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Skill-Based Immigration and Economic Growth: A Long-Term Analysis for Canada

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Abstract. *There has been an increasing acknowledgement of the importance of immigration, both in the scholarly discourse on economics and in the priorities of policymakers. In this regard, the immigrant inflows to maximize potential economic benefits is a highly debated topic in both the academic literature and the policy agendas. Nevertheless, the impact of the varied educational backgrounds and skill sets of immigrants on economic growth is still largely unexamined. Within this particular framework, this study investigates the impact of immigration based on skill level on the economic growth of Canada during the timeframe of 2006-2022. In the model examined, employment is categorized as native-born Canadian, low-skilled, semi-skilled, and high-skilled immigrants. In order to estimate the long-term parameters, the Vector Error Correction (VECM) is employed, and the results are confirmed by the Dynamic Ordinary Least Squares Estimator (DOLS). The estimates revealed that a 1% increase in native Canadian employment raises real output by 0.69%; a 1% increase in low-skilled immigrant employment decreases real output by 0.10%; a 1% increase in the semi-skilled immigrant employment raises real output by 0.15%; a 1% increase in high-skilled immigrant employment raises real output by 0.26%. The results demonstrate that the impact of immigration on economic growth varies depending on the skill level. Low-skilled immigration has a negative effect on economic growth, while semi-skilled and high-skilled immigration have a positive effect. In addition, the impact of high-skilled immigration on economic growth is greater than that of semi-skilled immigration. Immigration can only stimulate long-term real output if the inflow consists of qualified immigrant workers.*

Keywords: economic growth, employment, immigration, time series analysis, Canada

JEL Codes: E23, E24, E27, J15, O47

1. Introduction

Immigration has become one of many nations' top policy concerns due to factors such as the increasing value of education and training in today's knowledge-based industries and the inevitable demographic changes brought about by declining birth rates and rising life expectancies. The surge in global immigration towards industrialized nations has been characterized by exceptional institutional and technological transformations, including demographic shifts, emerging demands for expertise, and an increasing emphasis on specialized knowledge in both human capital and technology-driven fields. The present changes have had a notable impact on immigration patterns with respect to both demographic and skill-related tendencies. This argument is often grounded in endogenous growth models, which attribute great importance to human capital and research and development in relation to economic growth through labor market dynamics. The skill level of permanent immigrants in particular countries of destination has gone through notable transformations over time. On the other hand, it can be observed that immigration, specifically irregular migratory flows, is propelled by factors such as war, internal conflicts, natural disasters, and alterations in climate patterns. The economic consequences of immigration represent one of the many impacts that immigration exerts on the host countries. The repercussions of immigration receive significant focus and constitute a fundamental aspect of the discourse surrounding this topic.

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These changes have been linked to economic consequences and the changing priorities of immigration policies. Therefore, concerns regarding the impact of immigration on economic growth give rise to investigations into the skill sets possessed by immigrants. In this context, the points system, which has been utilized in Canada since 1967, aims to screen potential applicants by regulating their skill allocation. The primary objective of the system is to promote sustainable economic growth and enhance competitiveness by prioritizing the selection of immigrants by government, based on high levels of human capital needed by the local economy. In the context of the Canadian immigration system, candidates are evaluated and assigned a ranking or priority based on their favorable personal attributes, including their level of education, proficiency in language, and occupational experience (Macaluso, 2022).

Despite the fact that admission methods based on competency-based scoring have been implemented as state policy in advanced countries since the 1960s, research pertaining to the influence of immigrants over production growth is typically limited to theoretical models and fails to account for the human capital composition of immigrants. In addition, despite the fact that the phenomenon of immigration has been a subject of interest in economic literature, particularly with regard to the process of selecting and sorting immigrants across different countries, scholars have viewed immigration as a consequence of geographic variations in the net returns to factor supply and the reaction to labor market imbalances (Bodvarsson et al., 2014) and have therefore focused on wage and unemployment issues rather than growth. Similarly, Borjas (2019) pointed out that Immigration is occasionally asserted as a fundamental factor in fostering economic growth. However, there is a dearth of academic research that directly investigates the relationship between immigration and economic growth. The existing body of literature provides empirical evidence on diverse outcomes, including the impact on workers' factor incomes and government revenue, encompassing tax and spending. According to Jaumotte et al. (2016), immigration is a macro-critical policy issue that has raised concerns about its potential negative impact on the economies of the host countries. A meticulous analysis of the influence of immigration on the economies of destination countries is of utmost importance. The predominant academic discourse has revolved around the economic ramifications of migration, with particular emphasis on its influence on public finances and labor markets. The extent of knowledge regarding the enduring effects of immigration on income of the countries that receive immigrants is limited.

In the course of examining the impact of immigration on economic growth through empirical research, it has been ascertained that the role of immigrant composition has been overlooked. Regarding this matter, the objective of this research is to assess the impact of immigration on economic growth, with a specific focus on the human capital composition of immigrants, categorized by skill level.

Prior to discussing the effect of immigration on economic growth, it would be appropriate to address how immigration has been incorporated into the theoretical framework of economic growth.

2. Literature Review

Solow (1956) and Swan (1958) developed a neoclassical model of economic growth, which builds on earlier contributions by classical economics and early twentieth-century thinkers. The economic model developed by Arrow (1962) and Frankel (1962) acknowledge the importance of technological advancement and innovative thinking as driving factors behind the expansion of a nation's economy. This idea places an emphasis on the method of “learning by doing”, which aims to improve human capital as well as productivity and innovation.

The impact of demographic changes on macroeconomic indicators, such as investment choices and growth rates, is widely acknowledged. The UL growth model, which refers to the Uzawa (1965) and Lucas (1988) endogenous growth model, is a widely recognized benchmark model utilized for examining economic growth in literature. The conventional UL framework posits that human capital serves to enhance the productivity of labor. Therefore, both skilled and unskilled workers provide labor services that are identical in nature, but differ in terms of quantity. Furthermore, alterations in both skilled and unskilled labor have equivalent impacts on the production and the marginal productivity of capital. According to Romer's (1986) argument, the division between human capital services and unskilled services is not arbitrary due to the distinct nature of their respective production functions. Barro (1991) developed a theoretical framework by integrating the concept of "human capital", which refers to the educational level measured by the number of years of schooling as a contributing factor to economic growth.

The incorporation of the human capital component into Solow's growth model by Mankiw et al. (1992) resulted in a considerable increase in the model's degree of accuracy. In this context, the incorporation of human capital into the Solow Model results in outcomes that are consistent with the variations in income levels and become more rational with the full absorption of human capital into the production function. This re-evaluation of economic growth is crucial for examining the economic contribution of immigrants with varying levels of competence within the framework of the model's incorporation of human capital.

The interest in growth theory was sparked by the advent of endogenous growth models during the 1990s. According to the models, technological advancement is an endogenous process that relies on the allocation of resources towards research and development, as well as the spillover effects that ultimately result in a higher prevalence of knowledge-based economic activities over time. This progress cause to considering the impact of immigration on human capital in growth models

Dolado et al. (1994), in their research of OECD countries during the period 1960–1985, based on an augmented Solow model that incorporates human capital and immigration, concluded that immigration would contribute to the accumulation of human capital and partially offset the "dilution effect of population". In other words, immigration may raise the endowment of human capital in the host countries, depending on the skill level of the immigrants, influencing the productivity and, therefore, the real output levels.

