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FISCAL IMPACTS OF IMMIGRATION IN ESTONIA

Master Thesis

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I have written this Master Thesis independently. Any ideas or data taken from other authors or other sources have been fully referenced.

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Abstract

This paper investigates the fiscal impact of immigration in Estonia using a dual-classification approach that distinguishes between country-of-origin and country-of-birth definitions of immigrant populations. Employing static accounting methodology on individual-level data available from Statistics Estonia from 2018-2022, the study calculates the direct fiscal contribution of immigrants by measuring income tax, consumption tax, and social security contributions against unemployment benefit receipts over three years (2020-2022). Multiple regression analysis reveals that educational attainment stands as the primary determinant of positive fiscal outcomes across both classification models, with a bachelor's level or equivalent education level associated with fiscal contributions up to €11673.32 higher than the baseline (pre-primary education). Age at arrival demonstrates a key relationship with fiscal impact, with children arriving between ages 3-7 showing a uniquely positive fiscal impact, while immigrants arriving during adulthood exhibit progressively negative fiscal effects with increasing arrival age.

1. Introduction

Immigrants by definition, are individuals who choose to leave their country of origin to settle into a foreign country. Immigration flows have increased in Europe due to EU enlargement as well as labor market integration and demographic changes (OECD, 2020).

Immigration's fiscal consequences have become a key research matter because they measure the net impact of immigrant tax payments against their utilization of public resources. Some analysts believe immigrants drain public funds because they need public services and may become dependent on welfare programs but other experts demonstrate that immigrants boost economies through their workforce contributions and tax payments while also revitalizing demographic trends (Saar and Jakobson, 2015). Fiscal effects of immigration show strong variations because researchers produce different results when using different methodologies and time durations while analyzing unique national situations.

Estonia serves as an exceptional environment to analyze fiscal patterns. After gaining independence in 1991 and EU membership in 2004 Estonia shifted from being a Soviet state to becoming a digital leader with open economic systems. The period since Estonia regained independence brought a period of negative net migration which ended when the country started to receive more immigrants than it lost in 2015. Recent years have brought a shift in migration patterns to Estonia. The economic growth toward Western European standards and Estonia's digital society development together with skill-based immigration policy reform triggered this demographic shift. In 2022, Statistics Estonia recorded immigration at 20,469 people while emigration reached 12,958 individuals which produced a net immigration total of 7,511 persons. It should be taken into account though that the 2022 immigration numbers are a bit of an outlier and skewed toward immigration because of the Russian-Ukraine War which caused many Ukrainians to immigrate to European countries like Poland, Estonia etc.

The immigration framework of Estonia combines free movement rights for EU/EEA citizens with targeted admission procedures for third-country nationals. According to the Estonian Qualifications Authority (OKRA), Estonia, by 2035, will face an annual shortfall of approximately 1,400 top specialists and 700 skilled workers that cannot be filled by graduates of the Estonian education system. Involving foreign labour to a certain extent is inevitable. The government implements a yearly immigration quota that restricts residence permits for third-country nationals to 0.1% of the permanent population but grants strategic exemptions to skilled professionals and other specific categories. The controlled migration system of Estonia allows skilled foreign workers to enter sectors with labor shortages yet maintains

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strict regulations on EU non-member labor migration thus creating a population characterized by high-skilled professionals and EU nationals (Karma et al., 2022)

The fiscal effects of immigration in Estonia have not been studied extensively yet. One of the few comprehensive studies was conducted by Kivi et al. (2020) as part of the RITA-RÄNNE project. The report 'Rände Tulu-Kulu Mudeli Tutvustus' (Introduction to the Migration Cost-Benefit Model) by Kivi et al. (2020) presented a static accounting framework to evaluate the financial effects of immigration on Estonia's public budget. The research of Kivi et al. (2020) analyzed how education level, age at arrival, gender and employment sector influence fiscal outcomes. The model showed that immigrants with high education levels who work in IT fields produce the greatest positive fiscal effects while immigrants who arrive as children only become fiscal contributors after they start working. The research analyzed the financial effects of emigration on Estonia with a focus on the movement of young Estonian workers to Finland and other neighboring countries. Since the RITA-RÄNNE project paper is the most recent and detailed paper on the fiscal impact topic from Estonia, the findings of this paper will be compared to those of the RITA-RÄNNE project paper in the conclusion section.

Research studies about immigration impact major destination countries such as the United States, Germany, and United Kingdom have become abundant (Dustmann et al., 2014) but small EU member states remain under-studied. The majority of research about Baltic immigration has analyzed labor market effects and social adaptation but the fiscal effects remain poorly studied.

This research investigates the fiscal effects of immigration in Estonia with the sole focus on calculating the net fiscal impact of immigrants during a 3 year period from 2020-2022, using individual-level data obtained from Statistics Estonia for the period 2018-2022. The research objective has two goals, to calculate immigrant net contributions to Estonian public finances, and to determine what factors affect fiscal impacts through an examination of education level, arrival age, gender, marital status, age and country of origin/country of birth.

Keywords: immigration, net fiscal contribution

CERCS: S180

2. Literature Review

Since researchers have started investigating the finance effects of immigration, the first question that arises is that if new immigrants generate more tax income than they need in

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public services. During the last thirty years this fundamental question has transformed into an intricate academic discipline. According to Borjas (1995) immigrants are workers who either work with local workers or work against them in the labor market. The study of public finance through immigration has benefited from Preston (2014) who explained that immigrants simultaneously generate tax revenues and service usage while affecting labor markets and distributing costs of public facilities such as defense and infrastructure. More recent study by Edo et al. (2019) demonstrates that identical immigrant populations produce contrasting fiscal effects based on their destination country and its institutional characteristics.

Immigration produces effects that extend beyond immediate consequences. Studies by Auerbach and Oreopoulos (1999) and Storesletten (2003) instructed researchers to consider immigrants throughout their whole lifespan and including the financial contributions of their offspring. The researchers demonstrated that financial assessments about immigration impact should be approached with caution since short-term observations may fail to capture the complete value immigrants bring throughout extended periods. Dustmann and Frattini (2014) advanced the concept by dividing fiscal analysis into two phases: the immediate payment of taxes and receipt of benefits and the long-term perspective encompassing skill development and child-rearing activities and demographic stability. Razin and Sadka (2000) specifically analyzed how immigrant communities with children could become vital contributors to pension systems when they face population aging challenges.

2.1. Heterogeneity in Fiscal Impacts Across Immigrant Groups

Research evidence from numerous countries demonstrates that immigrants do not have uniform fiscal implications for public finances. Education serves as the primary factor determining fiscal contribution because university-educated immigrants create significant public financial gains. The recent research by Bansak et al. (2015) and Gustafsson and Österberg (2001) demonstrates that educated immigrants produce fiscal benefits in countries with extensive welfare systems yet less educated immigrants tend to create fiscal deficits especially in systems with narrow income gaps and broad social welfare programs.

