HIGH SCHOOL EDITION
Journal of Student Research
Volume 12 Issue 1 (2023)

Highly Skilled Migration Flows: A Case Study of Taiwan

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ABSTRACT

The largest type of international migration is the movement of people from developing to developed countries. This extensive global migration has raised concerns of brain drain, where highly skilled students and professionals leave their home countries and never return. While highly skilled migration may indeed create a brain drain, it simultaneously promotes the development of the home country. This paper uses the case study of Taiwan to demonstrate that the emigration of highly skilled individuals enhances the development of the sending country through return migration, transnational workers, and diaspora networks. To analyze the impacts that migration has had on the development of Taiwan, regression techniques are implemented. The empirical findings of the paper show that once transnational networks were developed, migration outflows led to an increase in the overall output of Taiwan.

Introduction

Taiwan once experienced a case of the classic brain drain during the 1970s and early 1980s with large portions of its college graduates going abroad for further study. From the perspective of the push and pull migration framework, higher salaries, greater opportunities for career advancement, and better teaching and research facilities were some of the pull factors that attracted these migrants to more developed countries overseas (Chang, 1992). However, over the next few decades, the brain drain slowed and began to reverse. Between 1985 and 1990, around 50,000 overseas migrants returned to Taiwan. Many brought with them high levels of education or significant business experience (Luo, 2002). When these students and professionals formed coethnic networks between their home and host countries, they fostered international trade and information exchange (Rauch, 2002). Rather than a brain drain, Taiwan experienced brain circulation, the drawing of skills and experience from their migrants and diaspora. The value of this permanent and temporary return migration is most apparent in the development of the semiconductor industry, which began in Silicon Valley and has been transferred to the Hsinchu Science-based Industrial Park in Taiwan (Saxenian, 2005). Now, Taiwan accounts for 92 percent of the most advanced semiconductor production (Varas, 2020). Other countries, especially the least developed countries, have experienced little of this positive side to emigration (Patterson, 2005). As such, it is important to analyze the effects of Taiwan's migration, as well as the policies and factors that led to it.

The empirical findings of this paper show that the migration outflow that Taiwan experienced from 1980 to 2000 increased the overall output of Taiwan. During this time period, Taiwan had an established collaboration network with overseas diasporas, as well as a developing technology sector that encouraged transnational workers to return to Taiwan. These factors facilitated the transfer of ideas and technology, helping improve Taiwan's development. However, the empirical analysis shows that this same benefit of migration outflow did not occur during earlier time periods. This emphasizes the idea that the emigration of skilled workers to more developed countries can improve the advancement of the home countries, but only when transnational networks have been developed.

The main policy implication from these results is that although developing countries may experience initial losses from migration outflows, they often result in later gains, as in the case of Taiwan. Therefore, countries should be wary of holding back talent from working or studying abroad, as it will limit the country's ability to participate in the global economy. Instead, countries should focus on actively pursuing the benefits that can arise from migration. By supporting diaspora networking and recruitment, providing an attractive environment for transnational entrepreneurs, and subsidizing a strong basic education demanded by the economy, Taiwan has been able to turn its brain drain into brain circulation.

This paper will be structured as follows. It will begin by outlining Taiwan's development from the 1950s to the present, highlighting changes in trade and skilled migration. By responding to its changing comparative advantage, Taiwan has transitioned from an agriculture-based economy to a labor-intensive manufacturing economy to a capital- and technology- intensive economy. Economic theories from the Heckscher-Ohlin model will be used as a framework to explain Taiwan's transitions in international trade. The third section will be a discussion of the data used in the fourth section, which will empirically analyze the relationship between brain circulation and output in Taiwan. Policy implications will be discussed in the fifth section and the sixth will conclude.

Outlining Taiwan's Development

During the latter half of the twentieth century, Taiwan experienced rapid industrial and economic growth. This section will trace Taiwan's economic development from the early 1950s to the present day, focusing on high skilled labor flows. Taiwan's changes in foreign trade based on its changes in resource endowments will also be shown to accurately follow the predictions of the Heckscher-Ohlin model.

