

# Brain Circulation Status of Türkiye

## Türkiye'nin Beyin Dolaşımı Durumu

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### Abstract

While the concept of “brain drain” remains commonly used to describe the emigration of highly skilled individuals, it falls short of capturing the complex, multidirectional flows of talent in today’s globalized world. To address this limitation, recent research has proposed a broader conceptual framework encompassing not only brain drain, but also reverse brain drain, brain gain, brain waste, brain linkage, and most notably, brain circulation. As such, the current study investigates the brain circulation patterns of highly skilled Turkish citizens by examining variables such as graduation department, host country, and sex. Utilizing microdata from 160,789 tertiary graduates who had been abroad between 2010 and 2022, it was found that 67,366 individuals returned to Türkiye, indicating a brain circulation rate of 41.9%. These findings suggest a significant level of return migration, pointing toward an emerging trend of brain circulation rather than a purely one-directional talent outflow.

**Keywords:** Brain Circulation, Brain Drain, Brain Linkage, Human Capital Movement, International Human Resources, Reverse Brain Drain, Türkiye.

The concept of ‘brain drain’ is still widespread. The term of brain drain, also known as human capital flight, refers to emigration of highly-skilled individuals from their home countries to mostly more developed countries (Gibson & McKenzie, 2011). Migrants with tertiary education are considered highly skilled individuals (Risberg & Romani, 2022). Until 2000s, the mainstream academic discourse consider brain drain a significant problem for developing countries, since the permanent loss of human capital negatively affects innovation and development at national level for home countries (Blachford & Zhang, 2014). Gaillard and Gaillard (1998) argued that human capital flight merely occurs as one-way from developing countries towards developed countries, thus it merely benefits the industrialised ones.

Nevertheless, a more positive scenario about the outcomes of human capital flows is described by the phenomenon of ‘brain circulation’ (Ette & Witte, 2021). The term brain circulation refers to the reciprocal flow of highly

### Özet

Beyin göçü terimi oldukça yaygın bir biçimde kullanılmaktadır. Ne var ki, beyin göçü terimi, yüksek vasıflı beşeri sermayenin uluslararası dolaşımının açıklanmasında oldukça yetersiz kalmaktadır. Bu nedenle, mevcut çalışmada beyin göçü, tersine beyin göçü, beyin kazanımı, beyin israfı, beyin bağları ve özellikle beyin dolaşımı kavramlarını bütünsel olarak temsil edecek kavramsal bir çerçeve sunulmuştur. Bunun yanı sıra, yüksek vasıflı Türk vatandaşlarının beyin dolaşımı yapısı mezun olunan bölüm, gidilen hedef ülke ve cinsiyet ayrımında ortaya çıkarılmıştır. 2010 – 2022 yılları arasında yurtdışında bulunan 160.789 yükseköğretim mezunundan, Türkiye’ye geri dönen 67.366 kişiye ait mikroveri setleri analiz edilerek, Türkiye’nin beyin dolaşım oranı %41,9 olarak tespit edilmiştir.

**Anahtar Kelimeler:** Beşeri Sermaye Dolaşımı, Beyin Bağları, Beyin Dolaşımı, Tersine Beyin Göçü, Türkiye, Uluslararası İnsan Kaynakları.

skilled individuals between countries, allowing for the two-ways of exchange of knowledge, ideas and experiences (Saxenian, 2005). Within the concept of brain circulation, the international migration of highly-skilled individuals is considered one of temporary migration, not a permanent loss of human capital for home countries (Docquier & Rapoport, 2012). While brain drain causes differences between origin and host countries in terms of innovation and growth, the concept of brain circulation is argued to minimise these differences (Metin, 2023) through transfers of knowledge, technology, and investments: from host countries to donor countries and vice versa (Le, 2008).

Nevertheless, brain circulation rates vary from country to country (Tungodden et al., 2004). While brain circulation is significantly low in most of the African countries (Radwan & Sakr, 2018), some emerging economies such as South Korea (Lee & Kim, 2010), China (Zweig, 2006), Taiwan and India have implemented successful policies to facilitate brain circulation (Daugeliene & Marcinkeviciene, 2009).

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Even though brain circulation arises as popular phenomena particularly in emerging countries, there are limited number of recent studies conducted regarding topic in Türkiye (Aysu Köksal, 2021; Bilgili & Siegel, 2014; Durmaz, 2020; Elveren & Toksöz, 2018; Güngör & Tansel, 2008; Ince, 2020; Sönmez Çalış, 2019; Sunata, 2014). Nevertheless, it is noteworthy that none of these papers have employed administrative registers to establish a comprehensive framework that covers the entire population. To our knowledge, the present paper is the first study which analyses brain circulation of highly skilled Turkish citizens through administrative registers of several public institutions of Republic of Türkiye. These public institutions including Ministry of Interior, Directorate-General for Population and Citizenship Affairs for residence abroad data, and Council of Higher Education of Türkiye (CoHE) for higher education data. Overall, the research questions delineated in this paper are enumerated as follows.