According to Waltz's (1995) argument, immigration can have a favorable impact on economic growth. This is attributed to alterations in the workforce's composition in both the host and origin nations, as opposed to changes in factor endowment. Waltz (1995) posited that the comparative proficiency of immigrants vis-à-vis the mean competencies of laborers in the growth-generating sector of the economy was the paramount factor to contemplate when assessing the enduring implications of immigration.

Lundborg & Segerstrom (2000, 2002) incorporated immigration into a quality ladder development model in their research. The authors propose that immigration could potentially yield positive effects on the economy of the receiving country, as it may incentivize businesses that experience reduced wages due to immigration to allocate more resources towards research and development. However, the positive effect of immigration on economic growth is accompanied by a potential negative impact on the welfare of domestic workers.

Bretschger (2001) suggests that skilled immigration has the potential to stimulate economic growth through a dual mechanism: firstly, by reducing the costs associated with research and development, and secondly, by expanding the market share of specific product categories.

The study conducted by Drinkwater et al. (2007) investigates the impact of immigration, an exogenous variable, on the sustained growth of the host country and the overall advantage to the indigenous population, commonly known as the "immigration surplus." The simulation of the model indicates that an escalation in skill-intensive research and development activity leads to a rise in the growth rate of real income, provided that immigration solely comprises of high-skilled immigrants. This phenomenon can be attributed to the higher proportion of individuals with advanced levels of education among the immigrant population. In the scenario

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where immigration is limited to low-skilled workers, the net real income benefits for natives were found to be unfavorable.

The incorporation of human capital as an endogenous factor in the growth model enables the examination of the impact of immigrant-led innovation and entrepreneurship on total factor productivity and subsequent long-term economic output growth. This phenomenon is facilitated through the process of endogenizing human capital. In this regard, Ortega & Peri (2009) conducted a study utilizing a unique dataset on immigration flows and stocks, in addition to immigration regulations, across 14 OECD host countries and 74 originating economies spanning from 1980 to 2005. According to their estimations, bilateral migration patterns exhibit a positive correlation with the per capita income differential between the source and destination countries. The researchers also discovered a reduction in bilateral flows subsequent to the implementation of more stringent immigration policies by the destination countries. The researchers were able to examine the effect that immigratory patterns have on employment rates, investment levels, and productivity results within the OECD member states by using an approach known as "pseudo-gravity." According to their results, immigration has a favorable impact on employment, and there is no evidence that natives are being disregarded for jobs. Furthermore, investment exhibited a rapid and robust response. The impacts of immigration on capital intensity and total factor productivity do not appear to be negative in the short-term and long-term. The results indicate that, over a short time frame, immigration has a direct correlation with the aggregate income of the country of destination, but does not exhibit any noticeable influence on the average wages and average income per capita.

Orefice (2010) investigates the influence of immigration patterns and the corresponding human capital on the variability of GDP per capita among 24 OECD host economies. The researcher employed an IV model and discovered that immigrants with a significant amount of human capital have a positive impact on the variation of per capita GDP. However, this effect is insufficient to entirely offset the adverse influences of immigration on alterations in output per capita.

The study conducted by Felbermayr et al. (2010) investigates the effect of immigration on the GDP per capita of the host nations. The authors employ an instrumental variable cross-sectional approach and incorporate institutional quality, international trade and financial liberalization as covariates in their model to demonstrate a favorable relationship between immigration and GDP per capita.

Using empirical data from the United States between 1940-2000, Hunt (2010) indicates that proficient immigrants make a significant contribution towards augmenting research and innovation, alongside technological advancements. This result implies that the influx of immigrants brings with it a valuable set of skills and abilities, thereby augmenting the host country's pool of human capital, that is, immigration improve economic growth over human capital.

According to Muysken and Ziesemer (2011) argued that immigration has the potential to mitigate the challenges posed by aging populations on the welfare systems of numerous Western economies. The authors have formulated a macroeconomic framework that addresses the effects of aging and immigration on economic growth. This is coupled with an intricate labor market model that incorporates the interplay with unemployment among individuals with limited skills. The study employs a VECM to demonstrate the empirical validity of certain critical model assumptions for the period of 1973 to 2009 in the Netherlands. The findings derived from the examination of transient and enduring perturbations suggest that immigration may serve as a viable solution to mitigate the aging predicament over an extended period, provided that the immigrants possess the ability to engage in the workforce to a comparable extent as the indigenous populace. Furthermore, it is argued that the level of education attained by immigrants has a positive correlation with their potential to make significant contributions to economic growth. Boubtane et al. (2013) have identified a significant and positive association between immigration and GDP per capita across 22 member countries of the OECD during the time frame spanning from 1987 to 2009.

In affluent OECD nations, there has been a decline in wages for low-skilled workers over the past few decades. The decline in question can be attributed to the advent of the computer and information technology revolution. The advent of new technology has had a positive impact on high-skilled STEM workers, either in a permanent manner through skill-biased technological change, or temporarily through improved allocative or decision-making efficiency. The increasing proportion of skilled workers in comparison to low-skilled workers, coupled with the rate of return on human capital, suggests a high demand for STEM professionals in the OECD (Chiswick, 2011). In this regard, Peri et al. (2014) discovered that STEM professionals, regardless of their nationality, contributed to approximately 30-50% of the overall improvement in productivity in the U.S. from 1990 to 2010. Within the framework of endogenous growth models, the phenomenon of immigration is posited to play a role in the augmentation of labor and human capital, alongside other forms of capital such as financial, social, and cultural capital. Skilled immigrants have the potential to influence factors that drive productivity, including, but not limited to innovation, capital formation, and business initiative.

Ortega & Peri (2014) investigate the link between trade openness, immigration, and per capita income in various countries employing the instrumental-variables approach. Researchers have presented empirical support for a strong and favorable impact of openness towards immigration on long-term income per capita. Moreover, the research demonstrates that migration has a significant impact on the enhancement of total factor productivity. This effect is attributed to the augmentation of diversity in productive skills and, to a certain degree, a rise in the rate of innovation.

According to Aydemir (2014), the presence of skilled immigrants can enhance the human capital stock of the nation of destination, augment the returns on physical capital, and potentially stimulate research and innovation, thereby contributing to the long-term economic growth.

Aleksynska and Tritah (2015) conducted a study that analyzed the effect of variations in the distribution of immigrants on the income of 20 OECD countries between 1960 and 2005. The findings from the aggregate analysis indicate that immigrants exert a favorable impact on income, which operates predominantly via the mechanism of total factor productivity (TFP). Divergent income effects are discerned across various age cohorts: an increased proportion of immigrants among the younger population has an adverse influence on overall income, whereas a greater proportion of immigrants among individuals in their prime working years has a favorable impact. The discrepancy was interpreted by the authors as pertaining to effects that are either short-term or medium-term in nature. Temporal modifications entail alterations not only in Total Factor Productivity (TFP) but also in the human capital of natives.

Ehrlich & Kim (2015), by aiming to examine the influence of demographic shocks on the accumulation of human capital in a Uzawa-Lucas model, posit that skilled immigrants make valuable contributions to knowledge development through their individual knowledge acquisition and the diversity effects that arise from their presence.

