Grech V. et al. (2025). *Xjenza Online*, 12(2):152–161.

Xjenza Online: Science Journal of the Malta Chamber of Scientists
www.xjenza.org
DOI: 10.7423/XJENZA.2024.3.05

Research Article

The Influence of Migration on Malta's Demographic Transition: An Observational Study

V. Grech[1], **S. Cuschieri***[2], **M. Gatt**[3], **C. Cordina**[3], **H. Scherb**[4], **N. Calleja**[3]
[1] *Department of Cardiology, Mater Dei Hospital, Msida, Malta*
[2] *Faculty of Medicine and Surgery, University of Malta, Msida, Malta*
[3] *Directorate for Health Information & Research, Ministry of Health, Msida, Malta*
[4] *Helmholtz Zentrum, German Research Center for Environmental Health, Munich, Germany*

Abstract. The demographic transition model (DTM) refers to the historical change from elevated birth and high death rates to low birth and low death rates in more advanced and higher education societies with higher levels of economic development. Malta is a small, central Mediterranean country (population ≈ 500,000) with a high influx of workers. This study was carried out to ascertain secular trends in births in Malta by nationality of mother, including age standardised fertility rates, population levels and employment trends. The study design uses ecological methodology. Births, age-specific fertility rates (ASFR), population and employment data were analysed for 2000-2020. Total births increased from 4,311 in 2000 to 4,420 in 2021 ($p = 0.0001$) as did proportion of non-Maltese births from 5.2 to 46.7% ($p < 0.0001$). Maltese ASFR only was in significant decline ($p = 0.0003$). Total population increased from 388,759 in 2000 to 520,971 in 2022 ($p < 0.0001$) as did the proportion of non-Maltese workers, which increased from 2.2% in 2000 to 20.6% in 2022 ($p < 0.0001$). Maltese and non-Maltese, part-time and full-time employment rates significantly increased ($p < 0.0001$). The proportion of non-Maltese increased for part-time and full-time workers also increased ($p < 0.0001$). Fertility is falling almost globally with ageing population and declining births and populations. In Malta, domestic labour supply cannot keep up with an influx of foreign workers, weathering its demographic transition at the expense of a rapidly expanding population but the long-term results are of significant concern as infrastructures may not cope and a substantial worker efflux for whatever reason could potentially precipitate a significant economic downturn.

Keywords: Demographic transition, Fertility, Malta, Migrants.

1 Introduction

The Total Fertility Rate (TFR) refers to the average number of children a woman is expected to have over her lifetime, given current birth rates. The Replacement Rate is the TFR needed to maintain a stable population size, without migration. In most developed countries, this rate is about 2.1 children per woman. The extra 0.1 accounts for childhood mortality or women who do not have children. If the TFR falls below 2.1, the population will eventually begin to decline, unless offset by immigration (Gietel-Basten & Scherbov, 2020).

In demography, the demographic transition model (DTM) refers to the historical change from elevated birth and high death rates in low technology, low education and poorly developed societies to low birth and low death rates in more advanced and higher education societies with higher levels of economic development (Galor, 2012; Lesthaeghe, 2020). DTM was first mooted in the late 1920s and early 1930s (Davis, 1945; Landry, 1987), and further refined in the following two decades (Woods, 2000). By the 21st century, DTM with a negative correlation between fertility and development/wealth had become an accepted tenet in social science (Lesthaeghe, 2020; Myrskylä et al., 2009). However, debate continues as to which is cause and effect: fertility or development/wealth (Lesthaeghe, 2020). It is also widely accepted that DTM occurs in phases:

The first stage is pre-industrial with high birth and rates in equilibrium with growth rates < 0.05%, as witnessed since the Agricultural Revolution circa 10,000 years ago since growth was constrained by a limited food supply

Correspondence to: S. Cuschieri (sarah.cuschieri@um.edu.mt)

(Chesnais, 1990; Lesthaeghe, 2020). This remained the case globally until the 18th century, whereupon this balance ended initially in Western Europe (Chesnais, 1990; Lesthaeghe, 2020).

In the second stage, in developing countries, death rates plummet due to a better food supply and improved sanitation, reducing disease and increasing life expectancy (Chesnais, 1990). This was first seen in Western Europe in the 18th century with large population increases (Chesnais, 1990; Lesthaeghe, 2020).