1952-1972: Shifting Away from Agriculture to Labor-Intensive Export-Led Growth

In the early fifties, the economy of Taiwan was heavily dominated by natural resource-intensive agricultural products. In 1952, agricultural products accounted for 56 percent of total employment and 91 percent of total exports (Mao, 1995). However, this was not sustainable. A lack of natural resources and arable land restricted Taiwan's growth in the agricultural industry. Taiwan did have one of the highest population densities in the world at this time, leading to a labor surplus in agriculture. In the realm of international trade, this excess of low skilled workers and lack of natural resources led to a comparative advantage in labor-intensive industries.

The Heckscher-Ohlin model predicts that an economy will export the goods whose production intensively uses the nation's relatively abundant and cheap factor, which is labor in this case, and import the goods whose production intensively uses the nation's relatively scarce factor, which is natural resources. This theory led the Taiwanese government to pursue policies that encouraged the export of labor-intensive goods in order to make use of its comparative advantage.

The government implemented the first Four Year Plan (1953-56), which emphasized promoting the low skilled labor-intensive consumer industry, including textiles, fertilizers, and apparel. In addition, the government adopted several export promotion policies, including the Nineteen-Point Program of Economic and Financial Reform, the Statute for Encouragement of Investment, and the establishment of Export Processing Zones (Kulkarni, 2004). The Taiwanese government's approach was to increase the export of cheap manufactured products to more developed countries, which experienced high labor costs.

The impact of these policies was impressive. As depicted in Table 1, the percentage of exports in manufacturing rose from 5 to 59 percent, while the percentage of exports in agriculture fell from 91 to 16 percent.

Table 1. Changes in the Composition of Trade, 1952-1975 (Council for Economic Planning and Development, 1989).

	1952-54		1973-75	
Item	Exports	Imports	Exports	Imports
	Percentage of Total			
Agriculture, forestry, fishing, food, beverages, and tobacco	91	26	16	17
Minerals (fuels)	4	6	2	12
Machinery and transport equipment	0	15	23	33
Manufacturing (products of textiles, clothing, travel good, footwear, plywood, furniture, etc.)	5	53	59	36
Total	100	100	100	100

This shift of focus from agriculture to manufacturing led to a rise in rural to urban migration. Although there was a decrease in the rural population, the large amounts of remittances sent by urban migrants to rural areas helped prevent a large decline in the rural economy (Chang, 1965).

Strict policies by Taiwan's government on studying abroad led to a lack of international migration during this time period. However, the investment of American semiconductor firms to set up IC packaging facilities in Taiwan helped Taiwanese engineers understand semiconductor technology, as well as plant and company management (Lin, 2014).

1973-1980: Capital-Intensive Growth

The increasingly labor-intensive manufacturing caused Taiwan's surplus in agricultural labor to end. By the late 1960s, wages began to rise steeply for unskilled labor (Mao, 1995). This trend is consistent with the predictions of the Heckscher-Ohlin model. The factor-price equalization theorem that arises out of the Heckscher-Ohlin model predicts that when the output prices of manufacturing goods are equalized through international trade, then the prices of the factor, low skilled labor, will also be equalized between countries.

This changed the basis for Taiwan's comparative advantage; low skilled labor was no longer the cheap and abundant factor. Instead, the economy shifted towards capital-intensive industries that utilized high skilled labor. Table 2 shows how Taiwan's exports declined for low skilled labor goods, including textiles and food processing, but increased for capital and technology intensive goods, especially electronics.

Table 2. Taiwan Composition of Trade 1970-1980 (Clark, 1989)

	1970	1975	1980
Food processing products	12.8%	10.8%	5.6%
Textiles	31.7%	27.8%	22.6%
Wood Products	8.6%	4.4%	6.0%
Rubber and plastics	1.0%	7.4%	8.9%
Chemicals	2.4%	2.0%	2.3%
Electronics	12.3%	14.7%	18.2%
Metal manufactures	1.9%	2.5%	4.3%
Machinery	3.2%	3.6%	3.8%

During this period, Taiwan began to experience a significant brain drain with a total of 100,000 Taiwanese studying abroad for advanced study in the second half of the 20th century. This constituted 20 percent of Taiwanese college graduates. Few of these graduates returned; in 1979, at the brain drain peak, only eight percent of students studying abroad returned to Taiwan (Luo, 2002).