In their analytical analysis, Muysken et al. (2015) investigate the effects of immigration on the labor market in both flexible and rigid labor market systems by developing a general equilibrium framework that takes into account skill diversity and labor market obstacles. These obstacles include situations in which unemployed semi-skilled manufacturing workers are forced to take low-skilled service jobs, while low-skilled service workers may continue to be unemployed. According to the findings of the analytical analysis, semi-skilled immigration seems to have a complementary impact on low-skilled unemployment under a system that allows for some degree of flexibility, which ultimately results in a reduction of low-skilled unemployment. In contrast, a strict regime has the opposite impact, which is that it has a substitution effect on semi-skilled immigrants, leading to a rise in low-skilled unemployment. In light of the findings of this analysis, it is reasonable to anticipate that the impacts of skill-based immigration on economic growth depend on the structure of the labor market, and therefore the consequences of immigration may vary.

McGowan & Andrews (2015) argued that the occurrence of skill mismatches, which can manifest as either a deficiency of skills among workers relative to their job requirements or an excess of skills possessed by workers in relation to their current job demands, can have an adverse effect on both worker productivity and the overall welfare of the economy. It is noteworthy that variations in skill mismatches among nations are associated with variations in policies pertaining to the labor market and the product market. This implies that public policies have a crucial function in mitigating skill mismatches that lower productivity and therefore production. Therefore, immigration have potential elevate overall world production and welfare.

Similarly, Cournede et al. (2016) claimed that facilitating workforce mobility by reducing constraints that impede workers from relocating to jobs that better utilize their abilities, and reducing the costs incurred by employers, can effectively mitigate skill mismatch. Enhanced international labor mobility could effectively mitigate skills mismatches among employees across various skill levels, without adversely affecting overall employment. The heightened movement of the workforce would have a notable effect on individuals with lower levels of skill, who are at a greater risk of experiencing unemployment. However, this would be counterbalanced by an increase in the likelihood of securing employment in a different role. This assertion posits that the easing of limitations on global labor mobility will yield favorable outcomes for economic growth in the context of resource allocation.

The study conducted by d'Albis et al. (2016) provides an empirical assessment of the link between the influx of permanent immigrants in France and the country's macroeconomic indicators, specifically its GDP per capita and unemployment rate. Based on a VAR model estimation utilizing monthly data from 1994 to 2008, researchers have determined that the flow of immigration is notably influenced by macroeconomic performance. Specifically, the study reveals a positive correlation between immigration flow and the country's GDP per capita, while a negative correlation is observed between immigration flow and France's unemployment rate. Simultaneously, authors have observed that immigration has a positive impact on income especially in the context of family immigration. Family immigration can have a positive impact on a country's unemployment rate, particularly when the families originate from developing economies.

Jaumotte et al. (2016) conducted a study which revealed that immigration has a significant effect on the per capita growth in developed countries. The study's findings suggest that the inclusion of immigrants with varying levels of skill, encompassing both highly skilled and less skilled workers, may have the capacity to improve the productivity of the workforce. Furthermore, a positive correlation exists between the proportion of immigrants in the population and the average income of the lowest 90% and top 10% of earners. This implies that a considerable proportion of individuals are able to simultaneously reap the advantages of immigration.

Boubtane et al. (2016) researched the influence of immigration on the economic growth of twenty-two OECD countries spanning from 1986 to 2006. The researchers utilized a distinctive dataset, which enabled them to differentiate the net migration of foreign and native-born individuals based on their skill level. The study's authors incorporated immigration into an augmented Solow-Swan model and subsequently conducted an estimation of a dynamic panel model employing SYS-GMM. The findings of the analysis indicate that the skill level of immigrants is positively related to GDP per capita. Additionally, a sustained rise in migration rates is associated with a positive impact on income. Furthermore, the influence of immigration on aggregate income growth remains significant even in nations that implement non-discriminatory migration policies.

The study conducted by Kang & Kim (2018) employs the GMM estimator to investigate the influence of immigration on growth in both the receiving and home countries. The findings indicate that the immigration

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of individuals from developed to developing economies has a significantly more substantial effect on the enhancement of economic growth. It can be inferred that the impact of immigration on economic progress is directly correlated with the competence levels of the migrant population.

The study conducted by Borjas (2019) analyzed the influence of immigration on economic growth through the utilization of a canonical Solow model. The findings of the study suggest that a solitary supply shock will not have any significant impact on the steady-state GDP per capita. However, a persistent supply shock is likely to lead to a permanent decline in income. The author's analysis highlights that the relationship between immigration and economic growth is dependent on several factors. These factors include the level of proficiency of immigrants, the speed of integration, the impact on the labor market, the size of the immigration surplus, the potential externalities of human capital, and the long-term fiscal consequences. Notwithstanding methodological discrepancies concerning effect measurement, the researcher arrived at the conclusion that immigration has a more favorable effect on growth when the inflow of immigrants comprises individuals possessing elevated levels of skill.

Upon reviewing the literature, it becomes evident that a greater number of studies demonstrate a positive correlation between immigration and economic growth. Moreover, it is evident that the research conducted on the incorporation of skill-based immigration into economic growth models is notably restricted. The subsequent section will undertake an examination of the influence of immigration based on skills on the growth of the economy. This will be accomplished through the utilization of a model that has been derived from the research conducted by Mankiw et al. (1992), which integrates human capital based on the Solow growth model. Additionally, the research of Dolado et al. (1994) and Borjas (2019) that incorporate immigration will also be incorporated into the analysis.

3. Research Objectives and Methodology

The primary aim of this research is to examine the relationship between skilled immigration and its influence on the economic growth of Canada during the period spanning from 2006 to 2022. Specifically, we intend to examine how the skill composition of immigrant groups entering Canada influences the country's overall economic performance by concentrating on various skill-level categories, namely low-skilled, semi-skilled, and highly-skilled immigrants.

The choice to focus on Canada in this study is motivated by its renowned and organized points-based immigration system, which places significant emphasis on the valuable contributions of skilled immigrants to the nation's economic growth. The nation's extensive immigration statistics, along with its multifaceted economy, offers a promising prospect for investigating the relationship between skill-oriented immigration and economic performance.

To analyze the relationship between skilled-based immigration and economic growth, we will build upon a modified neoclassical growth model that incorporates the influence of immigrant skill composition. The empirical analysis is based on a model inspired by those constructed and employed in Lutkepohl (2005), Borjas (2019), and Lehmann et al. (2020) papers. In the model specified in this study, the dependent variable is considered as real economic growth, while the independent variables are capital and employment. The employment variable is broken down into two categories: native-born Canadians and immigrant workers. According to the level of education and competence that immigrants possessed, they were categorized as low-skilled, semi-skilled, or high-skilled workers. The series of workers who were born in Canada was incorporated into the model as a separate component so that it would be possible to examine the impact of employment in the appropriate manner. In addition to employment, Physical Capital, which is the most important factor in

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economic growth, was also included in the empirical model. The primary data for this study is obtained from official source of Statistics Canada.

The estimation of variable parameters is conducted using the Vector Error Correction Model (VECM), and the outcomes are fortified through Dynamic Ordinary Least Squares (DOLS) Co-integration regression estimates. Prior to commencing the empirical examinations, the empirical model specification is presented alongside the variables incorporated in the model and their respective proxies. Subsequently, an assessment is conducted to determine the stationarity of the series, as well as the presence of a long-run associations between the series. Following the process of parameter estimation, the model's validity was assessed through a battery of tests including those for serial correlation, normality, and eigenvalue stability.