Some countries, particularly in Africa, remain stalled in this stage due to stagnant economic development, and this has in turn been attributed to under-investment, under-researched tropical diseases (e.g. Malaria and HIV), poor maternal education, declines in contraceptive use, increases in adolescent fertility, unmet needs for family planning advice and services and drug abuse (Affinnih, 2002; Ezeh et al., 2009; Schoumaker, 2019). However, this is a broad generalisation of an entire continent, with significant regional variations due to the diversity within the African continent regarding fertility trends (Tesfa et al., 2022).

The third stage results in a reduction in births with female education, contraception, and parental investment in childhood education resulting in population growth levelling off, as first witnessed in the late 19th century in northern Europe (Chesnais, 1990; Lesthaeghe, 2020).

In stage four, births drop further, sometimes well below replacement rates. This results in a shrinking workforce that must support the large and ageing cohort born during stage two. Death rates may actually rise slightly due to lifestyle diseases, such as lack of exercise, obesity and smoking (Chesnais, 1990; Lesthaeghe, 2020).

In the 18th century, Jewish populations of Moravia and Bohemia were some of the first populations to experience DTM, and this occurred prior to similar transitions occurring in other populations in this region, including other European Jews and Christians (Vobecká, 2013). Many countries have traversed DTM swiftly due to swift economic and social change (Chesnais, 1990; Lesthaeghe, 2020). Indeed, DTM has been experienced by almost all developing countries and in Europe for example, virtually all countries have total fertility rates below 2.1 (D'Alfonso et al., 2022)

This is different from the Epidemiologic Transition Model (ETM) which refers to the shift in the primary causes of mortality and disease in a society, due to changes in demographic and economic development. It identifies how disease patterns change as a country progresses through the demographic transition stages via The Age of Pestilence and Famine, The Age of Receding Pandemics, The Age of Degenerative and Man-Made Diseases, and The Age of Delayed Degenerative Diseases. Thus, DTM focuses on population changes (birth rates, death rates, and overall population size) due to economic and social development while ETM explains the shifts in causes of death and disease (from infectious to chronic diseases) as a society undergoes development (Yadav et al., 2022).

Malta is a small, central Mediterranean country that has reached a population of approximately half a million, increasing by 100,000 in the last decade alone (National Statistics Office, 2022) the highest proportionate increase in Europe. This has been due to an influx of workers in several industries, notably gaming, as well as workers attracted by resultant growth in collateral industries such as construction and the hospitality industry (M. G. Vella & Mintoff, 2022).

This study was carried out to ascertain secular trends in births in Malta by nationality of mother, including age standardised fertility rates, population levels and employment trends.

2 Materials and methods

2.1 Definitions

The World Health Organization (WHO) defines age-specific fertility rate (ASFR) as "the ratio of annual births to women at the same age or age-group, in the same year, for a given country, territory or geographical area". ASFR is a measure of the relative frequency of live births (per 1000 population) among different ages in females of reproductive potential. ASFR can then be used to compute Total Fertility Rate (TFR) (World Health Organisation, n. d.).

2.2 Data

Births by maternal nationality was obtained from the Malta's National Obstetric Information System (NOIS) for the period 2000-2021, as well as from Eurostat (European Commission, 2014; Ministry for Health and Active Aging, n. d.) Data was anonymised and aggregated by year. Population data was obtained from the website of the National Statistics Office Malta (nso.gov.mt). Employment data was obtained from the website of Jobsplus Malta (jobsplus.gov.mt). A copy of the data can be found in the Appendix.

Due to data anonymity, data protection and ethics approval were not required.

2.3 Statistical analysis

The ASFR was calculated for each year (2000 – 2021) then the TFR was computed. All tests were two-tailed.

Analyzing trends in demographic and epidemiological data is a straightforward statistical method for explor-

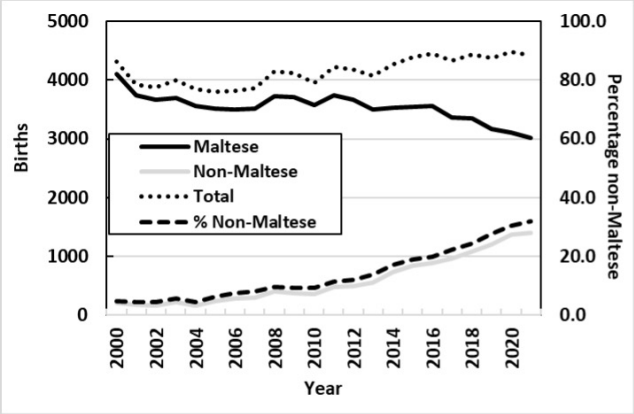

Figure 1: Births by nationality (Maltese and non-Maltese).