1981-Present: High Technology and Modernization

In the early eighties, serious attempts to develop Taiwan's technology capacity began (Kulkarni, 2004). For example, through substantial government investment, as well as rent and tax incentives, the Hsinchu Science-based Industrial Park (HSIP) was created in 1981. Based on the experiences of transnational entrepreneurs across Taiwan and the United States, the park was modeled after Silicon Valley and aimed to provide an environment of innovation in high-tech industries. Exports of electronics and telecommunications products rose fueled by the increasing success of the HSIP.

In the late 1980s, the brain drain began to reverse with an increasing return rate to Taiwan. This return migration helped to fuel the high-tech sector. In addition, another group of temporary returnees began to work in both the US and Taiwan, carrying the language and professional skills to engage in both economies. This group often traveled between Silicon Valley and Hsinchu, playing the role of middlemen (Shin, 2018).

Despite this high return rate, a more recent pattern of highly skilled migration outflow is currently occurring. Much of the workforce is leaving Taiwan in search of better job opportunities and higher salaries with the majority of them going to mainland China. The Taiwanese government is attempting to turn this brain drain into brain circulation as it has in the past.

Data

The following two sections will empirically evaluate the relationship between brain circulation and development in Taiwan using regression analysis. To measure the amount of brain circulation, the quantity of net migration (the difference between immigration and emigration) will be used. Net migration data was collected from the United Nations World Population Prospects 2022, which evaluated its international migration projections based on estimates derived as the differences between overall population growth and natural increase.

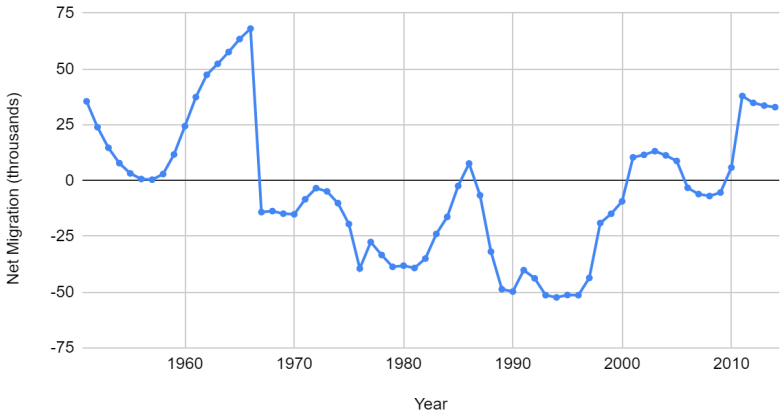
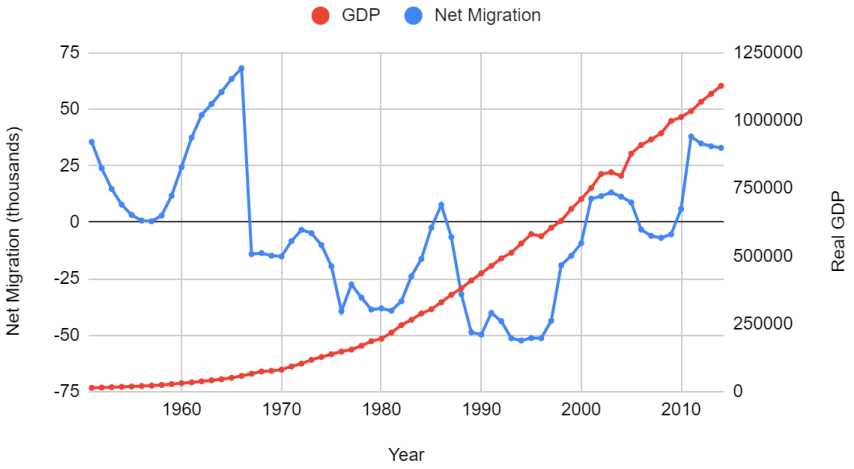


Figure 1. Taiwan Net Migration, 1951-2014 (United Nations Department of Economic and Social Affairs, 2022).