Prior to doing our empirical analysis, it is necessary to explore the theoretical underpinnings of the model upon which our empirical analysis is predicated. The following section will address this matter.

4. Theoretical Framework

In Eq. (1) shows that the country's aggregate output (Y) is a function of physical capital (K), human capital (H) and labor force (L). A depicts technology terms which is rising efficiency.

$$Y_t = (K_t)^{\alpha} \cdot (H_t)^{\beta} \cdot (A_t \cdot L_t)^{(1-\alpha-\beta)} \qquad Eq.(1)$$

In Eq. (2), $A_t$represents the efficiency at time t and L_t employment. g is the growth rate of A_t. Accordingly, in the t period, the efficiency changes at the rate of e^{gt}compared to the previous period.

$$A_t = A_0 e^{gt} \qquad Eq.(2)$$

In Eq. (3) "n" and "m" each stand for the corresponding growth rates of the native population and the immigration rate (M/L), which is calculated as the ratio of immigration (M) to labor force (L) respectively. Both the changes in native population and the immigration are included into the calculation of the total number of labor; hence, L increases at a pace that is proportional to (n + m).

$$L_t = L_0 e^{(n+m)t} \qquad Eq.(3)$$

Eq. (4) illustrates the shift in the country's existing stock of physical capital at time t. The amount of changes in physical capital stock ($\dot{K}_t$) is calculated in a manner that is directly proportionate to the fraction (s_k) of income (Y_t) that is allocated to investments($s_k Y_t$) and inversely proportional to the amount of depreciation (δ_k) in the physical capital stock ($\delta_k K_t$).

$$\dot{K}_t = s_k Y_t - \delta_k K_t \qquad Eq.(4)$$

Eq. (5) shows the change in the country's human capital ($\dot{H}$). ($\dot{H}$) is directly proportional to the share (s_h) of income (Y_t) allocated to human capital ($s_h Y_t$) and inversely proportional to the depreciation (δ_h) of human capital ($\delta_h H_t$). (ε) is a measure of an immigrant's proportional contribution to the human capital stock relative to the native workforce. Eq. (5) suggests that that a gain in human capital will only occur if the value of (ε) is positive and larger than zero (Lehmann et al. 2020)

$$\dot{H} = s_h Y_t - \delta_h H_t + \left(\frac{M_t}{L_t}\right) \cdot \varepsilon \cdot H_t \qquad Eq.(5)$$

Considering per effective capital-labor ratio; output per labor (6); and dynamic expressions of physical capital per worker (7) and human capital per worker (8) may be expressed by the following equations.

$$y = A \cdot k^{\alpha} \cdot h^{\beta} \qquad Eq.(6)$$

$$\dot{k} = s_k y_t - (g + \delta_k + n + m)k_t \qquad Eq.(7)$$

$$\dot{h} = s_h y_t - [g + \delta_h + n + m\,(1-\varepsilon)] \cdot h_t \qquad Eq.(8)$$

According to Eq. (7) and Eq. (8), immigration has a negative influence on growth. This is because immigration adds to the total population increase (n + m), which in turn hinders the accumulation of both physical and human capital. Eq. (8) demonstrates, however, that when $\varepsilon > 1$, migration begins to mitigate the

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adverse impact of population expansion on human capital. Additionally, when $\varepsilon > 2$ and the immigration rate is greater than the rate of native population increase, the positive effect of immigration on human capital offsets the negative effect of overall population growth (Lehmann et al. 2020).

Eq. (9) and Eq. (10) suggest the steady state levels of physical and human capital that are implied by the Eq. (7) and Eq. (8), and assuming that $\delta h = \delta k$, provided that both $\dot{k}$ and $\dot{hc}$ are equal to 0. (Borjas, 2019; Lehmann et al. 2020)

$$k^* = \left(\frac{s_k}{g+\delta+n+m}\right)^{\frac{1-\beta}{1-\alpha-\beta}} \cdot \left(\frac{s_h}{g+\delta+n+m(1-\varepsilon)}\right)^{\frac{\beta}{1-\alpha-\beta}} \qquad Eq.(9)$$

$$h^* = \left(\frac{s_k}{g+\delta+n+m}\right)^{\frac{\alpha}{1-\alpha-\beta}} \cdot \left(\frac{s_h}{g+\delta+n+m(1-\varepsilon)}\right)^{\frac{1-\alpha}{1-\alpha-\beta}} \qquad Eq.(10)$$

It is possible to derive the following Eq. [11] for steady-state output per capita by adding Eq. (9) and Eq. (10) into the production function Eq. (6) and calculating logarithms (Borjas, 2019).

$$\frac{\partial log\bar{y}^*}{\partial m} = -\frac{\alpha}{(1-\alpha-\beta)\cdot(g+\delta+n+m)} - \frac{\beta}{(1-\alpha-\beta)\cdot[g+\delta+n+m(1-\varepsilon)]} \qquad Eq.(11)$$

If ε≤1, the per capita income would undoubtedly fall, indicating that a large number of low-skilled immigrants are involved. In fact, falling marginal productivity of labor suggests that per-capita income might decline even if immigrants are slightly more competent, which means ε being slightly above 1. Eq. (11) demonstrates that immigration can only stimulate long-term development if the inflow of immigrants is well educated and competent, which means ε being significantly above 1 (Borjas, 2019).

5. Empirical Analysis

a. Empirical Model and Data Set

Before commencing our empirical analysis, we will undertake a visual inspection of its graphics to identify any possible correlation between economic growth and immigration based on skills.

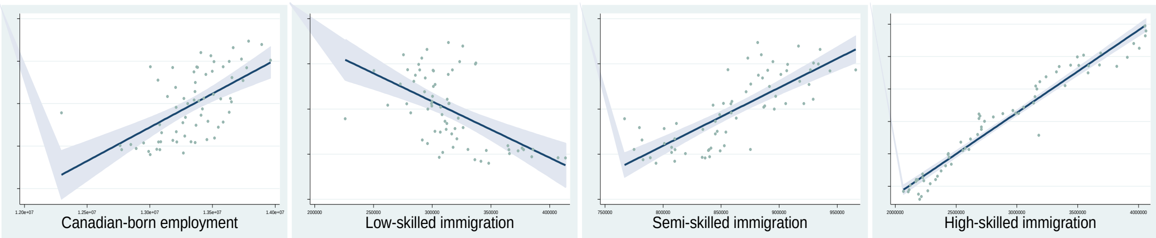

Figure 1: Two-way linear prediction plots

Figure 1 displays the two-way linear prediction plots of the dependent and independent variables, illustrating the correlation between economic growth and skill-based immigration. It can be posited that low-skilled immigration exhibits a positive correlation with economic growth, whereas semi- and high-skilled immigration, along with Canadian-born native labor, demonstrate a positive correlation with economic growth. Although the graphs may not offer precise depictions of the data, they do offer a broad understanding of the structure of relationships within the model.

Table 1 provides a summary of the model's variables, indicators, and abbreviations, as well as information about the data's original source.