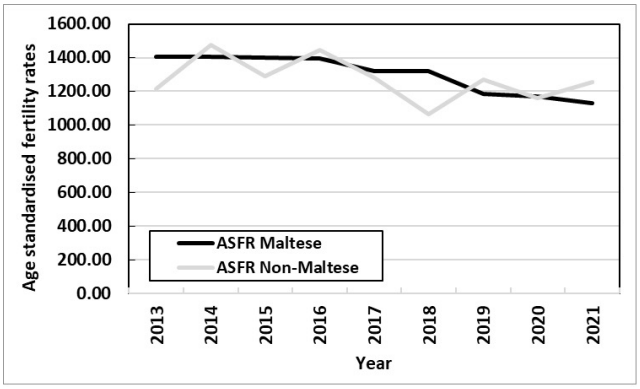

Figure 2: Age standardised fertility rates by nationality (Maltese and non-Maltese).

ing and answering scientific questions. Researchers often investigate hypotheses about how ecological and demographic variables evolve over time, along with their changing factors and interactions. These trends and changepoints can be visualized clearly, and their effects tested and measured using a variety of statistical techniques, including point and interval estimation.

Temporal trends were analysed with Kendall correlation and chi for trend using bespoke Excel spreadsheets (V. Grech, 2018a, 2018b) Kendall (non-parametric) correlation was preferred over Pearson (parametric) correlation due to the relatively small number of datapoints (just over 20). Chi for trend (Cochran-Armitage test for trend), is used to evaluate whether there is a linear trend in proportions across ordered categories and is commonly used where data is organized into contingency tables, and there is a hypothesis that proportions increase or decrease in a stepwise manner across categories. This is thus an extension of the chi-square test of independence but is specifically designed to assess trends.

Additionally, Poisson regression is commonly used for analysing absolute counts, and any overdispersion can be addressed by adjusting the covariance using the deviance divided by the degrees of freedom. These additional three tests were also performed

1. Log-linear Poisson regression (adjusted for overdispersion)
2. Negative Binomial regression
3. Two-way Anova

The main effects tested are time (year) and nationality (dummy variable: Maltese[0] vs. Non-Maltese[1]), the interaction tested is nationality x time.

The software tools utilized for this analysis included MS Excel 365, R version 3.5.1, Wolfram MATHEMATICA 11.3, and predominantly SAS/STAT software version 9.

A p value ≤ 0.05 was considered a statistically significant result.

3 Results

Births by nationality (77,821 Maltese and 12,959 non-Maltese, total 90780) are shown in Fig. 1. Total births increased significantly from 4,311 in 2000 to 4,420 in 2021 (Kendall's tau beta 0.61, $p = 0.0001$). The proportion of non-Maltese births increased significantly from 4.9 to 31.9% (chi for trend 1570.8, $p < 0.0001$). Age standardised fertility rates are shown in Fig. 2. Mean ASFR for Maltese and non-Maltese were 1302.66and 1272.27 respectively. The Maltese rate was in significant decline over the study period (Kendall's tau beta -1.06, $p = 0.0003$) while the non-Maltese rate showed no significant trends.

Population by nationality (Maltese and non-Maltese) are shown in Fig. 3. Total population increased significantly over the period studied from 388,759 in 2000 to 520,971 in 2022 (Kendall's tau beta 1.0, $p < 0.0001$). The proportion of non-Maltese increased significantly from 2.2% in 2000 to 20.6% in 2022 (chi for trend 100149.9, $p < 0.0001$). Employment by nationality (Maltese and non-Maltese, part-time and full-time) are shown in Fig. 4. Maltese full time increased from 133,136 in 2002 to 171,477 in 2022, part-time from 16418 to 27663, non-Maltese full time from 3,514 to 91,284, part-time from 340 to 5,686. All four trends were significant (Kendall's tau beta 0.99, $p < 0.0001$). The proportion of non-Maltese increased for both part-time and full-time workers increased significantly, the former from 2.6% to 34.7%, the latter from 2.0 to 17% (chi for trend 79676.5 and 6816.0 respectively, $p < 0.0001$).

