types of countries (i.e., the increased cross-border mobility in the world in recent decades may have contributed to an increase in the world's long-run growth rate).

Nonetheless, given the weak link between income per-capita growth and net migration, an increasing migration rate overall is unlikely to be an effective long-run growth strategy for a country vis-à-vis investments in education, R&D, infrastructure, institutional reforms, and the like. Although the exploratory regressions of this chapter

could not control for composition effects, a policy that sees migration as a means of addressing structural imbalances in the host labor market in terms of skills and talent is likely to be more effective for growth of a host country than a broader unilateral boost to immigration. Hence migration policy is not a single rectilinear instrument for growth but a broadly composed set of policy strategies serving a range of economic and societal objectives.

Following the global financial crisis and the resulting economic downturn in recent years, many migrant-receiving countries have tightened admission criteria while at the same time less favorable economic conditions in host countries have led to significant return migration. In the longer run, however, it is inconceivable that international migration will remain structurally lower than in the recent past (although in the very long run global population aging will decrease aggregate labor mobility). The co-existence of large cohorts of young and therefore highly mobile adults in developing countries and numerically and structurally fast aging high-income countries is likely to lead to an increasing supply of and demand for international migrants (Poot and Pawar, 2013). However, the nature of migration is changing. A conventional stereotype of a pioneer male migrant obtaining work in a host country, to be subsequently joined by his family and leading to permanent settlement, is being replaced by a much broader spectrum of international population movements that include cross-border commuting and fly-in fly-out (FIFO) employment, transfers within multinational corporations, seasonal migration, temporary migration, transnational living and retirement migration, education abroad, and the retention of foreign graduates of host country universities. The implications for growth of these different types of migrants are likely to be widely varying and certainly not always clear cut. For example, if FIFO workers spend most of their income in the home country such migration may benefit both the home and host societies (the impact on the former could be similar to that of remittances), but the impact on the host region may be muted. Indeed, the FIFO worker may be thought of as less committed economically and socially to the host region than a permanent migrant. While we have argued in this chapter, both theoretically and by means of empirical evidence, that the world will be better off economically in the long run from greater cross-border population movement in response to various incentives and disequilibria, the specific mechanisms through which this rich spectrum of modern nomads may influence the engines of long-run global development remain topics that warrant much further research.

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