1. What are the differences between the terms of brain drain, absolute brain drain, brain gain, brain waste, brain linkage, reverse brain drain, reverse brain waste, and brain circulation?
2. What were the brain circulation rates of Türkiye between 2010 and 2022?
3. Which countries had the highest brain circulation with Türkiye?
4. In which educational ISCED-F fields, brain circulation of Türkiye reached the highest scores?
5. Was there a sex gap in brain circulation of Türkiye?

## Human Capital Flows

Teferra (2005) argued that the term brain drain is molded and outdated. The author, therefore, claimed that reconceptualisation of the two terms brain drain and brain circulation become a necessity. In this regard, this study also aims to provide an overview of the conceptual framework to map out human capital flows including brain drain, reverse brain drain, brain retention, brain gain, brain waste, brain linkage, and more precisely brain circulation (Please see ■ Fig. 1 for further details).

*Brain drain* term, also known as human capital flight, is traditionally used to explain the movement of high-skilled individuals from their home country to more developed countries in order to have better work and life conditions (Metin & Ertan, 2022). Brain drain is traditionally considered the permanent loss of highly-skilled individuals thus a detrimental to per capita growth by origin countries (Horvat, 2004). This is due to the fact that highly-skilled individuals are a significant production factor for innovation and socio-economic growth for countries (Haque & Kim, 1995).

Nonetheless, the worldwide war for talent is clearly intensifying (Wadhwa, 2009). The competition for that talent has caused major changes in international human

resources policies and practices (Tung, 2016). During the recent decades, particularly emerging countries have developed strategies to attract their highly-skilled citizens back to their countries of origin (Bilgili & Siegel, 2014). On the other hand, developed countries mainly focus on offering incentives to attract qualified foreigners and taking steps to eliminate migration barriers (Metin & Ertan, 2022). Therefore, it is essential to develop strategies by emerging origin countries to utilise policies in order to supplement brain circulation practices.

## Host Countries

While the international transfer of human capital refers to the term brain drain for the home countries, this situation is commonly perceived as *brain gain* for the host countries. Nevertheless, although brain drain may result in a “drain” for the origin country, it may not always result in an “absolute gain” for the host country (Metin, 2023). In fact, highly skilled immigrants have the potential to benefit the host regions through contributing to the growth in the production of goods and services. In contrast, some highly skilled immigrants may have complementing skills with native workers, then immigration may rise labour demand, which in turn may lead to higher wages in the origin country.

Furthermore, if highly skilled immigrants and native workers have substitute skills, then immigration rises labour supply which results in lowering both wages and employment of natives (Viseth, 2020). Apart from that, even though highly skilled immigrants have high level of education in their origin countries, they predominantly find inequivalent jobs in destination countries (Risberg & Romani, 2022). Therefore, entering low-skilled jobs of immigrants may lead to downskilling problems, which causes *brain waste* (Barbone et al., 2013). Staniscia et al. (2019) defined the brain waste as the situation in which the skills of the immigrants are underutilised. Docquier and Rapoport (2012) argued that brain waste occurs when individuals invest in skills they end up not using even though they succeed in migrating. The authors gave the example of some doctors employed as nurses in London and some other professionals worked as taxi drivers in New York.

## Host and Origin Countries

From a further perspective, this case could also be discussed; should all highly-skilled migrates turn back to their origin countries? In other words, could not both host and origin countries gain benefits from these skilled migrants?

According to international social capital perspective, in spite of some negative effects, brain drain may also provide some opportunities to source countries. Shin and Moon (2018) argued that some highly skilled individuals may find equivalent jobs to their skills in the host country and thus they may not prefer returning permanently to their home countries. This situation used to be considered brain drain in the past.



Nevertheless, such emigrants who gain footing in the host country may keep and enhance their links with family, friends and professionals in the origin country through short-term stays, business visits, and diasporas. These types of home-host interactions were defined as *brain linkage* by Shin and Moon (2018). In fact, diasporas often keep their emotional, historical and family links with their home country. Highly skilled diasporas, such as Indian diaspora in the U.S.A., may play active roles to establish formal networks between professionals of both host and origin countries that promoted brain circulation (Shin & Moon, 2018). Establishment of brain linkages through diasporas may increase mutual trade between home and host countries, which in turn create a win-win situation for both sides. Furthermore, Jöns (2009) argued that circular mobility of highly skilled migrants has facilitated reintegration of Germany to international scientific communities during the second half of the last century. Thus, brain linkage could be beneficial not only developing countries but also for the developed ones.

Overall, apart from brain waste and brain gain, a further consequences of brain drain may arise as brain linkage. In this regard, brain linkage was also delineated in the conceptual framework developed in the current research (Please see ■ Fig. 1 for further details).

### Origin Countries

In contrast to the traditional evaluation of brain drain, Milio et al. (2012) claimed that human capital flows may not always result in negative outcomes as regards the countries from which these flows originate. Therefore, evaluation of the phenomenon of brain drain with a traditional point of view may result in missing the possible positive outcomes of human capital flows.