Table 1: Variables and indicators

Variables	Abbreviations	Variable Measure

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Economic Growth	GDP	Real Gross Domestic Product Quarterly, SA. (Chained 2012 $)
Capital	GFC	Gross Fixed Capital Formation Quarterly, SA. (Chained 2012 $)
Productivity	PSE	Post-Secondary School Education
Productivity	PTN	Patent Applications
Labor	EMP_{BIC}	Born in Canada (Number of workers / Labor Force)
Labor	$EMP_{IM_{LS}}$	Low-Skilled Immigrants (Number of workers / Labor Force)
Labor	$EMP_{IM_{SS}}$	Semi-Skilled Immigrants (Number of workers / Labor Force)
Labor	$EMP_{IM_{HS}}$	High-Skilled Immigrants (Number of workers / Labor Force)

Source: Statistics Canada Data (statcan.gc.ca),

The functional expression of the model to be employed in the empirical phase of the study is represented by Eq. (1).

$$GDP = f(GFC, PSE, PTN, EMP_{BIC}, EMP_{IM_{LS}}, EMP_{IM_{SS}}, EMP_{IM_{HS}}) \quad (Eq. 1)$$

Eq. (2) provides a statistical representation of the functional model presented in Eq. (1).

$$lnGDP_t = a + \beta_1 lnGFC_t + \beta_2 lnPSE_t + \beta_3 lnPTN_t + \beta_4 lnEMP_{BIC_t} + \beta_5 lnEMP_{IM_{LS_t}} + \beta_6 lnEMP_{IM_{SS_t}} + \beta_7 lnEMP_{IM_{HS_t}} + u_t \quad (Eq. 2)$$

t: 2006Q2…2022Q4

β_1 *and* β_2 are the regression coefficients that describe the change in GDP related to the per-unit change in $FC, EMP_{BIC}, EMP_{IM_{LS}}, EMP_{IM_{SS}}$ *and* $EMP_{IM_{HS}}$. The letter t stands for a time trend. " a " represents the constant, whereas "u_t" is the disturbance term that refers to the variations from the trend that occur in each individual year.

b. Testing of the Model and Estimates

The values of the variables that were defined for the empirical model are displayed in Table 2, along with their means, standard deviations, minimum and maximums.

Table 2: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
GDP	67	1794053*	157778*	1559687*	2094530*
GFC	67	432117*	28548*	355386*	477217*
PSE	67	2018294	138335.2	1726056	2183793
PTN	67	6338971	438723.8	5295754	6938843
EMP_{BIC}	67	.715	.023	.657	.751
$EMP_{IM_{LS}}$	67	.017	.002	.012	.024
$EMP_{IM_{SS}}$	67	.046	.002	.041	.05
$EMP_{IM_{HS}}$	67	.153	.026	.12	.203

* (thousands)

It is important to understand whether the stochastic process in the time series developed for an economic analysis varies over time. Most estimators in time series rely on data being stationary in order to maintain their statistical properties. The mean, variance, and autocovariance of a weakly stationary process are constant across time. A straightforward algebraic model cannot express the past and future structure of the series if the stochastic process's characteristics change over time, indicating that the series is not stationary. The majority

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of time series are not stationary in the real world. The series' mean fluctuates over time and includes trends. The reliability of the econometric analysis is compromised by the time series' non-stationarity. If the series is not stationary, the autocorrelations greatly deviate from zero or move farther away from zero as the lags grow, producing a spurious sample and therefore a spurious regression. Therefore, prior to performing any analysis on a time series, it is crucial to first establish whether or not the series is stationary.

The most commonly methods employed for testing stationarity in empirical studies are Dickey-Fuller (DF), Augmented Dickey-Fuller (ADF) and Phillips-Peron (PP). In this study, the ADF test and PP are employed to examine stationarity, and the results are presented in Table 3.

Table 3: Unit-root test

H0: series contain unit root	ADF				PP			
	I(0)		I(1)		I(0)		I(1)	
Variable	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.
GDP	-0.50	0.892	-9.39*	0.000	-0.21	0.937	-9.68*	0.000
GFC	-0.60	0.870	-8.48 *	0.000	-0.55	0.883	-8.50*	0.000
PSE	-1.47	0.550	-3.99*	0.001	-3.95***	0.002	-	-
PTN	-1.49	0.538	-3.98*	0.002	-1.86	0.350	-4.24*	0.001
EMP_{BIC}	-1.25	0.651	-7.32	0.000	-1.16	0.690	-7.31	0.000
$EMP_{IM_{LS}}$	-2.71 ***	0.072	-8.83	0.000	-2.66***	0.081	-9.46	0.000
$EMP_{IM_{SS}}$	-3.56*	0.007	-	-	-3.46*	0.009	-	-
$EMP_{IM_{HS}}$	0.11	0.967	-7.99 *	0.000	0.50	0.985	-8.31 *	0.000

Note: *** p<.01, ** p<.05, * p<.1

The outcomes of the test of the null hypothesis of "the series contain unit root" are shown in Table 3 along with the t-statistics and probability values. The results confirmed that the series GDP, GFC, PTN and $EMP_{IM_{HS}}$ are nonstationary at level, which indicates that each series contains a unit root. However, the unit roots are eliminated by differencing the series and concluded that the integration level of the series is I(1). On the other hand, it is observed that PSE, EMP_{BIC} , $EMP_{IM_{LS}}$ and $EMP_{IM_{SS}}$ series are stationary in level that means the integration level of the series is I(0).

The following step in the process of building the model is to determine the optimal number of lags of GDPt that will be incorporated into the VECM.

Table 4: Optimal lag order selection

Lag	LogL	LR	Prob.	FPE	AIC	SC	HQ
0	1184.46			5.0e-28	-37.3162	-37.1958	-37.01
1	1760.27	1151.6	0.000	7.8e-35	-53.0243	-51.8201	-49.9627
2	1928.27	336.02	0.000	5.7e-36	-55.7865	-53.4986	-49.9694*
3	2053.89	251.24	0.000	2.1e-36	-57.2029	-53.8313	-48.6304
4	2184.23	260.68*	0.000	1.1e-36*	-58.7693*	-54.314*	-47.4413

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Table 4 displays the log of the likelihood function (LogL) and its test statistic with p-value for each lag length. LL, LR, FPE are statistical values, while AIC, HQIC and SBIC are information criteria. In order to establish the optimal lag-length, we relied on a variety of information criteria, specifically the following: FPE, AIC, SC, and HQ. The lag-length that has been suggested by these four different methods is indicated by asterisk. FPE, AIC, and SC suggest four lags and HQ indicates two lags. In light of these findings, it is decided that four would be the suitable number to use as the appropriate lag length.

In the event of the presence of cointegration among the vector time series, it is advisable to conduct a test on the cointegration rank to determine its level of significance. Table 5 displays the results of the trace and maximum eigenvalue tests, in which the null hypothesis of no cointegrating vectors is examined with the purpose of confirming the presence of the long-term relationships.

Table 5: Co-integration rank test

Trace				
H_0: No. of CE(s	Eigenvalue	Trace Stat.	Critical Value	Prob.
$r = 0$	0.638226	153.3863*	95.75366	0.0000
$r \leq 1$	0.449608	90.34879*	69.81889	0.0005
$r \leq 2$	0.318076	53.32709*	47.85613	0.0140
$r \leq 3$	0.240775	29.59123	29.79707	0.0528
Maximum Eigenvalue				
H_0: No. of CE(s	Eigenvalue	Trace Stat.	Critical Value	Prob.
$r = 0$	0.638226	63.03754*	40.07757	0.0000
$r \leq 1$	0.449608	37.02170*	33.87687	0.0204
$r \leq 2$	0.318076	23.73586	27.58434	0.1442
$r \leq 3$	0.240775	17.07833	21.13162	0.1683

The results of the trace and the max-eigenvalue test indicate that there exists a potential long-term association between the series, as evidenced by the presence of 3 cointegrating equations at the 0.05 level and 2 cointegrating equations at the same level, respectively.