Figure 2. Taiwan Net Migration and Real GDP, 1951-2014 (United Nations Department of Economic and Social Affairs, 2022).

Figures 1 and 2 show a primarily net emigration of people out of Taiwan from 1967 to 2000. Once restrictions against studying abroad were loosened in 1966, net migration sharply decreased as many students left Taiwan for advanced study in more developed countries, especially in the United States. This trend continued through the 1970s (Huang, 2006).

However, as economic and political conditions increased in Taiwan in the early 1980s, emigration began to fall and net migration began to increase, but this rising net migration did not last as a new source of emigration to mainland China emerged. As a result of hostility between the Kuomintang and the Chinese Communist Party, migration between Taiwan and mainland China was heavily restricted between 1950 and 1987. However, as borders between the two areas became more open and as mainland China's economy developed,



many highly skilled individuals from Taiwan have been emigrating to China. The graph also shows a rise in net migration since the late 1990s. This was the result of Taiwan opening its borders to low skilled immigrants in the 1990s and causing an increased inflow of foreign contract workers from Southeast Asia (Lee, 2018).

The other data sets, including real GDP, population, exchange rate to U.S. dollar, and WTI crude oil prices, were collected from the Federal Reserve Economic Data. In addition, business cycle stages were determined based on reports from the National Development Council.

Empirical Analysis

This section will describe the linear regression done to analyze the relationship between net migration and real GDP. If the explanatory variables have a causal effect on the real GDP, the causal effect would be expected to occur gradually. To account for this, the explanatory variables will be lagged by 5 years.

The regression equation is as follows:

$$realgdp_t = \beta_0 + \beta_1 netmigration_{t-5} + \beta_2 population_{t-5} + \beta_3 worldoilprice_{t-5} + \beta_4 exchangerate_{t-5} + u$$

Using the model above, the regression yields the following results:

Table 3. Regression Statistics, 1956 – 2019

	Coefficients	*Standard Error*	*T Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-361303.783	51842.159	-6.969	3.049E-09	-465039.704	-257567.863
Net Migration	2786.121	375.084	7.428	5.094E-10	2035.580	3536.662
Population	59176.099	3447.561	17.165	1.291E-24	52277.546	66074.652
World Oil Price	3269.739	576.054	5.676	4.428E-07	2117.059	4422.420
Exchange Rate	-10843.097	1301.090	-8.334	1.495E-11	-13446.572	-8239.623

Note: The R Square value is 0.962 and the Significance F is 3.406E-41

Table 4. Regression Statistics, 1956 - 1979

	Coefficients	*Standard Error*	*T Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-109736.412	5452.893	-20.124	2.845E-14	-121149.449	-98323.376
Net Migration	-2.408	41.888	-0.057	9.547E-01	-90.081	85.264
Population	16047.086	893.702	17.956	2.239E-13	14176.546	17917.625
World Oil Price	2564.741	743.060	3.452	2.673E-03	1009.498	4119.984
Exchange Rate	-1095.739	183.236	-5.980	9.370E-06	-1479.256	-712.222

Note: The R Square value is 0.986 and the Significance F is 1.901 E-17

Table 5. Regression Statistics, 1980 – 2000

	Coefficients	*Standard Error*	*T Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	1309931.589	177835.198	-7.366	1.591E-06	1686925.368	-932937.811
Net Migration	-1277.474	421.688	-3.029	7.974E-03	-2171.413	-383.535
Population	85159.407	5760.311	14.784	9.497E-11	72948.093	97370.721
World Oil Price	-2943.927	713.970	-4.123	7.966E-04	-4457.476	-1430.379
Exchange Rate	1299.152	2197.678	0.591	5.627E-01	-3359.718	5958.021

Note: The R Square value is 0.987 and the Significance F is 9.526E-15

In Table 3, the P-values are less than 0.05, so the null hypothesis is likely not true. Therefore, the net migration rate is correlated with the GDP. More specifically, from 1956 to 2019, when the net migration increased by 1, Taiwan's real GDP increased by 2786 TWDs. However, during the smaller time period of 1956 to 1979 shown in Table 4, the P-value for net migration is larger than 0.05. The null hypothesis fails to be rejected, showing there is plausibly no correlation between Taiwan's net migration and real GDP during the earlier time periods. On the other hand, when the later time period from 1980 to 2000 is regressed, the results do show P-values less than 0.05 and an increase of 1 in net migration leads to a decrease of 1277 TWDs in GDP.