Apart from brain linkage, brain drain could also turn an advantage for the origin countries, in the case of ensuring *brain circulation* until a certain level. The brain circulation was firstly conceptualised by Gaillard and Gaillard (1998). The term refers to the two-way circulation of skilled individuals between countries, allowing for the exchange of knowledge, ideas and experiences. Brain circulation emphasises the idea that mobility of talent can be a mutually beneficial process for both home and destination countries. Therefore, brain circulation leads to a two-way flow of human capital (Saxenian, 2005). This is due to the fact that individuals can gain new perspectives and opportunities abroad. Thus their social ties with peers, professionals, family and friends in the home country can lead to the exchange of knowledge, ideas, experiences and even the flow of foreign direct investment. On the other hand, when highly-skilled migrants return to their home countries, productivity and economic development of the home country may strengthen (Saxenian, 2005).

Apart from social capital, financial savings of the return migrants could also be transferred to their home countries via worker remittances while working abroad or once they

return. Overall, the possible negative impacts of brain drain for the home countries could be lessened or even reversible through turning brain drain to brain circulation. Additionally, brain circulation could encourage further temporary migration flows of highly-skilled labour, which in turn could again strengthen the socio-economic and political environment of origin countries (Horvat, 2004).

Güngör and Tansel (2008) argued that when qualified programs that encourage return are achieved, benefits of brain circulation come to the forefront in terms of the origin country. Similar mechanisms drive return migration or brain linkage such as having strong homeland links with family, friends and professionals in the origin country (Crescenzi et al., 2017). The feeling of belonging to the homeland is another significant factor that increases the likelihood of brain circulation (Agrawal et al., 2007; Zweig, 2006). Furthermore, new growth and employment opportunities in the globalising cities of several fastest developing countries such as China (Wadhwa, 2009; Zweig, 2006), India (Chacko, 2007), and Türkiye (Bilgili & Siegel, 2014) increase brain circulation opportunities for these countries. In fact, both China and India initially concentrated on limiting brain drain, have recently shifted their focus toward brain circulation. Henceforth, these two countries are experiencing benefits such as technology transfer, remittances, and formation of brain linkage to facilitate knowledge exchange (Bhardwaj & Sharma, 2023). The initiative of China to attract globally bred researches to its new research-intensive universities is noteworthy. Therefore, China has been capable to get the most of its policies of reverse brain drain. This initiative highlights the ability of China to leverage its reverse brain drain policies (Marini & Yang, 2021).

Nevertheless, returning highly-skilled immigrants to their home countries may not result in absolute brain gain for home countries in some cases. In other words, socio-economic contribution of some skilled returnees may be limited for the home country. For instance, in the case of returnees have substitute skills with native workers in the home country, then reverse brain drain rises labour supply. Increased labour supply may lead to lowered wages and employment in the origin country market (Viseth, 2020). Apart from that, economic productivity in the origin country may not grow along with the expectations of returnees. In the case of insufficient demand for skills of returnees, these individuals may enter low-skilled jobs that do not fully utilise their talents. Due to these sort of skill mismatch issues, reverse brain drain could transform into brain waste, which in turn could negatively affect brain circulation situation of that country. This situation was defined as *reverse brain waste* by Staniscia et al. (2019).

Considering the aspects mentioned above, in the following section, the brain circulation phenomenon in Türkiye was revealed.

## Why or not to Return to Türkiye?

Reverse brain drain and contemporary human capital flows have been on the agenda of both developed and developing countries. This is due to the fact that return migration has a high potential for both the economic growth and human capital accumulation of origin countries (Bilgili & Siegel, 2014).

As an emerging economy, Türkiye has also developed several policies to facilitate brain circulation rather than reverse migration. The country has around 5 million citizens living abroad. Thus, Türkiye is not interested in establishing new labour agreements or bringing back all of its citizens back to the country. Instead of that, the country focuses on courting its diaspora and attempting to attract merely highly qualified citizens in the context of reverse brain drain. Within this context, Türkiye has implemented two significant national programs. Both the International Leading Researchers Support Program and the International Postdoctoral Research Scholarships Program have been initiated by the Scientific and Technological Research Council of Türkiye (TUBITAK). The fundamental purposes of these programs have been to encourage merely highly skilled Turkish citizens living abroad to return to Türkiye for research. The programs offer relatively high salaries for the researchers who have a research project on natural sciences, medical sciences, social sciences, and engineering and technological sciences (Bilgili & Siegel, 2014).

Apart from the brain circulation policies of the country, how highly skilled individuals perceive the idea of returning to Türkiye is also significant. There have been several number of studies conducted on this issue in Türkiye (Aysu Köksal, 2021; Bilgili & Siegel, 2014; Durmaz, 2020; Elveren & Toksöz, 2018; Ince, 2020; Güngör & Tansel, 2014; Metin, 2023; Sunata, 2014; Sönmez Çalış, 2019).