Poisson regression and negative Binomial regression expectedly yield nearly identical estimates with similar precision. All effects are highly significant ($p \leq 0.0005$). Concerning the significance of the nationality x time in-

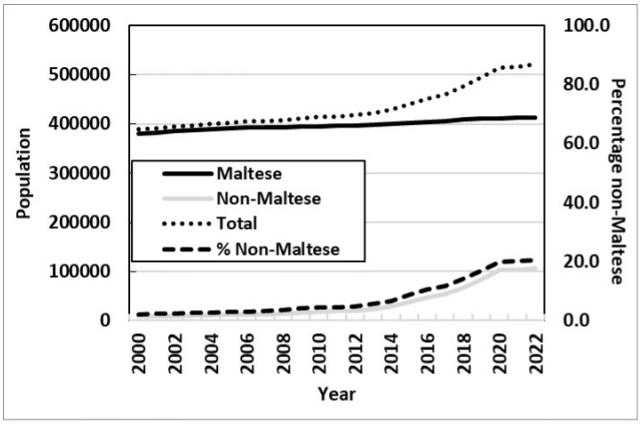

Figure 3: Population by nationality (Maltese and non-Maltese).

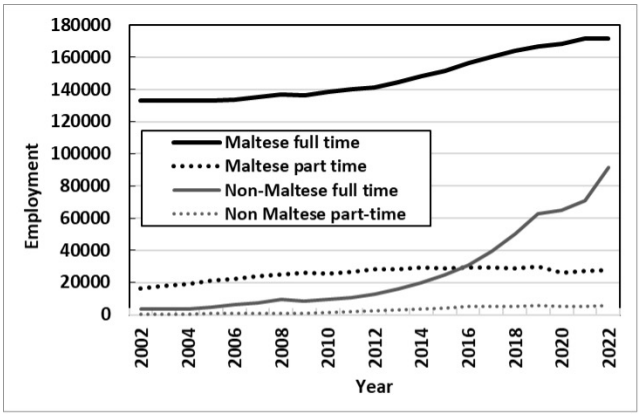

Figure 4: Employment by nationality (Maltese and non-Maltese, part-time and full-time).

teraction, a two-way ANOVA confirms the results of the regression analyses (Tab. 1, and Figs. 5 and 6).

3.1 Discussion

Thus far, Malta has evaded or delayed the seemingly inevitable demographic transition. However, this must be taken in terms of the global and temporal context. Since the Industrial Revolution circa 250 years ago, global wealth and population have surged, but for the first time since the world was afflicted by Bubonic plague (Durand, 1977), the population may shrink dramatically due to a collapse in birth rates (The Economist, 2023). In 2000 the global fertility rate was 2.7 births/woman, above the 2.1 replacement rate at which a population is stable. In 2021, this figure was 2.21 and falling (Statista, n. d.) The fertility rate of the fifteen largest economies by gross domestic product have fertility rates below the replacement rate and this includes most developed countries as well as China and India i.e., more than a third of the global population (The Economist, 2023) Malta's total fertility rate in 2021 was the lowest in the EU at 1.13 (Eurostat, n. d.).

It has been speculated that DTM occurs due to "shifting priorities" which reflect changes in preferences not only for having children, but also parenting norms and life aspirations (Kearney et al., 2022) Declining marriage rates, an increase in the average marriage age, natural loss of fertility with higher age at attempted pregnancy and concerns regarding the economic burdens of having children have also been mooted (Cabinet Office, 2022; Iijima & Yokoyama, 2018) The end result of DTM is a rise in a country's median age and a growing proportion of retirees, coupled with a shrinking labour force (Kuhn & Neusius, 2022). This transition has occurred in most industrialized countries since the end of the nineteenth century albeit in different ways and rates due to social, political and economic differences (Galor, 2012; Lesthaeghe, 2020)

For example, a declining birth rate in the United Kingdom was remarked upon in the medical literature as far back as 1914 (Dunlop, 1914). A similar reduction was noted in the United States since the Great Depression of 1929 – 1939, a decline in almost all groups including teens, Hispanics and college-educated white women (Kearney et al., 2022). The transition has been even more acute in countries such as Japan and Italy (Cabinet Office, 2022; Iijima & Yokoyama, 2018). Furthermore, certain regions of Spain such as the Basque country and Galicia have birth rates below 1 (Bosch, 1998) Indeed, even in China, TFR fell to 1.3 in 2020 (Kuhn & Neusius, 2022).