The time when immigrants arrive in a new country strongly determines their financial impact. Research conducted by Bratsberg et al. (2015) tracked immigrants through decades in Norway and discovered that children who migrate end up matching natives in educational achievements and career development, resulting in equivalent fiscal contributions throughout

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their lives. The fiscal impact of immigrants tends to decrease when immigration occurs at an older age because integration becomes more complicated. The research by Fasani et al. (2021) demonstrated that different age-based policies generate distinct fiscal results in multiple European countries. Research indicates that including children through family immigration can produce long-term financial advantages although it requires education investments initially. The research demonstrates that fiscal outcomes of immigrants vary according to their country of origin while controlling for both educational level and skill set. Studies by Storesletten (2003) and Ruist (2015) have shown how origin countries create enduring fiscal differences which survive after statistical adjustments for known factors. The analysis of these differences continues to be debated between researchers who link them to unmeasured skills and selection effects (Borjas and Monras, 2017) and those who point to structural barriers such as credential recognition problems and language barriers and discrimination (Fasani et al., 2021). Research by Chin and Cortes (2015) together with Dadush (2018) shows that refugees produce less favorable fiscal effects than economic migrants although refugee integration into labor markets reduces these differences.

2.2. Institutional Contexts and Welfare Systems

Research now demonstrates that the same immigrant population will produce entirely different fiscal effects based on the receiving country. Welfare systems combined with immigration characteristics in different ways that affect fiscal outcomes differently, as demonstrated by Boeri et al. (2012). Their research shows how generous welfare programs contribute to social integration but simultaneously create fiscal risks for immigration programs especially regarding lower-skilled workers in wage-compressed economies.

The fiscal impact of immigrants heavily depends on how the host labor markets operate. Battisti et al. (2018) investigated how employment protection laws together with minimum wage policies and collective bargaining arrangements influence immigrants' ability to integrate into the economy and pay taxes. Their research shows that flexible labor markets help new immigrants find their first job but stronger worker protections and wage-setting institutions lead to better upward mobility which produces stronger fiscal contributions in the long term. Research on southern European countries by Dustmann et al. (2017) and Rodríguez-Planas (2012) demonstrates unique fiscal behavior in regions with extensive informal work sectors and fragmented employment systems.

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Tax systems together with benefit eligibility rules produce fiscal effects through both direct accounting methods and behavioral modifications. Tax systems that rise with income levels amplify the positive fiscal effects of skilled immigrant workers yet reduce the fiscal contributions of unskilled immigrant workers. Special tax incentives for highly skilled immigrants have generated successful fiscal improvements according to the studies by D'Amuri and Peri (2014) and Liebig and Mo (2013) in various countries. The restrictions on immigrant benefits create better short-term financial stability according to Razin and Sadka (2000) and Ruist (2015) yet these restrictions may harm future integration and economic output by decreasing spending on health care, education and housing.

2.3. Recent Empirical Evidence from Estonia and around the world.

Randveer and Rõõm (2009) conducted one of the first analyses indirectly addressing fiscal aspects of Estonian migration, focusing on remittance patterns and labor market outcomes based on survey data. Their work revealed substantial income gains for Estonian emigrants, with wages abroad typically 2-3 times higher than in Estonia, resulting in significant remittance flows that partially offset the immediate fiscal losses from emigration. While their study focused primarily on emigration rather than immigration, it established the importance of considering both direct tax contributions and broader economic effects when assessing migration's fiscal impact.

Masso et al. (2016) examined the return migration patterns of young Estonians, focusing on how human capital acquired abroad affects subsequent labor market outcomes. Their findings indicated that returnees generally achieved wage premiums of 12-15% compared to non-migrants with similar characteristics, suggesting positive fiscal implications through higher income tax contributions.

Observing research outcomes worldwide enables us to understand immigration impacts on public finances across diverse circumstances. The National Academies of Sciences Engineering and Medicine released a comprehensive 2017 report indicating that first-generation immigrants expense state and local governments initially but their offspring later contribute as substantial fiscal forces to the population. New American research conducted by Nowrasteh and Orr (2018) demonstrates that different visa categories and different tax structures in different states of the United States create significant variations in public finances while high-skilled employment-based immigrants generate the largest fiscal surpluses.

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European evidence shows fascinating variation across countries. Vargas-Silva (2015) conducted research about recent European immigrants who strongly enhanced UK public finance but non-European immigrants produced mixed effects according to Dustmann and Frattini (2014). The welfare systems of Nordic countries lead to unique observations about immigrant economic contributions.

The immigration patterns of Southern European nations that deal with large numbers of irregular immigrants follow distinct approaches. Research conducted by Rodríguez-Planas (2012) in Spain and Bevelander and Luik (2015) in Italy shows that big informal economies negatively affect the combination of tax revenue and immigrant use of public services. Research shows that providing legal status to unauthorized immigrants leads to improved fiscal outcomes through formal employment growth and tax compliance (Chassamboulli et al., 2020). Post-socialist welfare states and rapidly transforming labor markets in Eastern European nations generate their own fiscal patterns which are discovered through pioneering research in Poland by Kaczmarczyk and Okólski (2008) and in the Czech Republic by Balcerzak-Paradowska et al. (2011).

A wide range of new research data is now available beyond Europe and North America. The skills-based immigration frameworks in Australia and New Zealand lead to continuous positive fiscal results according to Cully (2012). The Gulf Cooperation Council states demonstrate opposite patterns according to Shah (2012) because their temporary migration systems with reduced integration and minimal social benefits produce short-term financial gains while raising doubts about future stability of fiscal inflows. The East Asian region with its history of immigration restrictions now examines fiscal impacts through systematic studies as they welcome more international workers (Oishi, 2020; Moon, 2015). The different outcomes show how immigration selection procedures and integration frameworks determine the final fiscal impact.

2.4. Integration Policies and Fiscal Outcomes

Research now shows that immigrant fiscal contributions develop based on host country policies rather than their country of origin characteristics. Policies that connect immigrants to labor markets provide the most immediate path to shape their financial contributions. The research by Battisti et al. (2018) demonstrates that customized labor market programs for immigrants lead to faster employment integration and increased tax contributions but show wide variability based on population characteristics and regional

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economic conditions. The research by Lochmann et al. (2019) demonstrates that language training provision leads directly to improved employment results which in turn increases fiscal contributions.

Foreign qualification recognition strongly determines how immigrants can make meaningful contributions. A recent study by Fasani et al. (2021) shows that skill underutilization exists extensively throughout OECD member states because foreign-educated workers typically occupy positions which are below their qualifications. The implementation of streamlined credential recognition procedures shows promising results according to experimental studies by Hainmueller et al. (2016) because they lead to better occupational matches which generate higher earnings and tax revenue. The quasi-experimental analysis conducted by Damelang and Kosyakova (2021) demonstrates bridge training programs achieve positive outcomes when addressing qualification differences between foreign and domestic credentials especially for regulated fields with licensing hurdles. The settlement policies affecting immigrants shape fiscal results because they affect both their labor market possibilities and their housing expenses. Battisti et al. (2018) studied dispersal policies for refugees across different regions and discovered their fiscal effects are ambiguous because such dispersals lower urban housing costs but generate employment and tax contribution problems. Recent evaluations by Hayfron and Tjaden (2019) have shown municipal-level integration programs effectively improve economic outcomes for immigrants.