A study conducted by Durmaz (2020) on Turkish citizens living in Germany indicated that being married to a foreign national reduced the probability of reverse brain drain by 71.9 per cent, compared to those who are married to Turkish citizens. Moreover, being single as marital status also negatively affects the possibility of reverse brain by around 52.7 per cent, compared to those who are married. Apart from marital status, duration of stay in Germany reduces the likelihood of reverse brain drain by proximately 37.7 per cent. Furthermore, having international ties in their profession decreases the probability of reverse brain drain by around 56.9 per cent. Lastly, feeling of belonging to Türkiye positively affects the likelihood of reverse brain drain by around 37.6 per cent. Sunata (2014) argued that the lack of kinship network in the host country is ineffective in the antecedent brain drain but effective in the reverse brain drain. The author also claimed that (a) the presence of spouse/children in the country of origin, (b) marital

status, (c) child-parent care, and (d) loss of status of the spouse in the destination country were some other significant factors affecting reverse migration decision of skilled Turkish citizens.

In the study conducted by Aysu Köksal (2021) on academics who have returned to Türkiye indicated that 71.1 per cent of them were considering returning to Türkiye before going abroad. The main reasons for returning intentions of academics were compulsory services such as scholarship, compulsory military service, time limits of their working period, and the longing for homeland and family. Güngör and Tansel (2014) also found that family links was a significant factor for Turkish students in the United States to return to Türkiye. Apart from these, Elveren and Toksöz (2018) argued that female Turkish citizens abroad had higher tendency to migrate or not return to Türkiye compared to males.

In the aforementioned researches, the reasons behind the return intentions of Turkish citizens abroad were emphasised. To fill the gap in the brain circulation literature, the current research examined the brain circulation of Türkiye through the dimensions of across host country, educational field, and sex.

## Method

According to the conceptual framework of human capital flows developed in this study (Please see ■ Fig. 1) brain drain may result in brain gain, brain waste, or brain linkage for the host countries. When non-returning highly skilled immigrants do not keep their ties with their origin countries, then *absolute brain drain* for the origin country occurs. On the other hand, some immigrants in diasporas, who are stated in the brain linkage frame, may keep their ties with peers, professionals, family and friends in their home country. Therefore, these immigrants should not be considered an absolute brain drain for the origin countries. Apart from that some immigrants may decide to return to their home countries, hence *reverse brain drain* takes place. Moreover, some highly skilled individuals may be in abroad for a certain period of time. Thus, *the temporary and reciprocal flow of that human capital flows* were also covered in the framework. Lastly, some highly skilled individuals may prefer to continue their professional working life in their home countries. This situation is stated as *brain retention* in the framework (Please see ■ Fig. 1).

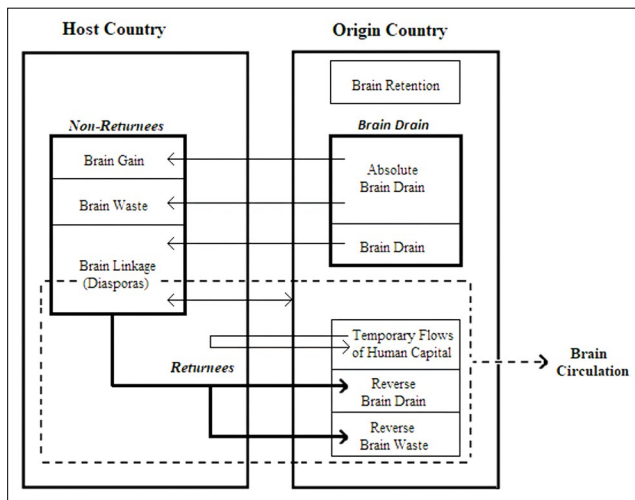
Overall, the framework of *brain circulation* is composed of the immigrants who are either in *the brain linkage* frame or *the temporary flows of human capital or the reverse brain drain, or the reverse brain waste* frames. Since this paper focuses on to explore the brain circulation patterns of Türkiye through returning Turkish migrants, the brain linkage (diasporas) were not included in the scope of this research.





■ **Figure 1**

The conceptual framework of human capital flows



The dataset in the current research covers returning highly skilled Turkish migrants. The dataset was based completely upon administrative registers of public institutions of Republic of Türkiye. These public institutions including Ministry of Interior, Directorate-General for Population and Citizenship Affairs for residence abroad data, and Council of Higher Education of Türkiye (CoHE) for higher education data. The target group for the analyses are individuals who are registered in the Registration System of Turkish Citizens Abroad, a database system under Central Population Administration System (MERNIS). First and foremost, constraint in the database is that the Registration System of Turkish Citizens Abroad is based upon the voluntary application of Turkish citizens living abroad (Supreme Election Council of Türkiye 2022). The citizens are not necessarily obliged to register in the system through Turkish embassies and consulates, nevertheless they do apply to be registered in the system so as to maintain citizenship affairs, such as compulsory military service for male citizens, voting for the parliamentary and presidential elections, marriage and divorce transactions etc. (Metin & Ertan, 2022).

Both the higher education data and residence abroad data of Turkish citizens are available as two different databases in the Turkish Statistical Institute (TurkStat). Prior to conduct the current research, the required permissions have been obtained from TurkStat. After obtaining the permissions of using microdata sets, the two datasets have been integrated through matching the *anonymised* national personal identification numbers of Turkish citizens. Subsequently, the final integrated dataset contained the graduation departments and dates of Turkish tertiary degree graduates, as well as the time periods in which countries they resided in.