In more recent time periods from 1980 to 2000, the migration outflow of individuals from Taiwan has increased the GDP. This is consistent with the idea that when people migrate to more developed countries, they bring ideas and technological knowledge back home, whether they return permanently or not. For example, transnational workers between the US and Taiwan have advanced the technology sector in Taiwan by acting as a facilitator of knowledge between the two countries. In addition, migration has led to the creation of ethnic Chinese networks, which increase international trade by matching buyers and sellers, as well as deterring opportunistic behavior. These networks ultimately help to reduce barriers to trade and promote more efficient markets (Rauch, 2002).

However, in the earlier time period, Taiwan was experiencing a more traditional brain drain, in which the migration outflow was not correlated with the real GDP. Before 1980, Taiwan experienced far fewer homeland collaboration networks. This reduced the capacity for the international transfer of ideas and thus, the capacity for receiving the benefits of migration. This emphasizes the importance of creating collaboration networks between diasporas in developed countries and their homeland to take advantage of the benefits that migration can create.

In order to control the effects of recessions, a dummy variable can be added to the equation, which is 0 in years without a recession and 1 in years with a recession. This will allow the regression line between real GDP and net migration to have a different intercept for years with a recession and years without a recession.

The new regression equation is:

$$realgdp_t = \beta_0 + \beta_1 netmigration_{t-5} + \beta_2 population_{t-5} + \beta_3 worldoilprice_{t-5} + \beta_4 exchangerate_{t-5} + \beta_5 recession_{t-5} + \upsilon$$

This model yields the following regression results:

Table 6. Regression Statistics with Dummy Variable, 1956 – 2019

	Coefficients	*Standard Error*	*T Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-361681.409	50581.886	-7.150	1.638E-09	-462932.054	-260430.765
Net Migration	2668.388	370.694	7.198	1.361E-09	1926.364	3410.412
Population	58959.743	3365.477	17.519	7.770E-25	52223.009	65696.476
World Oil Price	3396.942	565.653	6.005	1.336E-07	2264.664	4529.220
Exchange Rate	-10493.922	1281.468	-8.189	2.956E-11	-13059.059	-7928.784
Recession	-40849.657	20482.454	-1.994	5.082E-02	-81849.742	150.429

Note: The R Square value is 0.965 and the Significance F is 1.033E-40

Table 7. Regression Statistics with Dummy Variable, 1957- 1979

	Coefficients	*Standard Error*	*T Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-110105.626	5478.876	-20.096	0.000	-121616.318	-98594.934
Net Migration	-2.709	41.984	-0.065	0.949	-90.915	85.496
Population	15983.162	898.219	17.794	0.000	14096.074	17870.250
World Oil Price	2883.183	815.825	3.534	0.002	1169.199	4597.167
Exchange Rate	-1080.499	184.341	-5.861	0.000	-1467.786	-693.213
Recession	-2600.772	2720.121	-0.956	0.352	-8315.534	3113.991

Note: The R Square value is 0.987 and the Significance F is 2.441E-16

Table 8. Regression Statistics with Dummy Variable, 1980 – 2000

	Coefficients	*Standard Error*	*T Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	1295968.391	183176.457	-7.075	0.000	1686399.767	-905537.016
Net Migration	-1249.469	433.301	-2.884	0.011	-2173.027	-325.911
Population	84782.858	5917.812	14.327	0.000	72169.340	97396.376
World Oil Price	-3211.354	860.833	-3.731	0.002	-5046.177	-1376.532
Exchange Rate	1221.070	2248.319	0.543	0.595	-3571.109	6013.248
Recession	6729.992	11515.950	0.584	0.568	-17815.673	31275.658