This transition has also been seen in smaller European countries (like Malta), such as in Luxembourg, wherein younger individuals (aged 0-19 years) are relatively becoming less numerous, while the population bands aged 40-64 and 80 and over is increasing in relative terms (Statistiques.lu, n. d.). The same type of change is also seen in Cyprus, another small European country (Lamnisos et al., 2021).

Most governments view DTM with ensuing aging and declining populations as threats to national influence and to the welfare state (Cincotta & Weber, 2021; de Kaa, 1987). Pronatalist incentives such as restrictions on termination of pregnancy and economically costly state incentives to boost family sizes have repeatedly failed (Cincotta & Weber, 2021; de Kaa, 1987), with very few notable exceptions (Lalljee, 2023). Many countries have imposed strict controls on migration and have attempted integration of these minorities, typically without success (Cincotta & Weber, 2021; de Kaa, 1987).

Malta has experienced continuous economic growth, prosperity and quality of life since the 1960s, shifting from one of the largest relative deficits in the euro area to one

Method	Maximum Likelihood Analysis						
Poisson regression adjusted for overdispersion	Parameter	DF	Estimate	SE	Wald 95 % CL		Wald ChiSq	*p* value
	Intercept	1	8.360	0.032	8.297	8.424	66428.700	< 0.0001
	Nationality	1	-4.807	0.111	-5.025	-4.589	1866.280	< 0.0001
	Time	1	-0.008	0.001	-0.011	-0.005	34.960	< 0.0001
	Nationality x Time	1	-4.807	0.111	-5.025	-4.589	1866.280	< 0.0001
	Scale		2.388	0.000	2.388	2.388		
Negative binomial regression	**Maximum Likelihood Analysis**							
	Parameter	DF	Estimate	SE	Wald 95 % CL		Wald ChiSq	*p* value
	Intercept	1	8.363	0.057	8.251	8.474	21600.400	< 0.0001
	Nationality	1	-4.783	0.099	-4.977	-4.590	2350.410	< 0.0001
	Time	1	-0.008	0.002	-0.013	-0.004	12.290	0.0005
	Nationality x Time	1	0.117	0.004	0.110	0.125	915.050	< 0.0001
	Scale		0.003	0.001	0.001	0.007		
Two-way ANOVA	**ANOVA table ($R^2 = 0.9991$)**							
	Parameter	DF	Anova SS		mean square		*F* value	*p* value
	Intercept	1	95615432.82		95616432.82		20773.9	< 0.0001
	Nationality	1	629728.30		57248.03		12.44	< 0.0001
	Nationality x Time	11	3932645.93		357513.27		77.68	< 0.0001

Table 1: Log-linear Poisson regression (adjusted for overdispersion), Negative Binomial regression and Two-way Anova, with main effects time (year) and nationality (dummy variable: Maltese[0] vs. Non-Maltese[1]), as well as the interaction nationality x time. DF — degrees of freedom; SE — standard error; CL — confidence limits; SS — sum of squares.

of the highest surpluses and this has been ascribed to structural developments, such as improving energy facilities and a decline in import content (A. G. Grech, 2019). Indeed, Malta has developed from a military base into a resilient, robust and diversified economy, despite constraints on natural resources (Malta Employers' Association, 2017). This has been variously attributed to a strong sense of entrepreneurship, to new job creation, a hardworking and flexible labour force, a cohesive society with positive values, infrastructure investment and European Union membership (Malta Employers' Association, 2017). The downside is that wealth inequality has increased significantly over these decades (Georgakopoulos, 2019). Furthermore, the country faces infrastructural challenges that have reduced its attractiveness to investors. Indeed, a recent survey of foreign direct investor companies showed that 70% of respondents view Malta's infrastructure as inadequate to support the anticipated population expansion and an additional 19% perceive infrastructure planning and development as neither adequate nor inadequate, implying a sense of uncertainty/ambivalence with regard to the country's readiness for such population expansions. It is clear that "the growing demands of a rapidly expanding population and economy are exerting considerable pressure on existing systems, highlighting the urgency for comprehensive and forward-thinking infrastructure development" (EY, 2024). Furthermore, Malta needs economic diversification not only by the addition of new sectors, but also by diversifying existing ones to create a state of readiness and resilience in the face of potential economic shocks (Weekly, 2024).