The classification of levels of education is based on the International Standard Classification of Education (ISCED): ISCED is an instrument to compile and present education statistics. ISCED 2011 has nine hierarchical education levels, from level 0 to level 8. Tertiary level education covers ISCED 5 to ISCED8, including short-cycle tertiary education, bachelor's or equivalent level, Master's or equivalent level, and doctoral or equivalent level, respectively. Furthermore, the classification of fields of education and training was assembled according to the International Standard Classification of Education: Fields of Education and Training 2013 (ISCED-F). ISCED-F 2013 is an international framework for organising education programmes and related qualifications by fields (EUROSTAT, 2023).

All Turkish citizens who have completed their tertiary education in Türkiye and have returned to Türkiye after spending at least one year abroad are subjected to “brain circulation” in the current research. The time period covers the years between 2010 and 2022. For the calculation of brain circulation rates, the denominator was the number of *tertiary graduates* who have been abroad at least one year after their graduation. The denominator consisted of both non-returnees and returnees. On the other hand, the nominator consisted of merely returnees. For the year 2022, overall brain circulation rate of Türkiye was calculated through a total number of 67,366 returnees among 160,789 highly skilled Turkish citizens who have been abroad between 2010 and 2022. The denominator for each year is calculated through taking back the interval one year.

## Findings and Discussions

### Brain Circulation by Educational Fields

When the brain circulation situation of highly skilled Turkish citizens was examined in ■ Table 1, it was observed that the brain circulation rate of Türkiye was 41.9% between the years 2010 and 2022.

The results in the ■ Table 1 also indicated that the ISCED fields where the brain circulation was occurred most were welfare (70.0%), law (63.7%), humanities (55.3%), and health (54.8%). On the other hand, the brain circulation rates remained low among the graduates with bachelor's degree of physical sciences, and mathematics and statistics, which is classified as ISCED-F 05. Similarly, the brain circulation was measured as lower than the average of 41.9% in ICTs field starting with ISCED-F code 06. Lastly, except architecture and construction, the brain circulation was also revealed lower in the fields of engineering and manufacturing.

**Table 1**  
Brain circulation of Türkiye by educational fields (2010-2022)

ISCED F Code	Fields	Number of abroad	Number of returnees	Brain circulation rate (%)
092	Welfare	220	154	70.0
042	Law	4,210	2,680	63.7
022	Humanities (except languages)	6,350	3,509	55.3
091	Health	5,962	3,266	54.8
073	Architecture and construction	10,946	5,680	51.9
011	Education	17,588	8,938	50.8
082	Forestry	289	146	50.5
023	Languages	8,588	4,250	49.5
081	Agriculture	897	431	48.0
084	Veterinary	459	202	44.0
032	Journalism and information	1,213	523	43.1
104	Transport services	483	207	42.9
031	Social and behavioural sciences	21,789	8,900	40.8
041	Business and administration	15,216	6,056	39.8
083	Fisheries	356	138	38.8
021	Arts	5,724	2,206	38.5
072	Manufacturing and processing	3,104	1,193	38.4
053	Physical sciences	7,254	2,664	36.7
101	Personal services	3,023	1,087	36.0
078	Inter-disciplinary programmes and qualifications involving engineering, manufacturing and construction	6,997	2456	35.1
071	Engineering and engineering trades	31,098	10,047	32.3
054	Mathematics and statistics	4,057	1265	31.2
068	Inter-disciplinary programmes and qualifications involving ICTs	518	152	29.3
051	Biological and related sciences	3,637	997	27.4
061	Information and communication technologies (ICTs)	811	219	27.0
Total		160,789	67,366	41.9

Apart from these, the average length of stay abroad for returned highly skilled Turkish citizens was calculated as 2.87 years. Veterinary (3.24 years), welfare (3.27 years), humanities (except languages) (3.12 years), fisheries (3.09 years), and education (3.03 years) were revealed as ISCED fields with the value above the average. On the other hand, journalism and information (2.53 years), ICT (2.55 years), transport services (2.68 years), and arts (2.69 years) were the fields with the value below the average 2.87 years of length of stay.

### Brain Circulation by Country

Highly qualified Turkish citizens were numerically predominantly located in the United States, Germany and the United Kingdom (Please see Table 2). Again, these were the countries with the highest number of returns in terms of number of individuals. Apart from these countries, although Saudi Arabia was not as popular

as these countries among highly qualified Turkish citizens, the country was listed as the fourth place in terms of number of returnees.

Furthermore, the high rates of brain circulation between Türkiye and several countries such as Turkmenistan (94.2%), Saudi Arabia (89.8%), Azerbaijan (78.6%), and Kyrgyzstan (77.9%) were remarkable. These noticeably high rates of brain circulation indicated that human capital flows from Türkiye to these countries occurred as temporary forms. In other words, the tendency of highly qualified Turkish citizens to stay as immigrants in these countries was relatively low.