The fiscal impact of citizenship and naturalization policies constitutes an essential element for governments to consider. Research by Gathmann and Keller (2018) employs quasi-experimental designs to evaluate how citizenship programs influence economic assimilation and tax revenue from immigrants. The study demonstrates that citizenship acquisition leads to improved financial results alongside tax payment increments especially for immigrants from nations with distant institutional systems from their host countries. The pathways to citizenship produce effects through three mechanisms: Labor market discrimination decreases while immigrants invest in country-specific skills and gain public sector employment opportunities. Citizenship has different effects on various immigrant populations and social environments thus demonstrating that integration policies work together with a range of measures.

2.5 Emerging Research Directions and Synthesis

Several exciting new research directions promise to deepen our understanding of immigration's fiscal impacts. The expansion of linked administrative data availability now allows researchers to measure individual-level fiscal contributions with higher accuracy across multiple time periods. These detailed data sources allow researchers to examine how immigrants' fiscal contributions transform across their life span as well as how immigrant-native economic differences modify with time according to Bratsberg et al. (2014) in Norway and Bansak et al. (2015) in Switzerland. New analytical methods are resolving long-standing methodological barriers within this field.

The research field now dedicates more attention to analyzing return migration trends and their associated fiscal effects. The majority of current studies base their analysis on permanent immigrant settlement but emerging data shows that numerous immigrants end up returning to their home countries or circular migration. Research by Dustmann and Görlach (2016) together with Wahba (2015) demonstrates that life-long mobility patterns strongly affect the total fiscal output of individuals through their use of pension and healthcare services during aging years.

The economic impact of climate migration continues to expand as a new research field with significant budgetary effects. The emerging field of climate migration research allows Benveniste et al. (2020) and Cattaneo et al. (2019) to study differences between climate migrants and traditional economic and humanitarian migrants regarding their selection patterns and destination preferences and integration results. Research about the COVID-19 pandemic has led scholars to explore how economic disturbances affect the fiscal performance of immigrants. Fasani and Mazza (2020) present early findings that demonstrate immigrants suffered disproportionately from pandemic-related job losses across different countries which impacted their tax contributions and benefit usage patterns but these impacts differed widely between sectors of employment and worker groups.

This extensive collection of research shows consistent patterns about the topic but also reveals critical variations and unaddressed issues. The human capital factors especially education and arrival age determine fiscal contribution results throughout various national settings. The same immigrant population will have different fiscal effects in different welfare systems and labor markets when considering various integration policies. Research shows that many studies demonstrate initial negative fiscal outcomes which later transform into

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positive outcomes when immigrants gain labor market integration and their offspring start working.

The rising need for evidence-based policy decisions worldwide about aging populations and labor market shifts and migration trends makes it essential to grasp immigration's fiscal consequences. The current literature shows immigration produces neither all-positive nor all-negative fiscal effects because it heavily depends on demographic characteristics of immigrants along with received policies and institutions of destination countries thus requiring strategic selection and integration methods to boost economic performance and foster successful host country absorption.

3. Methodological Framework

3.1. Research Design and Analytical Framework

The fiscal structure of Estonia contains three main features that shape immigration-related fiscal effects: the 20% flat income tax rate together with a €545 basic monthly exemption for annual incomes under €25,200 and the unique profit taxation model which only applies distribution taxes instead of accrual taxes and the social security system which relies mostly on employer-paid social tax at 33% of gross salary. The 20% VAT tax system operates as a consumption tax system while employees pay 2% for pension and 1.6% for unemployment insurance through mandatory schemes and 33% of gross salary goes toward social tax. The fiscal system treats immigrants with valid permits equally to residents by providing access to most public services.

This study employs a static accounting methodology to evaluate the fiscal impact of immigration in Estonia, focusing on the 2020-2022 period using individual-level data from 2018-2022. The static accounting method, also known as the "accounting approach" or "cash-flow method," provides a snapshot of fiscal contributions and receipts at a particular moment in time (Borjas, 1994; Dustmann & Frattini, 2014). This approach has become standard in the fiscal impact studies of immigration due to its transparency, computational efficiency, and capacity to produce clear, interpretable results. The research adopts an individual-level analytical framework that treats each immigrant as an independent economic unit, computing their net fiscal contribution by juxtaposing tax payments against benefit receipts. This approach focuses exclusively on direct fiscal transactions between immigrants and the public sector, deliberately excluding dynamic effects such as labor market displacement, wage impacts on natives, and long-term economic growth contributions. By concentrating on

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immediate measurable fiscal flows, the methodology provides an empirical foundation for assessing immediate budgetary implications while acknowledging the limitations inherent in static approaches.

For each individual i , the total fiscal impact is:

$$(1) \quad \text{Total Fiscal Impact } i = \sum (t = 2020 \text{ to } 2022) [\text{Total Revenues } i, t - \text{Total Expenditures } i, t]$$

where

Total Revenues i, t = the sum of income tax, consumption tax, and social security contributions in year t ,

Total Expenditures i, t = unemployment benefits received in year t .

3.2 Data Sources and Sample Selection

Datasets were used from Statistics Estonia, namely the TSD Dataset (from 2018-2022) and the RSR Dataset. These two datasets had individual data that were combined using the Unique ID of every individual. The TSD dataset had monthly level data on the payouts, while the RSR dataset had variables that captured the characteristics of every individual, namely gender, age, country of birth, country of origin, education level, family status and record creation date. There were other variables in the dataset, but they were filtered out and unused since they were not particularly relevant in our fiscal effects analysis. Some extrapolations and calculations were performed and the reasoning behind is explained further in the methodology section. The analysis draws on data tracking monthly income, employment status, and demographic characteristics for immigrants in Estonia from 2018 to 2022. Several sample selection criteria and calculations were applied:

- A. Age restriction: Only immigrants between ages 25-60 were included, concentrating the analysis on the core working-age population and excluding students and retirees whose fiscal impacts follow distinct patterns.
- B. Temporal coverage: Only individuals with complete fiscal impact data across all three years (2020-2022) were retained in the analysis, ensuring balanced longitudinal coverage.
- C. Dual classification approach: The study employs two distinct methods for identifying immigrants: (a) country-of-origin based classification and (b) country-of-birth classification, resulting in samples of 142,882 and 55,016 observations of immigrants

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respectively. This dual approach acknowledges Estonia's complex demographic history and enables methodological comparison.

- D. **Employment tracking:** Monthly employment status was determined by creating a binary variable column where income exceeding the basic tax exemption threshold (€545) was assigned the value=1 (indicating that the individual is employed), while income below this threshold was assigned the value=0 (indicating that the individual is unemployed). This operationalization enabled precise calculation of employment durations for benefit eligibility determination.
- E. **Age at arrival calculation:** Statistics Estonia has a variable that records the date when an immigrant had his official record created in the Estonian registry, and since there is no clear age-at-arrival variable in the dataset, the following calculation is done: Age at arrival is calculated as the difference between an individual's date of birth and their record creation date in RSR dataset, providing an objective measure of migration timing. This variable is crucial for analyzing integration trajectories and understanding how arrival age impacts subsequent fiscal contributions. Even the Estonian RITA-RÄNNE report in 2020 acknowledged the importance of the age-at-arrival of an individual when predicting the fiscal effect of the individual.