However, Malta's population is rapidly ageing, a typical fourth phase DTM with increasing life expectancy and decreasing fertility rates (Formosa, 2019), with over 18% of the total population aged 65+ years in 2017, and with projections expecting this country to have one of the fastest ageing populations in Europe (M. Vella & von Brockdorff, 2019) Projections estimate that the 65+ and 80+ aged populations will climb from 17.5% and 3.8% in 2013 to 28.5% and 10.5% of the total population by 2060 (M. Vella & von Brockdorff, 2019). Unmitigated, this will impact the labour market, health care, and long-term care (M. Vella & von Brockdorff, 2019).

Nevertheless, despite low unemployment and increased female participation in the workforce, the domestic labour supply has been unable to keep up with demand and with the skillsets needed.(Malta Employers' Association, 2017). This has resulted in a progressive increase in foreign employees, with 18% of the workforce being foreign in 2017 (Malta Employers' Association, 2017).

Thus, from a protectionist mentality, the country has

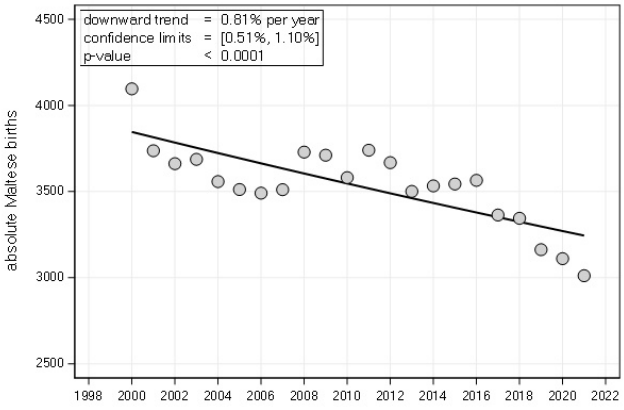

Figure 5: Births in Malta and log-linear Poisson regression trend: Maltese births

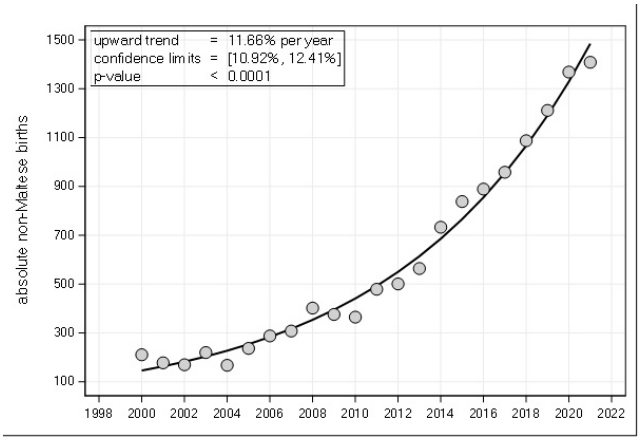

Figure 6: Births in Malta and log-linear Poisson regression trend: non-Maltese births

moved to embrace these workers as necessary to sustain economic growth (Malta Employers' Association, 2017). This is potentially dangerous in that foreign workers are now vital for continuing economic growth under current economic conditions, a potential vicious cycle that challenges Malta's size and the sustainability of the entire economic model (Malta Employers' Association, 2017). This has also been clearly identified as a sustainability threat by the European Commission (European Union, 2020). Indeed, current projections envisage even more foreign workers, such that if the public sector employs 50,000 persons from an estimated labour force of 220,000, > 30% of private sector employees will be foreign, and 30% of Maltese employees will be employed in the public sector since virtually all foreigners are employed in the private sector (Malta Employers' Association, 2017). The trends are concerning - Malta's current Finance Minister has referred to a study by Malta's Economic Policy Department which showed that to maintain an economic growth rate of 4.2%/annum (as recently experienced) with the current economic model, Malta's population would have to increase to 800,000 by 2040, unless a new economic model was developed (N. Borg, 2023).