According to the results, brain circulation tends to be more prominent among countries with comparable level of development. Additionally, highly skilled individuals from more developed countries often prefer to stay a few years in less developed host countries before returning

**Table 2**

Brain circulation of Türkiye by country (2010-2022)

Host Country	Number of Abroad	Number of Returnees	Brain Circulation Rate (%)
The U.S.A.	32,352	10,455	32.3
Germany	25,438	8,302	32.6
The United Kingdom	14,473	4,537	31.3
The Netherlands	7,634	1,755	23.0
Canada	5,648	1,379	24.4
France	5,009	2,242	44.8
Saudi Arabia	3,750	3,366	89.8
Australia	3,692	1,086	29.4
Russia Federation	3,192	2,125	66.6
The United Arab Emirates	3,064	1,071	35.0
Belgium	2,949	1,077	36.5
Switzerland	2,851	749	26.3
Austria	2,717	1,294	47.6
Italy	2,715	1,476	54.4
Azerbaijan	1,957	1,538	78.6
Spain	1,730	630	36.4
Poland	1,725	600	34.8
Sweden	1,669	348	20.9
Qatar	1,574	802	51.0
Ireland	1,488	463	31.1
Turkmenistan	1,421	1,339	94.2
Kazakhstan	1,286	802	62.4
China	1,259	795	63.1
Romania	1,029	530	51.5
Kyrgyzstan	1,004	782	77.9
Other Countries	29,163	17,823	61.1
<b>Total</b>	<b>160,789</b>	<b>67,366</b>	<b>41.9</b>

home, favouring brain circulation. Conversely, highly skilled individuals originating from less developed countries are more likely to seek permanent settlement in more developed host countries, hence contributing to brain drain for the origin country.

The findings of the current research were consistent with the study of Teney (2009). The author conceptualised intra-European Union (EU) brain circulation and brain drain through immigration of highly skilled EU professionals to Germany. The study highlighted that physicians from North-western Europe near the brain circulation end and those from Eastern EU member states near the brain gain end to Germany. This hierarchy mirrors the socio-economic disparities between the host and the origin countries still plays a key role in explaining migration patterns.

### Brain Circulation by Country and Field

In this section, the brain circulation rates by fields and country were listed. The five ISCED-F fields with the highest number of returnees were analysed by country (Please see Table 3, Table 4, Table 5, Table 6, & Table 7). Lower level of brain circulation between Türkiye and Western countries takes attention particularly in engineering field with around 24%. In contrast, the brain circulation rates between Türkiye and Asian countries such as Turkmenistan, Azerbaijan, Russia Federation, and Saudi Arabia were revealed as considerably high with around 80%.

**Table 3**

Brain circulation in architecture and construction field (2010-2022)

Host Country	Number of Abroad	Number of Returnees	Brain Circulation Rate (%)
The U.S.A.	1,544	497	32.2
Russia Federation	1,037	628	60.6
Saudi Arabia	452	380	84.1
Azerbaijan	426	339	79.6
Turkmenistan	423	396	93.6

**Table 4**

Brain circulation in business and administration (2010-2022)

Host Country	Number of Abroad	Number of Returnees	Brain Circulation Rate (%)
The U.S.A.	3,294	1,179	35.8
Germany	1,841	520	28.2
The United Kingdom	1,673	513	30.7
France	417	171	41.0
Russia Federation	251	160	63.7
Saudi Arabia	219	184	84.0

**Table 5**

Brain circulation in education (2010-2022)

Host Country	Number of Abroad	Number of Returnees	Brain Circulation Rate (%)
Germany	3,794	1,747	46.0
The U.S.A.	2,746	928	33.8
The United Kingdom	1,207	462	38.3
Saudi Arabia	1,068	1,035	96.9
France	751	401	53.4

**Table 6**

Brain circulation in engineering and engineering trades (2010-2022)

Host country	Number of abroad	Number of returnees	Brain circulation rate (%)
The U.S.A.	7,306	1,863	25.5
Germany	5,173	1,136	22.0
The United Kingdom	2,758	663	24.0
Russia Federation	737	494	67.0
Saudi Arabia	469	387	82.5

**Table 7**

Brain circulation in social and behavioural sciences (2010-2022)

Host Country	Number of Abroad	Number Of Returnees	Brain Circulation Rate (%)
U.S.A.	4,446	1,608	36.2
Germany	2,808	827	29.5
The United Kingdom	2,540	857	33.7
France	775	308	39.7
Saudi Arabia	320	276	86.3





The United States of America (the USA) was revealed as the most popular destination country for Turkish tertiary graduates between 2010 and 2012. As it could be seen from the tables below, the USA was at the first place in all fields, besides education. On the other hand, the relatively low rates of brain circulation of engineers with 25.5% draw attention. Furthermore, Germany was the second most popular migration destination for Turkish professionals particularly among tertiary graduates from engineering, and education fields. Similar to the U.S.A., the brain circulation rates of engineers between Türkiye and Germany was considerably limited with 22.0%. The United Kingdom is another popular destination for Turkish migrants. According to the findings of the current study, the UK mostly preferred by engineering and, social and behavioural science graduates. The brain circulation rates between Türkiye and France were relatively higher than the rates between Türkiye the other most popular countries like the U.S.A, Germany, and the United Kingdom.