3.3. Revenue and Expenditure Calculations

The revenue calculations incorporate three main elements: income tax, consumption tax, and social security contributions, each calculated annually for 2020, 2021, and 2022. Estonia's progressive tax system was applied to each immigrant's monthly earnings by first deducting the basic tax exemption of €545 from gross monthly income, then applying a 20% tax rate to the remaining taxable income, and finally aggregating monthly values to calculate annual income tax contributions. For example, an immigrant earning €2,000 monthly would contribute annual income tax of $(€2,000 - €545) \times 0.20 \times 12 = €3,492$. Consumption tax contributions were estimated through a sequential process wherein individual savings were calculated using Estonia's average savings rate of 5.9% (OECD data), the remaining 94.1% of post-tax income was assumed to be spent on consumption, and Estonia's 20% Value Added Tax (VAT) was applied to this consumption expenditure. For an immigrant with €1,800 in monthly post-tax income, the annual consumption tax contribution would be $€1,800 \times 0.941 \times 0.20 \times 12 = €4,068$. Social security contributions were calculated based on the mandatory

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employee pension insurance rate of 2% applied to gross wages, with monthly contributions summed to annual values for each year.

The expenditure calculation focuses exclusively on unemployment benefits, applying parameters detailed in the ESPN Flash Report 2020/10 on Estonia's unemployment protection system. Two types of benefits were considered: unemployment insurance benefit and unemployment allowance. Eligibility for unemployment insurance benefit requires employment for at least 12 months within the previous 3 years, with benefits calculated as 50% of previous gross income for the first 100 days (capped at €53 per day) and 40% for days 101-360 (capped at €42 per day), with a maximum duration of 360 days. Unemployment allowance, a less generous benefit, requires 180 days of employment in the past 365 days, with eligible individuals receiving a flat rate of 6 Euros a day, for a maximum of 270 days. (Estonian Unemployment Insurance Fund, Unemployment insurance benefit rates and calculation methodology, 2020).

The monthly employment status tracking (with binary variables for determining employed or unemployed) enabled precise determination of eligibility periods and calculation of appropriate benefit amounts for each unemployment spell during the study period. For both benefit types, the longitudinal nature of the data (from 2018-2022) facilitated systematic checking of each individual's employment record against eligibility criteria and computation of benefits for qualifying unemployment spells in each year of the study period.

3.4. Analytical Methods

The dual classification system which separates country-of-origin from country-of-birth definitions of immigrant populations proves essential for Estonia because of its unique demographic changes during Soviet rule.

Estonia maintained ethnic homogeneity before Soviet occupation since ethnic Estonians made up 97% of the population in 1945 after World War 2. Post World War 2, during Soviet rule, immigration in large numbers from other Soviet States (Russia, Ukraine and Belarus) into Estonia reduced the ethnic Estonian population to 60% by 1989 (Statistics Office of Estonia, 1995). The ethnic composition of Estonia underwent one of the most extreme changes in less than fifty years without any territorial modifications.

The 1991 independence of Estonia brought forth special classification issues because the country transitioned from internal to international immigration patterns. The Soviet period brought Russian speakers to Estonia through domestic migration patterns that did not involve

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crossing international borders. The post-1991 period created an uncertain status for these people and their descendants regarding their immigrant or native identity.

This research employs a dual immigrant classification approach, enabling analysis of how definitional choices affect measured fiscal impacts. The first model employs a country-of-origin classification that identifies immigrants based on origin country (considered all individuals with country of origin other than Estonia as immigrants), capturing both foreign-born individuals and Estonia-born second generation immigrants (n=142,882). The second model utilizes a country-of-birth classification that identifies immigrants solely based on foreign birthplace, focusing exclusively on first-generation immigrants (n=55,016). This parallel analytical framework addresses a significant methodological gap in immigration fiscal analysis literature and responds to Estonia's complex demographic composition, where historical circumstances have created intricate patterns that conventional immigrant definitions may inadequately capture. The significant difference between the two models' observation numbers (142,882 versus 55,016) demonstrates the demographic complexity by showing that country-of-origin based immigration criteria would classify two-thirds of current Estonian-born individuals as second-generation immigrants. This substantial difference in sample size between models highlights the conceptual distinction between foreign-born populations and minority communities with multi-generational presence, providing valuable insights into Estonia's unique demographic landscape.

To identify the determinants of fiscal impact, the study employs ordinary least squares (OLS) regression with the following specification for each model:

The Total Fiscal $Impact_i$ is calculated using the following formula:

$$(2) \text{ Total Fiscal Impact}_i = \beta^0 + \beta^1 \text{Age}_i + \beta^2 \text{AgeArrival}_i + \beta^3 \text{Education}_i + \beta^4 \text{Gender}_i + \beta^5 \text{Country}_i (\text{Country of Origin in Model 1 and Country of Birth in Model 2}) + \beta^6 \text{Marital}_i + \varepsilon_i$$

The dependent variable is the calculated net fiscal impact for each separate year and then summed across the three-year period (2020-2022) for each individual. Independent variables include categorical indicators for current age groups (25-30, 31-36, 36-40, 40-45, 46-60, with Ages 25-30 as reference), age at arrival (0-3, 3-8, 8-10, 11-14, 15-17, 18-25, 26-35, 36-45, 46-60, with Ages 0-3 as reference), education levels (0-8, corresponding to Estonia's educational classification system (described in detail in Annexure 1), with level 0 as reference, pre-primary education), gender (male and female), native country classification

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(Model 1: EEA, non-EEA high/middle/low income, with EEA as reference; Model 2: EEA countries, non-EEA high/middle/lower-middle/low income, with EEA as reference)(All the groups have been explained in detail in Annexure 2), and marital status (Categories 1-4, with Category 1/Single as reference, with Category 2,3,4 indicating married, widowed and divorced respectively). The analysis proceeds in three stages: first, individual-level fiscal impacts are calculated for each year (2020, 2021, 2022); second, these annual impacts are summed to create a total three-year fiscal impact measure per individual; third, regression analysis identifies how immigrant characteristics influence fiscal outcomes across both classification models.

3.5. Methodological Limitations

The research design omits public goods because their non-rival and non-excludable characteristics create substantial challenges for allocation purposes. Public expenditures related to immigration might be underestimated because immigrants receive the same benefits from education systems, healthcare, infrastructure and governance structures as native residents in Estonia. The shared nature of these goods creates methodological challenges for precise allocation which requires their exclusion from individual-level fiscal accounting. The methodology fails to capture essential dynamic effects which include labor market complementarities, productivity spillovers and long-term economic growth contributions because it only focuses on direct fiscal transactions. The static accounting framework faces inherent limitations because it prioritizes exact fiscal flow measurement instead of capturing intricate economic relationships.