This is a potentially volatile population proportion as it has been shown that 45% of foreign workers left Malta after a period of between one and two years and only circa 30% remain in the Maltese labour for longer (I. Borg, 2019). This significantly lowers these workers' rate of local economic assimilation (I. Borg, 2019). Furthermore this high worker turnover places significant pressures on the human resource departments, and this is aggravated by the need to source workers from overseas (I. Borg, 2019). Any cyclicality that precipitates significant foreign worker exodus would drop the economy into recession, decreasing labour demand and further exacerbating the exodus in their search for work outside the country, and a recovery phase would be prolonged by the need to reimport workers (I. Borg, 2019).

4 Conclusion

Malta has changed from a country of emigrants to one of returning Maltese emigrants along with an international influx of workers of diverse nationalities and skillsets. The country has been likened to an economic miracle with social and economic metrics comparable with those of the world's major economies (Malta Employers' Association, 2017). It has been stated that "immigration as a solution is unfeasible" (Cincotta & Weber, 2021; de Kaa, 1987), however, Malta appears to have been weathered the European Union's DTM (Palma, 2021; Pinkerton, 1995), with a slow but steady population rise due to an influx of non-Maltese workers (M. G. Vella & Mintoff, 2022) coupled with an increased proportion of births from these workers that has mitigated the drop in Maltese births, as shown in this study. This has bolstered the workforce and since these workers pay tax and national insurance contributions, DTM and its negative consequences have been thus far averted but the long-term results are of significant concern.

Conflict of interest statement The authors all declare no competing interests. This research received no specific grant from any funding agency, commercial entity or not-for-profit organization.

References

Affinnih, Y. H. (2002). Revisiting sub-Saharan African countries' drug problems: Health, social, economic costs, and drug control policy. *Substance Use & Misuse*, *37*(3), 265.

Borg, I. (2019). The length of stay of foreign workers in Malta.

Borg, N. (2023). Malta's population could increase to 800,000 by 2040 - clyde caruana. *Times of Malta*.

Bosch, X. (1998). Investigating the reasons for Spain's falling birth rate. *The Lancet*, *352*(9131), 887.

Cabinet Office. (2022). *Annual report on the declining birthrate 2022 (summary)* (tech. rep.).

Chesnais, J.-C. (1990). Demographic transition patterns and their impact on the age structure. *Population and Development Review*, 327–336.

Cincotta, R., & Weber, H. (2021). Youthful age structures and the risks of revolutionary and separatist conflicts. In *Global political demography: The politics of population change* (pp. 57–92). Springer International Publishing Cham.

D'Alfonso, A., Ludovisi, M., Palermo, P., Serva, A., Polsinelli, V., Bruno, M., Tiberi, A., Tabacco, S., Di Florio, C., & Guido, M. (2022). Sex ratio at birth: Causes of variation and narrative review of literature. *Minerva Obstetrics and Gynecology*.

Davis, K. (1945). The world demographic transition. *The Annals of the American Academy of Political and Social Science*, *237*(1), 1–11.

de Kaa, D. J. (1987). Europe's second demographic transition. *Population Bulletin*, *42*(1), 1–59.

Dunlop, B. (1914). The falling birth-rate. *British Medical Journal*, *1*(2775), 566–567.

Durand, J. D. (1977). Historical estimates of world population: An evaluation. *Population and Development Review*, *3*(3), 253–296.

European Commission. (2014). Eurostat statistics database.

European Union. (2020). EUR-Lex - 52020SC0517 - EN - EUR-Lex [Accessed: February 20, 2025].

Eurostat. (n. d.). Fertility statistics - statistics explained [Accessed: February 20, 2025].

EY. (2024). Future realized. ey attractiveness survey malta - 20 years on.

Ezeh, A. C., Mberu, B. U., & Emina, J. O. (2009). Stall in fertility decline in Eastern African countries: Regional analysis of patterns, determinants and implications. *Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences*, *364*(1532), 2991–3007.

Formosa, M. (2019). Measuring and modelling demographic trends in Malta: Implications for ageing policy. *International Journal on Ageing in Developing Countries*, *4*(2), 78–90.

Galor, O. (2012). The demographic transition: Causes and consequences. *Cliometrica*, *6*(1), 1–28.

Georgakopoulos, I. (2019). Income and wealth inequality in Malta. *International Journal of Social Science Studies*, *7*, 58–71.

Gietel-Basten, S., & Scherbov, S. (2020). Exploring the 'true value' of replacement rate fertility. *Population Research and Policy Review*, *39*(4), 763–772.