In the context of time series analysis, it is typical to presume that the fundamental data time series is stationary. In statistical parlance, stationarity stipulates that the probability distribution of any arbitrary collection of Xt must remain constant over the course of observation (Tsay, 2014). Xt is considered stationary in a k-dimensional time series if (a) E(Xt) =, which is a k-dimensional constant vector, and (b) Cov(Xt) = t, which is a constant kxk positive definite matrix. Both of these conditions must hold in order for Xt to be considered stationary (Hamilton, 1994; Tsay, 2014).

Granger (1988) proposes that in the event that there is cointegration among the variables, there ought to be at least one-way causality between these variables. When this kind of scenario arises, it is strongly recommended that the causality analysis be carried out using VECM.

The process we use to determine the stationarity of the series may result in the loss of long-term information about the series. The advantage of VECM is that it can utilize both the short- and long-term information of the data without permitting spurious relationships between the variables, i.e., it can eliminate the losses caused by the difference operation. The VECM model can be expressed in the following way:

$$\Delta X_t = \Gamma_1 \Delta X_{t-1} + \Gamma_2 \Delta X_{t-2} + \cdots + \Gamma_p \Delta X_{t-p+1} + \Pi X_{t-1} + \varepsilon_t \qquad (Eq.3)$$

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$$\Delta X_t = \sum_{i=1}^{p} \Gamma_{i-1} \Delta X_{t-i} + \Pi X_{t-1} + \varepsilon_t \quad (Eq. 4)$$

X_{t-1} is endogenous vector variable with l lag, ε_t represents vector residual, Γ_i is the i matrix coefficient, Π symbolized matrix coefficient cointegration. (Lutkepohl, 2005)

The parameters of the Π matrix can be written as $\alpha\beta'$ in two-component form ($\Pi = \alpha\beta'$). Here, parameter β' represents the long-term coefficient and α represents the sepped of adjsutment of the long-term parameter. Taking into account the equation ($\Pi = \alpha\beta'$), we can restate equations 3 and 4 as follows.

$$\Delta X_t = \Gamma_1 \Delta X_{t-1} + \Gamma_2 \Delta X_{t-2} + \cdots + \Gamma_p \Delta X_{t-p+1} + \alpha(\beta' X_{t-1}) + \varepsilon_t \quad (Eq. 5)$$

$$\Delta X_t = \sum_{i=1}^{p} \Gamma_{i-1} \Delta X_{t-i} + \alpha(\beta' X_{t-1}) + \varepsilon_t \quad (Eq. 6)$$

where $\beta' X_{t-1}$ is the vector error correction term with (m-1) number of vectors. Since ZT is a vector of the variables which are I(1), ΔX_t will be I(0). Therefore, for the error term ε_t to be I(0), ΠX_{t-1} or $\alpha(\beta' X_{t-1})$ must be I(0).

Our empirical model can be expressed in VECM form as follows:

$$\Delta lnGDP_t = a + \sum_{i=1}^{p} \beta_i \Delta lnGDP_{t-i} + \sum_{i=1}^{p} \gamma_i \Delta lnGFC_{t-i} + \sum_{i=1}^{p} \delta_i \Delta lnPSE_{t-i} + \sum_{i=1}^{p} \omega_i \Delta lnPTN_{t-i} + \sum_{i=1}^{p} \theta_i \Delta lnEMP_{BIC_{t-i}} + \sum_{i=1}^{p} \xi_i \Delta lnEMP_{IM_{LS_{t-i}}} + \sum_{i=1}^{p} \psi_i \Delta lnEMP_{IM_{SS_{t-i}}} + \sum_{i=1}^{p} \varphi_i \Delta lnEMP_{IM_{HS_{t-i}}} + \lambda ECT_{t-1} + u_{1t} \quad Eq. (7)$$

In the Eq. p is the optimal lag length, $\beta_i, \gamma_i, \delta_i, \omega_i, \theta_i, \xi_i, \psi_i$ *and* φ_i are the short-run dynamic coefficients in the model, λ denotes the speed of adjustment parameter, while ECT_{t-1} refers to the error correction term, which is the lagged value of the residuals obtained from the co-integrating regression of the dependent variables on the repressors. ECT includes information about the long term acquired from the long term co-integrating regression.

Table 6: VECM estimation

D_GDP	Coef.	St.Err.	t-value	p-value	[95% Conf.	Interval]	Sig.
_ce1 L1.	-.811	.224	-3.62	0.000	-1.249	-.372	***
beta							
Gross Fixed Capital Formation	.257	.037	6.99	0.000	.185	.329	***
Post-Secondary School Education	.178	.074	2.40	0.017	.032	.323	**
Patent Applications	.115	.027	4.24	0.000	.062	.169	***
EMP. Canadian Natives	.687	.289	2.38	0.017	.121	1.254	**
EMP. Low-Skilled Immigrants	- .100	.027	-3.70	0.000	-.153	-.046	***
EMP. Semi-Skilled Immigrants	.153	.060	2.57	0.010	.037	.270	***

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EMP. High-Skilled Immigrants	.259	.050	5.15	0.000	.161	.358	***
_cons	25.116	.	.	.	.	.	

Note: *** p<.01, ** p<.05, * p<.1

Analyzing the results of parameter estimation in Table 6, the error correction coefficient (_ce1) has a negative value of 0.81. The fact that this value is negative and between zero and one confirms the existence of a long-term relationship.

The following is determined upon analysis of the beta parameter estimation results:

1) A 1% increase in gross fixed capital formation raises real output by 0.26%.

2) A 1% increase in the postsecondary school education raises real output by 0.18%.

3) A 1% increase in the patent applications raises real output by 0.12%.

4) A 1% increase in native Canadian employment raises real output by 0.69%.

5) A 1% increase in low-skilled immigrant employment decreases real output by 0.10%.

6) A 1% increase in the semi-skilled immigrant employment raises real output by 0.15%.

7) A 1% increase in high-skilled immigrant employment raises real output by 0.26%.

To robust the outcomes of the VECM estimation DOLS co-integration regression employed and reported in Table 7.

Table 7: DOLS co-integration regression

GDP	Coef.	Rescaled Stan.Err.	z	P>z	[95% Conf	Interval]	Sig.
Gross Fixed Capital Formation	.253	.022	11.32	0.000	.209	.297	***
Post-Secondary School Education	.257	.029	8.75	0.000	.199	.314	***
Patent Applications	.147	.012	11.93	0.000	.123	.171	***
EMP. Canadian Natives	.507	.198	2.57	0.010	.120	.894	***
EMP. Low-Skilled Immigrants	-.100	.018	-5.59	0.000	-.135	-.065	***
EMP. Semi-Skilled Immigrants	.106	.056	1.91	0.056	-.003	.216	*
EMP. High-Skilled Immigrants	.202	.028	7.14	0.000	.146	.257	***
_cons	18.97	.576	32.94	0.000	17.84	20.10	
DOLS Lag = 4 Long run SE. = 0005634			R2 = .8999099 Adj.R2 = .8986487				

Note: *** p<.01, ** p<.05, * p<.1

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The empirical model's validity shall be assessed through tests of serial correlation, normality, and eigenvalue stability.

c. Model Validity

The results of testing the null hypothesis of “no autocorrelation at lag order” with the Lagrange multiplier (LM) are presented in Table 8. The table contains statistics and probability values for the X2 test for each lag length. The null hypothesis is not rejected at the 0.05 significance level, so the test results confirm that there is no autocorrelation in the residues.