This three-year analysis captures a medium-term effect but not the long-term fiscal effects of an individual. For example: an individual might have a low phase in their career, or have had a child, which might alter the fiscal effect drastically. The application of Estonia's average savings rate (5.9%) across all immigrants, regardless of income level, country of origin, or family structure, overlooks established relationships between socioeconomic characteristics and savings behaviors. The model probably produces excessive consumption tax revenue estimates because it uses a uniform savings rate for all immigrants who earn different amounts of money. For many immigrants, the goal is often to earn as much as possible during a short period of time and send money home; thus, the amount spent in Estonia might be smaller. World Bank data on “Migration and Remittances“ from 2021

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documented that remittances often constitute 10-30% of migrants' incomes and showed particularly high remittance rates, especially among temporary migrants.

The VAT calculation method used in the model fails to consider VAT exemptions for specific goods and services which could result in overestimated consumption tax revenue. The analysis of unemployment benefits as the sole benefit type underestimates benefit receipt among immigrant subgroups who have children or specific housing requirements.

4. Descriptive Statistics

Table 1 showcases the immigrant individual data formed after combining the datasets obtained from Statistics Estonia, and making calculations and assumptions as mentioned in the methodological framework section. The country-of-origin classification model (Model 1) comprises 142,882 observations across 26 variables. This number represents that our data set has 142,882 unique individuals who have been classified as immigrants based on their country of origin, each individual has 26 variables that contains information regarding different characteristics about the respective individual. The country-of-birth classification model (Model 2) encompasses 55,016 observations across 26 variables, representing individuals born outside Estonia's current territorial boundaries. This sample is substantially smaller than Model 1's 142,882 observations—approximately 38.5% of the size of Model 1's observations—revealing a fundamental conceptual difference in immigrant identification. The dramatic reduction shows that the majority of individuals classified as immigrants under country-of-origin criteria were born within Estonia's current territory, highlighting the distinction between first-generation immigrants and communities with second and third generation presence. It is important to note that the dataset is the same, but the two different classifications of being classified as an "immigrant", is what gives us different values.

Table 1. *Descriptive statistics of the dataset*

Characteristics	Model 1 (Country-of-origin classification)	Model 2 (Country-of-birth classification)
Total observations (<i>Unique Individual</i>)	142,882	55,016
Total variables (<i>Data about each Unique Individual</i>)	26	26
Gender Distribution (%)		
Female	51.3%	54.2%
Male	48.7%	45.8%
Education Level Distribution (%)		
Level 0 - Pre-primary education	2.0%	4.1%
Level 1 - Primary education	0.8%	0.4%

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Characteristics	Model 1 (Country-of-origin classification)	Model 2 (Country-of-birth classification)
Education Level Distribution (%)		
Level 2 - Lower secondary education	7.7%	3.9%
Level 3 - Upper secondary education	33.6%	24.7%
Level 4 - Post-secondary non-tertiary	11.2%	8.8%
Level 5 - Short-cycle tertiary education	11.5%	15.0%
Level 6 - Bachelor's or equivalent	12.5%	13.8%
Level 7 - Master's or equivalent	19.9%	27.7%
Level 8 - Doctoral or equivalent	0.8%	1.6%
Age Group Distribution (%)		
25-30	11.3%	11.3%
31-36	16.0%	12.9%
36-40	16.4%	12.8%
40-45	14.6%	12.4%
46-60	41.7%	50.6%
Age at Arrival Distribution (%)		
0-3	5.0%	0.8%
3-7	13.2%	3.3%
8-10	5.4%	1.9%
11-14	10.4%	4.8%
15-17	7.7%	4.7%
18-25	19.7%	20.9%
26-35	28.1%	50.3%
36-45	3.5%	9.6%
46-58	1.1%	3.3%
NA	6.0%	0.3%
Country Economy Distribution (%)		
Model 1: Country of Origin GDP Classification		
EEA	5.1%	--
Non-EEA high	1.0%	--
Non-EEA low	1.8%	--
Non-EEA middle	92.1%	--
Model 2: Country of Birth GDP Classification		
EEA	--	13.7%
Non-EEA high	--	2.3%
Non-EEA low	--	0.3%
Non-EEA lower-middle	--	29.5%
Non-EEA middle	--	54.2%
Fiscal Effects		
Average Fiscal Effect by Gender (€)		
Female	14820	14387
Male	11078	9787
Average Fiscal Effect from 2020-2022 by Country Economy (€)		
EEA	15289	--
Non-EEA high	19475	--

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Characteristics	Model 1 (Country-of-origin classification)	Model 2 (Country-of-birth classification)
Average Fiscal Effect from 2020-2022 by Country Economy (€)		
Non-EEA low	15135	--
Non-EEA middle	12761	--
Average Fiscal Effect from 2020-2022 by Birth Country Economy (€)		
EEA	--	14286
Non-EEA high	--	17675
Non-EEA low	--	9770
Non-EEA lower-middle	--	11660
Non-EEA middle	--	11898
Average Fiscal Effect from 2020-2022 by Education Level (€)		
Level 0 - Pre-primary education	6924	7828
Level 1 - Primary education	6916	6720
Level 2 - Lower secondary education	8000	7294
Level 3 - Upper secondary education	10658	9239
Level 4 - Post-secondary non-tertiary	11066	9413
Level 5 - Short-cycle tertiary education	10398	9274
Level 6 - Bachelor's or equivalent	17325	15398
Level 7 - Master's or equivalent	18988	16724
Level 8 - Doctoral or equivalent	28775	24588

Notes. NA - not applicable, information not available; EEA - European Economic Area

Source: Compiled by the author

Gender distribution in the birth country model shows a female majority (54.2%) compared to males (45.8%), slightly more pronounced than in Model 1 (51.3% female). This increased female representation may reflect two underlying patterns. An important point to note here is that the migrants arriving after the Russia-Ukraine War are not included in our data, hence this number cannot be skewed by female immigrants from Ukraine. First, it could indicate higher male mortality in earlier migration cohorts, with female survivors overrepresented in the long-established foreign-born population. Second, it might suggest gender-specific return migration patterns, with foreign-born males potentially more likely to return to countries of origin than females who may have established stronger social integration.

The birthplace country model distribution presents a dramatically different portrait from the country-of-origin model. Non-EEA middle-income countries represent the largest group (54.2%)—substantially lower than their 92.1% representation in Model 1. EEA high-income countries represent 13.7% of immigrants—nearly triple their 5.1% proportion in

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Model 1. Non-EEA high-income countries account for 2.3% (versus 1.0% in Model 1), while non-EEA low-income countries represent just 0.3% (versus 1.8% in Model 1).

This redistributed origin profile reveals important patterns. First, the reduced proportion from non-EEA middle-income countries suggests that many ethnic Russians and other Slavic populations identified in Model 1 were born within Estonia's territory rather than migrating themselves. Second, the tripled representation from EEA countries suggests that Estonia has attracted somewhat meaningful European migration following its EU accession in 2004, a pattern obscured in the country-of-origin approach because of the larger number of non-EEA middle income country immigrants and the subsequent reduction in percentage of immigrants from EEA countries.