Furthermore, the findings also indicated that highest number of brain circulation of Turkish professionals who graduated from architecture and construction fields mostly occurred in Turkmenistan, Saudi Arabia, Azerbaijan, and Russia Federation, respectively. This may be due to the fact that various Turkish construction companies operate in these countries and these professional have been in these countries on temporary work contracts.

### Brain Circulation by Sex

Since our integrated datasets covered sex dimensions of Turkish citizens abroad, the brain circulation situation of Türkiye was also examined in terms of sex (Please see ■ Table 8). The results indicated that two in third of highly qualified Turkish citizens who have been abroad between the years 2010 and 2022 consisted of males. When considering the brain circulation rates by sex, female brain circulation appeared as 40.9% that was slightly less than the average rate of males which was 43.5%.

From gender perspective, Elveren and Toksöz (2018) revealed that female Turkish citizens abroad have higher tendency to migrate or not return to Türkiye compared to males. Nevertheless, the findings of the study conducted by Metin (2023) showed that brain drain rates of Turkish women (2.84%) was significantly less than Turkish men (3.62%). The results of the present research further

revealed that the brain circulation exhibited a noteworthy degree of parity between highly-skilled Turkish males and females. Metin (2023) argued that migrants generally find inequivalent jobs in host countries, this situation may even worse for women immigrants. Additionally, longing for family, relatives and friends may be higher for women compared to men. Moreover, starting a family and rising children abroad may also be more influential in women's decision to return to their origin country.

### Conclusion and Recommendations

Brain drain has generally been regarded by origin countries as an absolute “drain” in the context of international human capital flows. Nonetheless, as it was argued in this paper, mobility of talent between countries may not always arise as a catastrophic phenomenon through ensuring a sustainable brain circulation between origin and host countries (Blachford & Zhang, 2014; Chacko, 2007; Daugeliene & Marcinkeviciene, 2009; Le, 2008; Lee & Kim, 2010; Milio et al., 2012; Saxenian, 2005; Teferra, 2005; Wadhwa, 2009; Zweig, 2006). Therefore, retention, return, and diaspora policies should be all well organised by the governments of home countries in order to not missing the possible outcomes of human capital flows (Milio, et al., 2012; Radwan & Sakr, 2018).

In this regard, a conceptual framework of human capital flows was developed in this study with the purpose of providing a better understanding of the several possible outcomes of mobilisation of talent across borders. Indeed, human capital flows may arise in several concepts including brain retention, brain drain, absolute brain drain, brain gain, brain waste, brain linkage, temporary flows of human capital, reverse brain drain, and reverse brain waste (Please see ■ Fig. 1). For instance, brain drain from origin countries may result in brain gain, brain waste or brain linkage for the host countries. On the other hand, returning migrants and temporary flows of human capital flights may result in several forms including brain linkage, reverse brain drain, or reverse brain waste for the origin countries.

Apart from that, in the context of the current study, an examination was conducted in order to explore the brain circulation rates of tertiary graduates from Türkiye. The research framework covers all Turkish tertiary graduates who have returned to Türkiye after a minimum one-year residency abroad between the years 2010 and 2022. The analysis was conducted through the lenses of academic discipline of graduation, host country of residence, and sex. Prior to delving into the empirical findings, it is pertinent to provide a succinct overview of the determinants influencing the phenomenon of brain circulation for Türkiye.

From the macroeconomic perspective, gross domestic product (GDP) rates of Türkiye has been growing at 5% on average during the last ten years. The growth in the GDP,

■ **Table 8**  
Brain circulation of Türkiye by Sex (2010-2022)

Sex	Number of Abroad	Number of Returnees	Brain Circulation Rate (%)
Male	100,732	42,338	43.5
Female	60,057	25,028	40.9
Total	160,789	67,366	41.9

in general, results in creating new job opportunities and improvement of quality of life for citizens. Apart from that, the reverse brain drain policies of Türkiye such as offering tax incentives and establishing special economic zones that implemented during the last decade may have also facilitated to attract highly skilled professionals to return to Türkiye.

Rather than economic factors, there are several potential sociological consequences of brain circulation for the countries. According to international social capital perspective, brain circulation may provide reciprocal benefits to the both host and home countries (Milio et al., 2012; Shin & Moon, 2018). For instance, movement of highly skilled migrants may foster interactions among different cultures and may promote cultural enrichment. Furthermore, brain circulation may also stimulate economic growth and innovation by exchanging skills and ideas between the countries (Saxenian, 2005). Movement of highly skilled migrants also contribute to human capital development and international collaboration (Jöns, 2009). Brain circulation may encourage further temporary migration flows of highly-skilled labour thus strengthen the socio-economic and political environment of origin countries (Horvat, 2004). Regarding the issues discussed in this paragraph, there are perhaps thousands of outstanding individuals who exemplify brain circulation of Türkiye. For instance, Turkish scientist Professor Dr. Aziz SANCAR, who spent his career in the United States of America, was awarded the Nobel Prize in Chemistry in 2015. His successful career bridged scientific networks between the USA and Türkiye, fostering increased collaboration between two nations in the field of molecular biology.