Table 8: Serial correlation

	Lag 1	Lag 2	Lag 3	Lag 4
$\chi2$	688.795	741.824	857.657	888.103
Prob > $\chi2$	0.82928	0.69099	0.33743	0.25883

The null hypothesis that the error terms are normally distributed is examined with the D'Agostino, Belanger, and D'Agostino test. Table 9 displays the probability values for Skewness and Kurtosis, as well as the test statistic (Adj $\chi2(2)$) and probability values (Prob>$\chi2$) for the joint test. The joint test probability statistic value is 0.558. Therefore, the hypothesis that the error terms are normally distributed is not rejected, and the normal distribution of the error terms is confirmed.

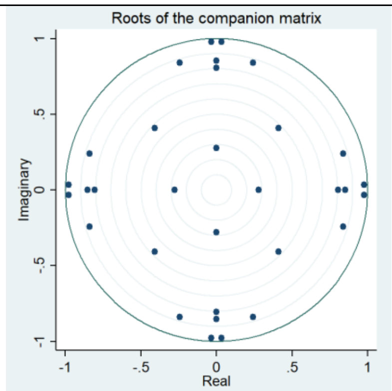
Table 9: Normality test

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	Adj $\chi2(2)$	Prob>$\chi2$
resid	67	0.527	0.393	1.170	0.558

The outcomes of the eigenvalue stability test are presented in Table 10. It can be observed that “the entirety of the eigenvalues is situated within the unit circle of the roots of the companion matrix.”

Table 10: Eigenvalue stability

Eigenvalue	Modulus	Eigenvalue	Modulus
.9770794 + .0326952i	.977626	.8525376	.852538
.9770794 - .0326952i	.977626	.8525376	.852538
.0326952 + .9770794i	.977626	1.305e-15 + .8525376i	.852538
.0326952 - .9770794i	.977626	1.305e-15 - .8525376i	.852538
.9770794 + .0326952i	.977626	2.776e-17 + .8056224i	.805622
.9770794 - .0326952i	.977626	2.776e-17 - .8056224i	.805622
.0326952 + .9770794i	.977626	.8056224	.805622
.0326952 - .9770794i	.977626	.8056224	.805622
.2413296 + .8392046i	.873215	.4090013 + .4090013i	.578415
.2413296 - .8392046i	.873215	.4090013 - .4090013i	.578415
.2413296 + .8392046i	.873215	.4090013 + .4090013i	.578415
.2413296 - .8392046i	.873215	.4090013 - .4090013i	.578415
.8392046 + .2413296i	.873215	.2779682	.277968
.8392046 - .2413296i	.873215	9.107e-16 + .2779682i	.277968
.8392046 + .2413296i	.873215	9.107e-16 - .2779682i	.277968
.8392046 - .2413296i	.873215	.2779682	.277968



On the basis of the results of the serial correlation test, the normality test, and the eigenvalue stability condition test, we are able to reach the conclusion that there is no evidence to confirm the misspecification of the model.

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6. Conclusion

In recent years, scholarly debates on economics as well as the priorities of those in charge of making decisions have gradually begun to acknowledge the relevance of immigration. In the academic literature on economics as well as the policy agendas of countries all over the world, a topic that is the subject of considerable discussion is the administration of immigration influxes with the goal of maximizing the potential economic benefits. In recent years, governments have begun to limit migration flows by enacting discriminatory immigration rules that are based either on human capital prerequisites or skill criteria. These policies have the effect of narrowing the pool of potential immigrants. It is reasonable to anticipate that the policies put into place by host countries will have an impact, not only on the selection of immigrants but also on the immigrants' resulting socioeconomic results, with regard to the direction in which these impacts will go as well as the size of their potential impact. However, there is a paucity of research on the connections between policies that are selective in terms of quality, the skill mix of immigrant groups, and the impact these connections have on economic growth.

Researchers hold divergent views regarding the extent to which immigrants foster the commercial growth of receiving countries. As a result of the capital dilution, the neoclassical growth model predicts that more immigration will, over the long term, have the effect of slowing down overall economic growth. On the other hand, apprehensions regarding the impact of immigration have led to concerns about the determinants that influence the quantity and composition of immigrants. The prevailing consensus is that immigrants are expected to have a positive impact on economic growth by bringing in skills that are in high demand and augmenting the workforce. One of the most debated topics pertains to the identification of the immigrant category that would yield the highest accumulation of projected economic advantages.

Within this framework, the main goal of this study was to investigate the impact of immigration, broken down by skill level, on Canada's economic growth from 2006 to 2022. Canada was selected as the subject of study owing to its historical adoption and execution of selective immigration rules beginning in 1967.

This study's empirical analysis is based on a model that draws inspiration from works by Borjas (2019), Lehmann et al. (2020), and Lutkepohl (2005). In this regard, immigration, which is segmented into three categories according to skill level, is included in the growth model together with the workforce in Canada, and the impacts of both are studied to determine the extent to which they contribute to economic growth. VECM is employed to estimate the long-term parameters, while DOLS, which is one of the cointegration regression estimation techniques, is employed to confirm these findings.

The findings derived from our investigation have shown discernible effects of immigrants with varying skill levels on the economic growth of Canada. The presence of low-skilled immigrants has been seen to have an adverse impact on economic growth, but immigrants with semi-skilled and high-skilled backgrounds have been associated with a favorable influence. Furthermore, it is worth noting that immigration characterized by a significant degree of competence has a much more advantageous impact on economic growth when compared to immigration characterized by modest skill levels. The findings of this study validate the proposition posited by Bojar's (2019) theoretical framework that "immigration can only stimulate long-term real output if the inflow consists of qualified immigrant workers."

Nevertheless, in order to provide a fuller comprehension and encompass the ramifications of our study, it is essential to realize the need to expand upon our findings and conclusions. Our research results have the potential to inform and influence the growth of immigration policy in diverse nations. The findings of our study may be used by governments and policymakers to formulate policies aimed at attracting highly qualified immigrants, which in turn can contribute to economic growth. However, it is important for them to exercise caution in regard to the possible adverse effects associated with the admission of low-skilled immigrants. A comprehensive examination of immigration laws has the potential to result in improved allocation of human resources and increased workforce augmentation, thereby increasing economic performance.

Furthermore, our analysis proposes many avenues for further research in this field. Conducting a more comprehensive examination of the precise determinants that impact the assimilation of immigrants into both the workforce and broader societal structures might provide significant scholarly contributions. Gaining insight into the specific ways in which immigrants of different skill levels contribute to distinct sectors of the economy has the potential to enhance immigration policy with the aim of fostering targeted economic growth. Furthermore, it is worth noting that longitudinal studies that span longer time periods have the potential to provide insights on the evolving effects of immigration on economic growth in the long run.

In summary, our study makes a valuable contribution to the existing academic discussions and policy deliberations around the relationship between skilled-based immigration and economic growth. The findings highlight the need for discerning immigration policies and illustrate the considerable beneficial influence of highly qualified immigrants on the advancement of the economy. We strongly promote the use of these results to guide immigration policies on a global scale and advocate for more research in this field to enhance our comprehension and improve policy strategies.