Educational attainment in Model 2 reveals an upward shift compared to Model 1. Level 7 constitutes the largest group (27.7% versus 19.9% in Model 1), followed by level 3 (24.7% versus 33.6%), level 5 (15.0% versus 11.5%), and level 6 (13.8% versus 12.5%). Lower educational categories (levels 0, 1, 2) collectively represent only 8.4% of the sample, with level 1 being the least represented (0.4%). Age distribution in Model 2, like Model 1, skews toward older cohorts but with even greater concentration. The 46-60 category represents 50.6% of immigrants in Model 2, compared to 41.7% in Model 1. Younger age categories show relatively similar distributions between models, with slightly reduced proportions in Model 2. This pronounced aging pattern in the birth country model suggests several possible dynamics. First, it indicates that many foreign-born residents arrived during earlier historical periods, particularly the late Soviet era and immediate post-independence transition, and have aged in place. Second, it suggests limited recent migration of younger foreign-born individuals to Estonia, potentially reflecting economic opportunities in other EU destinations or restrictive immigration policies. Third, it may reflect life-cycle effects where Estonia-born descendants of immigrants (included in Model 1 but not in Model 2) are naturally younger than their foreign-born parents, creating a younger age profile in the country of origin-based model.

The age-at-arrival distribution in Model 2 shows even stronger concentration in prime working ages than Model 1. The 26-35 age range represents 50.3% of immigrants (versus 28.1% in Model 1), followed by 18-25 at 20.9% (versus 19.7%). Notably, childhood arrivals constitute much smaller proportions—3.3% for ages 3-8 in Model 2 versus 13.2% in Model 1, and 1.9% for ages 8-10 versus 5.4%. The dramatically reduced proportion of childhood arrivals suggests that many children of immigrants identified in Model 1 were actually born

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in Estonia rather than migrating themselves. Half of all foreign-born immigrants arriving between ages 26-35 indicate strong labor market motivations, representing individuals with completed education and early career experience in their countries of origin who sought economic advancement in Estonia.

The fiscal effects data reveal several intriguing patterns. Despite lower employment rates evident in the literature on female immigrants, females demonstrate higher average fiscal contributions than males in both models (€14,820 versus €11,078 in Model 1; €14,387 versus €9,787 in Model 2). This counterintuitive finding suggests that employed female immigrants are concentrated in higher-value sectors. Native country effects show consistent patterns across both models, with non-EEA high-income immigrants generating the highest average fiscal contributions (€19,475 in Model 1; €17,675 in Model 2), followed by EEA countries, then non-EEA low and middle-income countries. This hierarchy persists regardless of classification approach, suggesting robust native country effects on fiscal outcomes.

The fiscal contribution hierarchy based on the native country reveals important patterns that persist across both models, suggesting robust structural determinants of fiscal outcomes. Non-EEA high-income immigrants generate the highest average fiscal contributions (€19,475 in Model 1; €17,675 in Model 2), followed by EEA countries (€15,289 in Model 1; €14,286 in Model 2), then non-EEA low-income (€15,135 in Model 1; €9,770 in Model 2) and middle-income countries (€12,761 in Model 1; €11,898 for middle and €11,660 for lower-middle in Model 2).

Several important observations emerge from these figures. First, the premium for high-income non-EEA immigrants is substantial—approximately 27% higher than EEA immigrants in Model 1 and 24% higher than EEA immigrants in Model 2. This suggests that immigrants from wealthy non-EEA countries (such as the United States, Japan, and Switzerland) represent a particularly positive fiscal asset, likely reflecting highly selective migration patterns and concentration in high-value economic sectors. Third, the approximately 10-20% reduction in fiscal contributions across most native country categories in Model 2 compared to Model 1 may reflect integration challenges specific to foreign-born populations, such as credential recognition issues, language barriers, or shorter durations in the Estonian labor market.

The educational gradient in fiscal contributions is pronounced and consistent across both models, ranging from approximately €6,900 for the lowest education levels (Pre-Primary and Primary Education) to €28,775 (Model 1) and €24,588 (Model 2) for doctoral-

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level education. This represents a more than fourfold increase in fiscal contribution between the lowest and highest education levels, empirically demonstrating education's powerful role in determining immigrants' fiscal impact. The slightly lower educational premium in Model 2 might reflect credential recognition challenges among foreign-born immigrants.

The premium for tertiary education is particularly striking, with significant jumps occurring at bachelor's level (level 6: €17,325 in Model 1; €15,398 in Model 2) and then again at doctoral level (level 8: €28,775 in Model 1; €24,588 in Model 2). This pattern aligns with Estonia's knowledge-based economic development strategy and emphasis on high-skill sectors like information technology. Both models show minimal differences in fiscal contributions between the lowest education levels (0-1), with substantial increases beginning only at level 3 (upper secondary education). This pattern suggests that basic education provides limited fiscal advantage in the Estonian context, while completion of upper secondary education represents an important threshold for meaningful fiscal contribution increases.

5. Results

5.1 Determinants of Fiscal Impact Across Classification Models

Table 2 presents the results from the country-of-origin model (Model 1) and the country-of-birth model (Model 2), with the dependent variable being the individual-level fiscal impact across the 2020-2022 period.

Table 2. *Regression Results*

Variables	Model 1 (Country of Origin)	Model 1 SE	Model 2 (With Birth Country)	Model 2 SE
Intercept	4794.57***	(427.14)	11578.60***	(957.30)
Age (Ref: 25-30)				
31-36	1949.13***	(237.98)	2529.50***	(405.20)
36-40	2314.36***	(255.97)	2453.70***	(409.80)
40-45	2100.39***	(273.81)	2752.20***	(431.70)
46-60	1968.51***	(250.96)	2165.40***	(369.50)
Education Level (Ref: Level 0: Pre-Primary)				
Level 1 (Primary)	-251.62	(523.48)	-543.50	(1341.10)
Level 2 (Lower Secondary)	1160.46***	(315.53)	155.50	(631.10)
Level 3 (Upper Secondary)	4537.69***	(287.23)	3161.30***	(516.00)
Level 4 (Post Secondary)	5134.00***	(302.72)	3862.80***	(557.70)
Level 5 (Short Cycle)	5933.36***	(303.56)	4701.00***	(535.20)
Level 6 (Bachelor's)	11673.32***	(307.34)	9962.90***	(553.60)

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Variables	Model 1 (Country of Origin)	Model 1 SE	Model 2 (With Birth Country)	Model 2 SE
Education Level (Ref: Level 0: Pre-Primary)				
Level 7 (Master's)	14058.84***	(294.11)	11777.40***	(517.10)
Level 8 (Doctoral)	25525.73***	(546.07)	21038.30***	(847.00)
Gender				
Male (Model 1)	5561.08***	(82.57)	-	-
Female (Model 2)	-	-	-6298.50***	(165.10)
Age at Arrival (Ref: 0-3)				
3-7	839.89***	(209.68)	363.90	(881.90)
8-10	-1489.92***	(278.01)	-1432.30	(973.30)
11-14	-1429.02***	(264.11)	-2293.60**	(889.50)
15-17	-1728.77***	(278.06)	-1944.70*	(892.80)
18-25	-3091.21***	(252.67)	-3155.50***	(833.00)
26-35	-4891.59***	(248.07)	-4714.40***	(831.80)
36-45	-6811.98***	(368.99)	-6865.30***	(901.70)
46-58	-8139.77***	(645.61)	-7976.30***	(1089.00)
Country/Birth Country				
Non-EEA high	1772.94***	(505.49)	388.80	(686.20)
Non-EEA low	-3584.62***	(427.17)	-7203.60***	(1727.60)
Non-EEA middle	-3042.03***	(218.86)	-2841.80***	(293.10)
Non-EEA lower-middle	-	-	-2870.10***	(315.30)
Marital Status (Ref: Single)				
Married	2848.37***	(106.14)	2169.30***	(254.20)
Divorced	1514.26***	(129.26)	1077.20***	(296.80)
Widowed	2499.88***	(312.79)	1908.60***	(578.20)

Observations	123,822	43,382
Adjusted R ²	0.128	0.096

Notes: Standard errors in parentheses. Model 1 uses country of origin-based classification without birth country; Model 2 includes birth country in the classification.