Note: The R Square value is 0.987 and the Significance F is 1.491-13

The model controlled for the recession has yielded similar results to the previous model. From 1956 to 2019, when the net migration increases by 1, Taiwan's real GDP increases by 1668 TWDs. From 1956 to 1979, the regression fails to reject the null hypothesis and shows a lack of correlation between net migration and real GDP. From 1980 to 2000, an increase of 1 in net migration led to a decrease of 1249 TWDs in GDP. The pattern is consistent; the time period of 1980 to 2000 experiences a positive effect from migration outflow. In this time period, unlike others, Taiwan had established networks with other more developed countries, which allowed it to take advantage of the benefits of a migration outflow.

Lessons from Taiwan

Taiwan's experience with highly skilled emigration has been far more positive than in other developing countries. It has experienced the transfer of ideas and technology through its emigrants, as well as the return of skilled workers that boost the nation's economic performance. The case of Taiwan shows that initial losses from brain drain often result in later gains and holding citizens back from studying or working overseas is not an effective solution, as it will only further exacerbate the country's isolation from the global economy. The main question for developing countries is how to turn their brain drain into brain circulation. Taiwanese policies that helped achieve this are worth a closer examination. This section will look at three lessons that can be learned from Taiwan's high skilled labor flows.

Support Diaspora Networks

As Taiwanese firms shifted towards capital- and technology- intensive production rather than labor-intensive production, they were able to formally and informally tap into the diaspora of overseas Taiwanese and even recruit them to return. The Taiwanese government helped facilitate these connections. For example, in the early 1970s, they established the National Youth Council, which connects Taiwanese businessmen with skilled migrants by tracking migrants in a database and advertising jobs overseas.

Provide an Attractive Environment for Transnational Professionals

One of Taiwan's most evident successes from highly skilled migration outflows and the resulting diaspora networks has been the Hsinchu Science-based Industrial Park. This park was created based on inspiration gained from overseas networks; it served to replicate the concentration of high technology and innovation found in

Silicon Valley. Through the government providing financial incentives and planning infrastructure for companies, the HSIP has helped develop Taiwan's semiconductor industry and contributed to economic growth (Mathews, 2000). The park successfully attracted high technology firms and has caused the return of skilled migrants.

Subsidize Basic Education

The basis for Taiwan's positive experiences with migration was educational policies that started in the 1950s. It heavily invested in public and private education in a much larger capacity than other countries with similar resources. Also, the distribution of its educational investment was as important as its size. Education was subsidized only to the level demanded by the economy (Huang, 2006). The basic education and vocational schools successfully funneled people into the manufacturing industry, in which few workers chose to migrate. Only students seeking further education and advanced degrees chose to migrate. Therefore, countries should subsidize education that leads to attractive employment in the country itself, rather than subsidizing advanced degree workers who would be forced to seek jobs overseas. By developing and prioritizing a strong basic education, countries will be able to take advantage of international migration in their favor.

Clearly, the economic and political situations in countries will impact the policies they form in relation to highly skilled migration, and some may be better or worse suited to follow the lessons from Taiwan's experience. However, in all cases, well-informed educational policies and active networking with migrants will help countries improve their future migration outcomes.

Conclusion

This paper first laid out the development of Taiwan, focusing on its transitions in international trade and highly skilled migration. As Taiwan's resource endowments changed, it switched from an agriculture-based economy to a labor-intensive manufacturing economy to a capital- and technology- intensive economy. This followed the predictions of the Heckscher-Ohlin model and allowed Taiwan to take advantage of its changing comparative advantage.

Another transition Taiwan experienced was a shift from brain drain to brain circulation. After a period of migration outflow of highly skilled students and workers, Taiwan was able to experience benefits from its overseas diasporas and an increasing return migration rate in the long run. This helped to fuel the high-tech sector and develop the economy.

This was supported by the results of the regression analysis which showed that migration outflow had a positive effect on the output of Taiwan from 1980 to 2000 once the economy of Taiwan was developed enough to create transnational networks. This paper emphasizes the importance for developing countries to support diaspora networking and recruitment, provide an attractive environment for transnational entrepreneurs, and subsidize basic education in order to encourage brain circulation and diaspora networks.