On the other hand, brain circulation may also cause several negative socio-cultural outcomes as well. Skilled migrants may experience feelings of displacement, cultural alienation, discrimination, hardness of establishing new social networks (Sunata, 2014), disruption of gender roles (Durmaz, 2020), and unemployment or deskilling (Barbone et al., 2013; Docquier & Rapoport, 2012; Risberg & Romani, 2022). Additionally, returning highly-skilled immigrants to their home countries may rise labour supply, which in turn may lead to lowered wages and employment in the origin country (Viseth, 2020).

Apart from economic and social factors, temporary human capital flows also facilitate brain circulation. Public officials, academics, and other professionals who reside abroad due to temporary duties may also facilitate the brain circulation rates of Türkiye. Moreover, compulsory military service for male Turkish citizens also foster brain circulation of these individuals.

The findings of the current research were revealed that while the brain circulation of Turkish citizens was low in natural sciences, it was generally high in social sciences. The results showed that the academic fields with the highest

rate of brain circulation for Türkiye were welfare (70.0%), law (63.7%), and humanities (55.3%). On the other hand, information and communication technologies (27.0%), biological and related sciences (27.4%), engineering and engineering trades (31.2%), and mathematics and statistics (32.3%) were identified as the fields with the lowest brain circulation rates for Türkiye, respectively. This may be due to the fact that finding equivalent jobs to their skills in abroad may be easier for natural sciences graduates, compared to graduates of social sciences from Türkiye. The findings of the current research are aligned with the study of Shin and Moon (2008). The authors highlighted that merely 12% of international science, technology, engineering, and math (STEM) students in the USA had intention to leave the country. Therefore, the low brain circulation rates in high demanded fields, such as STEM, may lead to a brain drain problem for the origin countries.

Furthermore, one of the most striking points among the research findings was that the rate of brain circulation between Türkiye and the USA, the U.K, and EU member countries, Canada, and Australia were generally between 20% and 40%. These rates were lower than the average brain circulation rate of Türkiye, which was 41.9%. This situation revealed that most of the highly qualified persons who went to the mentioned countries from Türkiye did not prefer to return back. In other words, these results indicated possibly high rate of brain drain from Türkiye to these countries. This assumption is consistent with the previous findings of Metin (2023). The author found that, the most popular destinations to brain drain from Türkiye were the U.S.A. with 22.4%, Germany with 14.3%, the U.K. with 11.6%, Netherlands with 6.6%, and Canada with 4.0%. Gaillard and Gaillard (1997) mentioned that developed countries have 16% of the global workforce, but they have more than 60% of global migrants. The authors argued that this phenomenon of international migration of human capital can be framed as a one-way flow, from developing nations to developed nations (Blachford & Zhang, 2014). The findings of the current paper suggest even after several decades, there remains a significant one-way flow of human capital from Türkiye to the USA, the U.K. and the EU member countries.

Nevertheless, as stated in the human capital flows framework developed within the scope of this study, non-returned highly qualified Turkish citizens may still maintain their ties with Türkiye. Additionally, these people may also participate in diaspora activities in the host countries. For these reasons, a part of the non-returnees may be considered in the frame of brain linkage, not in absolute brain drain frame (Please see ■ Fig. 1). Therefore, establishing channels of cooperation between Türkiye and the highly skilled Turkish citizens who are in the frame of brain linkage is essential for Türkiye, rather than merely focusing on reverse brain drain policies. Additionally, Viseth (2020) argued that reverse brain drain always means that returning immigrants will contribute



positively to the development of the origin country. The compatibility between the skills of returning migrants and employment, as well as the social, cultural and institutional context of the country of origin, are also effective.

Moreover, it was also noteworthy to highlight the substantial brain circulation rates observed between Türkiye and certain countries, notably Turkmenistan (92.4%), Saudi Arabia (89.8%), Azerbaijan (78.6%), and Kyrgyzstan (77.9%). These noticeably elevated rates of brain circulation suggest that human capital flows from Türkiye to these countries occurred as temporary forms. In essence, this implies that the tendency of highly-qualified Turkish individuals to establish permanent residency as immigrants in these countries remained low. Lastly, Shin and Moon (2018) argued that brain retention policies may reduce brain drain, nonetheless these policies may also result in missing the possible positive outcomes of brain circulation for the origin countries such as reciprocal exchange of knowledge, ideas and experiences between host and origin countries. Marini and Yang (2021) found that global research networks are heavily depend on brain circulation, with returnees playing a vital role in fostering these connections. This is due to the fact that highly skilled individuals who gain experience in abroad bring valuable skills and insight back home, prompting further international collaboration. This underscores the significance of brain circulation policies that encourage domestic researches to gain international experience, particularly for emerging countries like Türkiye.

The current study results are based on descriptive statistics and there are no results on the sociological causes of brain circulation. Statistics on the sociological causes of brain circulation could be gathered trough conducting a survey on individuals who have returned to Türkiye.

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