(* p < .05, ** p < .01, *** p < .001)

Source: Compiled by the author

Both models demonstrate that educational attainment stands as the most powerful predictor of immigrants' fiscal contributions in Estonia. In Model 1 (country-of-origin based), education coefficients display a clear stepwise progression from basic school education (Lower Secondary, Level 2) (€1,160.46) through doctoral education (PhD, level 8) (€25,525.73), with each successive educational level associated with substantially higher fiscal contributions. Similarly, Model 2 (country-of-birth) exhibits a comparable pattern, ranging from high school (Upper secondary, level 3) (€3,161.3) to doctoral education (PhD,

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level 8) (€21,038.3). The negative coefficient for education level 1 is not statistically significant in either model, suggesting minimal difference from the reference category (education level 0, which is pre-primary education).

The strong educational gradient identified in both models aligns with research by Bansak et al. (2015) and Gustafsson and Österberg (2001), who demonstrated that educated immigrants produce fiscal benefits even in countries with extensive welfare systems. The substantial premium observed for higher education levels (particularly levels 6-8) supports the findings of D'Amuri and Peri (2014) and Liebigh and Mo (2013).

Age at arrival emerges as a critical determinant of fiscal outcomes in both models, though with notable differences in effect patterns. In Model 1, with 0-3 years as the reference category, age at arrival 3-7 shows a positive and significant effect (€839.89, $p = 0.000$), while all other arrival age categories display negative coefficients, with increasingly negative effects for later arrivals (reaching -€8,139.77 for ages 46-58). This pattern suggests that children arriving between ages 3-7 represent an optimal integration window, outperforming even those arriving as infants.

Model 2 displays a similar pattern with more pronounced negative effects for later arrivals, but notably, the positive effect for the 3-8 age group (€363.9) is not statistically significant ($p = 0.679887$). The reduced significance of this effect in Model 2 reflects the smaller sample size of the birth country model. The magnitude of negative effects for older arrival ages remains substantial in Model 2, ranging from -€3,155.5 for ages 18-25 to -€7,976.3 for ages 46-58.

These findings align with research by Bratsberg et al. (2015), who identified that children who migrate tend to match natives in educational achievements and career development. The particularly favorable outcomes for the 3-7 age group in Model 1 suggest support for the "critical period hypothesis" in language acquisition and cultural adaptation. This result reflects the optimal balance between retaining cognitive advantages from early development in the origin country while still acquiring native-like proficiency in the host country language.

Current age demonstrates consistent positive effects across both models, with all age categories showing significant positive coefficients compared to the reference group (Immigrants within the age group of 25-30). In Model 1, coefficients range from €1,949.13 for ages 31-36 to €2,160.39 for ages 40-45, while Model 2 shows slightly higher values ranging from €2,165.4 for ages 46-60 to €2,752.2 for ages 40-45. This pattern indicates that

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immigrants in all working-age categories beyond young adulthood contribute more to public finances, with peak contributions typically occurring in the 40-45 age range.

The positive age cohort effects align with research by Fasani et al. (2021) demonstrating how different age-based policies generate distinct fiscal results across European countries. The finding that prime-age immigrants (31-60) make higher fiscal contributions than younger immigrants (25-30) show natural wage progression throughout career trajectories.

The gender effect displays consistency across both models. In Model 1 (country-of-origin-based), males show substantially higher fiscal contributions than females (€5,561.08, $p = 0.000$), while Model 2 (country-of-birth) also shows similar results with females showing a significant negative coefficient (-€6,298.5, $p = 0.000$), when compared to males. This consistency suggests similar gender integration patterns across both classification approaches, with males demonstrating stronger fiscal performance than females regardless of definitional choices. The gender disparity in both models aligns with research from the RITA-RÄNNE project, with male immigrants showing higher employment rates and earnings than female immigrants.

Both models demonstrate significant native country effects. In Model 1, with EEA countries as the reference, immigrants from non-EEA high-income countries show positive fiscal contributions (€1,772.94), while those from non-EEA low-income (-€3,584.02) and non-EEA middle-income countries (-€3,042.03) demonstrate negative effects. Model 2, also using EEA countries as the reference, shows that immigrants from non-EEA high-income countries have slightly higher fiscal contributions, though this effect is not statistically significant (€388.8, $p = 0.570991$). Immigrants from all other origin categories display negative coefficients, with the strongest negative effects observed for non-EEA low-income countries (-€7,203.6, $p < 3.85e-05$) and progressively smaller negative effects for non-EEA lower-middle (-€2,870.1, $p = 0.000$) and non-EEA middle-income countries (-€2,841.8, $p = 0.000$).

These findings support research by Storesletten (2003) and Ruist (2015), who demonstrated how origin countries create enduring fiscal differences after controlling for other factors via regression analysis. The persistent origin effects align with ongoing debates between researchers who attribute these differences to unmeasured skills and selection effects (Borjas and Monras, 2017) versus those who emphasize structural barriers such as credential recognition problems, language barriers, and discrimination (Fasani et al., 2021).

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Marital status demonstrates consistent effects across both models, with all marital categories showing positive coefficients compared to the reference category (marital_factor_1, "single"). In Model 1, the strongest effect appears for married immigrants (€2,848.37, $p = 0.000$), followed by divorced immigrants (€2,499.88, $p = 1.34e-15$) and widowed immigrants (€1,514.26, $p = 0.000$). Model 2 shows a similar pattern with somewhat lower magnitudes: married immigrants (€2,169.3, $p = 0.000$), widowed immigrants (€1,908.6, $p = 0.0009$), and divorced immigrants (€1,077.2, $p = 0.0002$).

These positive marital status effects reflect stability effects, dual-income potential, and other family-related factors that enhance labor market integration and earnings capacity. Having children causes much higher motivation for higher earnings leading to higher fiscal revenues.

The significant positive intercepts in both models (€4,794.57 in Model 1, €11,578.6 in Model 2) indicate that immigrants in the reference categories (age 25-30, arrival age 0-3, education level 0, female gender, EEA origin, and single marital status) make positive fiscal contributions over a three year period. The substantially higher intercept in Model 2 suggests that foreign-born immigrants defined by birthplace make higher baseline contributions than those defined by country of origin criteria when all other factors are held constant.

5.2 Synthesis of Key Findings

The study's dual-model approach to analyzing immigration's fiscal impact in Estonia has yielded several significant insights into how immigrant characteristics influence public finances. The following findings stand out as particularly consequential for understanding immigration's fiscal effects in the Estonian context.