7. Acknowledgements

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8. References

[1]. Aleksynska, M. & Tritah A. (2015). The heterogeneity of immigrants, host countries' income and productivity: a channel accounting approach. Economic Inquiry, vol. 53, issue 1, 150-172.

[2]. Arrow, Keneth J. (1962). The economic implications of learning by doing. Review of Economic Studies, Vol.29(3),155-173.

[3]. Barro, R.J. (1991). Economic growth in a cross section of countries. The Quarterly Journal of Economics, Oxford University Press, Vol.106(2), 407-443.

[4]. Bodvarsson, O. B., Simpson, N. B., & Sparber, C. (2014). Migration theory. Handbook of The Economics of International Migration: The Immigrants, Elsevier.

[5]. Borjas, G.J. (2019). Immigration and economic growth. NBER Working Paper, No. 25836.

[6]. Boubtane, E., Coulibaly, D. & Rault, C. (2013). Immigration, growth, and unemployment: Panel VAR evidence from OECD countries. Review of Labour Economics and Industrial Relations, Vol.27, 399-420.

[7]. Boubtane, E., Dumont, J.C.and Rault, C.(2016). Immigration and economic growth in the OECD countries 1986–2006. Oxford Economic Papers, 2016, Vol.68(2), 340-360.

[8]. Bretschger, L. (2001). Labor supply, migration, and long-term development, Open Economies Review, Vol.12, 5-27.

[9]. Chiswick, B. R. (2011). Immigration: high skilled vs. Low skilled labor. IZA Policy Paper Series, No. 28.

[10]. Cournede, B., Denk, O. & Garda, P. (2016). Effects of flexibility-enhancing reforms on employment transitions. OECD Economics Department Working Papers, No. 1348, OECD Publishing, Paris, http://dx.doi.org/10.1787/bd8e4c1f-en.

[11]. D'Albis, H., Boubtane, E. & Coulibaly, D.(2016). Immigration policy and macroeconomic performance in France Annals of Economics and Statistics, issue 121-122, 279-308.

[12]. Dolado, J., Goria, A. & Ichino, A. (1994). Immigration, human capital and growth in the host country: Evidence from pooled country data. Journal of Population Economics, Vol.7, 193-215.

[13]. Drinkwater, S., Levine, P., Lotti, E., & Pearlman, J. (2007). The immigration surplus revisited in a general equilibrium model with endogenous growth. Journal of Regional Science, 47(3), pp. 569-601

[14]. Felbermayr, G., Hiller, S. & Sala, D. (2010). Does immigration boost per capita income?. Economics Letters, Vol.107(2), 177-179.

[15]. Frankel, M. (1962). The production function in allocation and growth: A synthesis. The American Economic Review, Vol.52(5), 996- 1022.

[16]. Granger, Clive W. J. (1988). Some recent developments in a concept of causality. Journal of Econometrics, 39 (1-2), 199-211.

[17]. Hamilton, J. D. (1994). Time series analysis. Princeton University Press, Princeton. https://doi.org/10.1515/9780691218632

[18]. Ehrlich, I. & Kim, J. (2015). Immigration, human capital formation, and endogenous economic growth. Journal of Human Capital, Vol. 9, No. 4, pp. 518-563.

[19]. Jaumotte, F., Koloskova, K. & Saxena, S.C. (2016). Impact of migration on income levels in advanced economies. IMF Spillover Notes, 2016/008, International Monetary Fund.

[20]. Kang, Y. & Kim, B.Y. (2018). Immigration and economic growth: do origin and destination matter? Applied Economics, Vol.50:46, 4968-4984.

[21]. Lehmann, H., Oshchepkov, A. & Silvagni, M. G. (2020). Regional convergence in Russia: estimating a neoclassical growth model. IZA Discussion Papers, No. 13039, Institute of Labor Economics (IZA), Bonn

[22]. Lucas, R. E., Jr. (1988). On the mechanics of economic development. Journal of Monetary Economics, Vol.22(4), 3-42.

[23]. Lundborg, P. & Segerstrom, P. (2002). The growth and welfare effects of international mass migration. Journal of International Economics, Vol.56, 177-204.

[24]. Lundborg, P. & Segerstrom, P. (2000). International migration and growth in developed countries: A theoretical analysis, Economica, Vol.67, 579-604.

[25]. Lutkepohl, H. (2011). Vector autoregressive models. EUI Working Paper ECO 2011/30, Department of Economics. Florence: European University Institute.

[26]. Macaluso, M. (2022). The influence of skill-based policies on the immigrant selection process. Economia Politica, 39, 595–621 (2022). https://doi.org/10.1007/s40888-022-00264-w

[27]. McGowan, M. A. & Andrews, D. (2015). Labour market mismatch and labour productivity: Evidence from PIAAC data. OECD Economics Department Working Papers, No. 1209, OECD Publishing, Paris, http://dx.doi.org/10.1787/5js1pzx1r2kb-en.

[28]. Mankiw, N. G., Romer, D. & Weil, D.N. (1992). A contribution to the empirics of economic growth. The Quarterly Journal of Economics, Oxford University Press, Vol.107(2), 407-437.

[29]. Muysken, J. & Ziesemer, T. (2011). The effect of net immigration on economic growth in an ageing economy: Transitory and permanent shocks. UNU-MERIT Working Paper, 2011-055.

[30]. Muysken, J., Vallizadeh, E. & Ziesemer, T. (2015). Migration, unemployment, and skill downgrading. Scandinavian Journal of Economics, Wiley Blackwell, Vol. 117(2), 403-451.

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[31]. Orefice, G. (2010). Skilled migration and economic performances: evidence from OECD countries. Swiss Journal of Economics and Statistics (SJES), Swiss Society of Economics and Statistics (SSES), Vol.146(4), 781-820.

[32]. Ortega, F. & Peri, G. (2014). Migration, trade and income. Journal of International Economics, Vol.92, 231-51.

[33]. Ortega, F. and Peri, G. (2009). The Causes and Effects of International Migrations: Evidence from OECD Countries 1980-2005. NBER Working Papers from National Bureau of Economic Research, No 14833.

[34]. Peri, G., Shih, K.Y. & Sparber, C. (2014). Foreign STEM workers and native wages and employment in U.S. Cities. National Bureau of Economic Research. W.P.#20093. DOI 10.3386/w20093.

[35]. Romer, P. M. (1986). Increasing returns and long run growth. Journal of Political Economy, Vol.94(5), 1002-1037.

[36]. Solow, R.M. (1956). A contribution to the theory of economic growth. The Quarterly Journal of Economics, Oxford University Press, Vol. 70(1), 65-94.

[37]. Swan, T.W., (1956). Economic growth and capital accumulation. The Economic Record, Vol.32(2), 334-361.

[38]. Tsay, R.S. (2014). Multivariate volatility models. Multivariate time series analysis: With R and financial applications. John Wiley & Sons, Hoboken, 399-464.

[39]. Uzawa, H. (1965). Optimal technical change in an aggregative model of economic growth. International Economic Review, Vol.6, (1), 18-31.

[40]. Walz, U. (1995). Growth (rate) effects of migration. Zeitschrift f¨ur Wirtschafts- und Sozialwissenschaften, Vol.115, 199-221.

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