The case study of Taiwan is indicative of the complex effects of highly skilled migration outflows, as well as the important role that diasporas and return migration can play in a country's development. Future research on the effects of brain drain and brain circulation in the least developed countries is important. A global understanding of highly skilled migration flows will improve policy recommendations and outcomes for developing countries.

Acknowledgments

I would like to thank Professor William Lincoln from Claremont McKenna College for his invaluable guidance in the development of this paper.

References

Chang, D. W. (1965). US Aid and Economic Progress in Taiwan. *Asian Survey*, 152-160. https://doi.org/10.2307/2642405

Chang, S. L. (1992). Causes of brain drain and solutions: The Taiwan experience. *Studies in comparative international development*, *27*(1), 27-43. https://doi.org/10.1007/BF02687103

Clark, C. (1987). The Taiwan exception: Implications for contending political economy paradigms. *International Studies Quarterly*, *31*(3), 327-356. https://doi.org/10.2307/2600670

Council for Economic Planning and Development. (1989). Taiwan Statistical Data Book 1989.

Huang, F. (2007). Internationalization of Higher Education in the Developing and Emerging Countries: A Focus on Transnational Higher Education in Asia. *Journal of Studies in International Education*, *11*(3–4), 421–432. https://doi.org/10.1177/1028315307303919

Kulkarni, K. G., & Sun, Q. (2004). Outward looking policies and economic development: A case of Taiwan since 1952. *Global Business Review*, *5*(1), 1-14. https://doi.org/10.1177/097215090400500101

Lee, J. S. (2018). The role of low-skilled foreign workers in the process of Taiwan's economic development. In *Migrant Workers in Pacific Asia* (pp. 41-66). Routledge. https://doi.org/10.1080/713999158

Lin, Y., & Rasiah, R. (2014). Human capital flows in Taiwan's technological catch up in integrated circuit manufacturing. *Journal of Contemporary Asia*, *44*(1), 64-83. https://doi.org/10.1080/00472336.2013.801167

Luo, Y. L., & Wang, W. J. (2002). High-skill migration and Chinese Taipei's industrial development. *International mobility of the highly skilled*, *25369*. https://www.oecd.org/migration/mig/internationalmobilityofthehighlyskilled.htm

Mao, Y. K., & Schive, C. (1995). Agricultural and industrial development in Taiwan. *Agriculture on the Road to Industrialization*, 23-66. http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/129333

Mathews, J. A., & Cho, D. S. (2000). *Tiger technology: The creation of a semiconductor industry in East Asia* (Vol. 389). Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511552229

Patterson, R. (2005). US diasporas and their impacts on homeland technological and socioeconomic development: How does Sub-Sahara Africa compare?. *Perspectives on Global development and Technology*, *4*(1), 83-123. https://doi.org/10.1163/1569150053888245

Rauch, J. E., & Trindade, V. (2002). Ethnic Chinese networks in international trade. *Review of Economics and Statistics*, *84*(1), 116-130. https://doi.org/10.1162/003465302317331955

Saxenian, A. (2005). From brain drain to brain circulation: Transnational communities and regional upgrading in India and China. *Studies in comparative international development*, *40*(2), 35-61. https://doi.org/10.1007/BF02686293

Shin, G. W., & Moon, R. J. (2018). From brain drain to brain circulation and linkage. *Shorenstein Asia-Pacific Research Center Working Paper. Stanford, CA: Stanford University.* https://aparc.fsi.stanford.edu/publication/brain-drain-brain-circulation-and-linkage

United Nations Department of Economic and Social Affairs, Population Division. (2022). World Population Prospects 2022: Summary of Results. https://www.un.org/development/desa/pd/content/World-Population-Prospects-2022

Varas, A., Varadarajan, R., Goodrich, J., & Yinug, F. (2020). Government incentives and US competitiveness in semiconductor manufacturing. *Boston Consulting Group*. https://www.bcg.com/publications/2020/incentives-and-competitiveness-in-semiconductor-manufacturing