Educational attainment emerges as the single most powerful determinant of immigrants' fiscal contributions, the substantial premium associated with doctoral education (€25,525.73 in Model 1, €21,038.3 in Model 2) underscores the exceptional fiscal value of highly educated immigrants. This is consistent with the findings of the RITA-RÄNNE project (2020), which highlighted that highly educated immigrants, particularly in the IT sector, generate the most positive fiscal contributions.

The analysis reveals a novel finding in the relationship between age at arrival and fiscal outcomes, with childhood arrivals between ages 3-7 demonstrating uniquely favorable results. This finding supports the "critical period hypothesis" in immigrant integration, suggesting an optimal window where children are young enough to acquire native-like

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language proficiency while retaining cognitive advantages from early development in their origin countries (De Keyser, 2000). The positive coefficient for this age group (€839.89 in Model 1) compared to the infant age-at-arrival group contrasts with progressively negative effects for later arrivals, creating a clear integration trajectory that peaks in early childhood and declines steadily thereafter. The RITA-RÄNNE project (2020) pointed out that longer the immigrant stays in the foreign country, the better fiscal outcome can be expected of the migrant. This research builds upon that, by showing that the fiscal returns from the arrival age of an immigrant peaks at the 3-7 age category, and then progressively declines. The RITA-RÄNNE project found out that a migrant arriving at 10 years old would be a net fiscal contributor at age 26, but an infant would be a net fiscal contributor at age 29. This finding is somewhat consistent with this paper, but that may be accounted for different reasons since the RITA-RÄNNE project took into account healthcare and education costs, which caused migrants arriving at infancy to take longer than migrants arriving at age 10 to be fiscal contributors.

Both models demonstrate significant native country effects that persist after controlling for human capital characteristics, with immigrants from high-income countries generally outperforming those from middle and low-income regions.

Our analysis identifies consistent positive effects of current age and marital status on fiscal contributions. Immigrants in prime working ages (31-45) demonstrate substantially higher fiscal contributions than younger immigrants, while married individuals outperform single counterparts across all models. These findings reflect both labor market dynamics, where earnings typically peak in mid-career, and family structure effects, where marriage may enhance stability and dual-income potential. The robustness of these patterns across classification approaches suggests that age and family structure represent core determinants of fiscal outcomes that transcend definitional considerations.

5. Conclusion

This study demonstrates that immigration's fiscal impact in Estonia varies substantially based on immigrant characteristics, with education level, age at arrival, and country of origin emerging as key determinants. The predominantly positive fiscal contributions observed across most immigrant categories suggests that immigration, particularly of highly educated individuals, represents a fiscal asset rather than a burden for Estonia's public finances.

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The research reveals that Estonia occupies a distinctive position within European migration patterns. As a post-Soviet state that has transformed into a digital leader with open economic systems, Estonia presents unique integration opportunities and challenges. The country's transition from negative to positive net migration since 2015 signals its emergence as an immigrant destination, with fiscal implications that differ from both Western European welfare states and other post-socialist economies (Tammaru et al., 2017). The positive fiscal contributions documented in this study suggest that Estonia's skills-based immigration framework has been relatively successful in attracting economically beneficial immigrants.

The pronounced educational gradient in fiscal contributions, highlights the exceptional value of knowledge economy workers in Estonia's development model. This finding aligns with Estonia's strategic positioning as a digital society and suggests that immigration can support the country's economic transformation by addressing specific skills shortages in high-value sectors. At the same time, the negative fiscal effects observed for later-age arrivals indicate that integration challenges remain substantial, particularly for adult immigrants from non-EEA countries.

The dual-classification approach employed in this study yields methodological insights that extend beyond the Estonian context. The dramatic difference in sample composition between the country-of-origin model (142,882 observations) and country-of-birth model (55,016 observations) demonstrates how definitional choices fundamentally influence measured fiscal impacts. This methodological contribution highlights the importance of precise immigrant identification in fiscal impact analysis, especially in societies with complex demographic histories.

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7. Appendices

Appendix A

Education level description

Education Level	ISCED Code	Description	Typical Qualifications	Duration
"Level 0"	"ISCED 0"	"Pre-primary education"	"Kindergarten preschool"	"1-3 years"
"Level 1"	"ISCED 1"	"Primary education"	"Elementary school"	"6 years"
"Level 2"	"ISCED 2"	"Lower secondary education"	"Basic school completion (grades 7-9)"	"3 years"
"Level 3"	"ISCED 3"	"Upper secondary education"	"General secondary (gymnasium) or vocational secondary"	"3 years"
"Level 4"	"ISCED 4"	"Post-secondary non-tertiary"	"Vocational certificates technical diplomas"	"6 months - 2 years"
"Level 5"	"ISCED 5"	"Short-cycle tertiary education"	"Professional higher education associate degrees"	"2-3 years"
"Level 6"	"ISCED 6"	"Bachelor's or equivalent"	"Bachelor's degree (bakalaureusekraad)"	"3-4 years"
"Level 7"	"ISCED 7"	"Master's or equivalent"	"Master's degree (magistrikraad)"	"1-2 years"
"Level 8"	"ISCED 8"	"Doctoral or equivalent"	"Doctoral degree (doktorikraad)"	"3-4 years"

Source: Compiled by author.

Appendix B

Native country classification

Country Category	Examples	Key Characteristics
"EEA Countries"	"EU countries + Norway Iceland Liechtenstein"	"Free movement mutual qualification recognition"
"Non-EEA High Income"	"USA Canada Japan Switzerland Australia"	"GDP > \$13205 advanced economies"
"Non-EEA Middle Income"	"Russia Ukraine Belarus Kazakhstan Turkey"	"GDP \$1086-\$13205 former Soviet states"
"Non-EEA Low Income"	"Afghanistan Bangladesh various African countries"	"GDP < \$1086 developing economies"
"Total"		

Source: Compiled by Author using World Bank data.

Résumé

Käesolevas artiklis uuritakse sisserände fiskaalset mõju Eestis, kasutades kahe liigituse meetodit, mis eristab immigrandid päritolu- ja sünnimaa alusel. Kasutades staatilist arvestusmetoodikat Statistikaameti 2018.-2022. aasta saadaval olevate üksikisiku tasandi andmete põhjal, arvutatakse uuringus sisserändajate otsene fiskaalne panus, võrreldes tulumaksu, tarbimismaksu ja sotsiaalkindlustusmaksu töötushüvitiste laekumisega. Mitmekordne regressioonanalüüs näitab, et haridustase on positiivsete fiskaalsete tulemuste peamine määraja mõlema klassifikatsioonimudeli puhul. Seda toetab ka tulemus, kus leidsin, et doktoriõppega seotud fiskaalne panus on kuni 25 525 eurot kõrgem kui baasjoon (alusharidus). Ka saabumisvanusel on oluline seos fiskaalse mõjuga, kuna 3-8-aastaselt saabuvatel lastel on eriti positiivne fiskaalne mõju, samas täiskasvanueas saabuvad sisserändajad näitavad saabumisvanuse kasvades järk-järgult negatiivset fiskaalset mõju.

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