Grech, A. G. (2019). From a deficit to a surplus country: The case of malta. *European Scientific Journal*, *15*(4), 130–142.

Grech, V. (2018a). Wasp (write a scientific paper) using excel - 10: Contingency tables. *Early Human Development*, *121*, 65–68.

Grech, V. (2018b). Wasp (write a scientific paper) using excel - 13: Correlation and regression. *Early Human Development*, *122*, 60–63.

Iijima, S., & Yokoyama, K. (2018). Socioeconomic factors and policies regarding declining birth rates in japan. *Nihon eiseigaku zasshi. Japanese journal of hygiene*, *73*(3), 305–312.

Kearney, M. S., Levine, P. B., & Pardue, L. (2022). The puzzle of falling US birth rates since the great recession. *Journal of Economic Perspectives*, *36*(1), 151–176.

Kuhn, B., & Neusius, T. (2022). Will China's three-child policy defuse the demographic time bomb?

Lalljee, J. (2023). Japanese town with high birth rate charges visitors to learn its baby-making tips.

Lamnisos, D., Giannakou, K., & Jakovljevic, M. M. (2021). Demographic forecasting of population aging in Greece and Cyprus: One big challenge for the Mediterranean health and social system long-term sustainability. *Health Research Policy and Systems*, *19*(1), 21.

Landry, A. (1987). Adolphe Landry on the demographic revolution. *Population and Development Review*, *13*(4), 731–740.

Lesthaeghe, R. (2020). The second demographic transition, 1986–2020: Sub-replacement fertility and rising cohabitation-a global update. *Genus*, *76*, 1–38.

Malta Employers' Association. (2017, November). *Malta's demographic challenges a position paper by the Malta Employers' Association* (tech. rep.).

Ministry for Health and Active Aging. (n. d.). Directorate for health information and research [Accessed: February 20, 2025].

Myrskylä, M., Kohler, H.-P., & Billari, F. C. (2009). Advances in development reverse fertility declines. *Nature*, *460*(7256), 741–743.

National Statistics Office. (2022). *Census of population and housing 2021: Final report: Population, migration and other social characteristics (volume 1)* (tech. rep.).

Palma, A. (2021). Fertility trends in european countries. *Acta Universitatis Lodziensis. Folia Oeconomica*, *2*(353), 7–28.

Pinkerton, D. (1995). The european experience of declining fertility: A quiet revolution, 1850-1970. *Continuity and Change*, *10*(2).

Schoumaker, B. (2019). Stalls in fertility transitions in sub-Saharan Africa: Revisiting the evidence. *Studies in Family Planning*, *50*(3), 257–278.

Statista. (n. d.). World - fertility rate 2011-2021 [Accessed: February 20, 2025].

Statistiques.lu. (n. d.). Evolution of the population [Accessed: February 20, 2025].

Tesfa, D., Tiruneh, S. A., Gebremariam, A. D., Azanaw, M. M., Engidaw, M. T., Kefale, B., Abebe, B., Dessalegn, T., & Tiruneh, M. (2022). The pooled estimate of the total fertility rate in sub-Saharan Africa using recent (2010-2018) demographic and health survey data. *Frontiers in Public Health*, *10*, 1053302.

The Economist. (2023). Global fertility has collapsed, with profound economic consequences. *The Economist*.

Vella, M., & von Brockdorff, P. (2019). Pensions across generations: Scenarios for the maltese islands. *Journal of International and Comparative Social Policy*, *35*(3), 280–298.

Vella, M. G., & Mintoff, Y. (2022). *Debt and domination: Maltas usurious economy* (tech. rep. No. 02 / 2022 D). OCCASIONAL PAPERS ON ISLANDS and SMALL STATES.

Vobecká, J. (2013). *Demographic avant-garde: Jews in Bohemia between the enlightenment and the shoah*. Central European University Press.

Weekly, T. M. B. (2024). Malta needs economic diversification not just in new sectors, but also existing ones.

Woods, R. (2000). *The demography of victorian England and Wales* (Vol. 35). Cambridge University Press.

World Health Organisation. (n. d.). Specific fertility rate in women 15-19 years of age.

Yadav, S., Perianayagam, A., Patel, S. A., & Cunningham, S. A. (2022). The role of age inequalities in cause of death in the slow pace of epidemiological transition in India. *Scientific Reports*, *12*(1), 20291.

Appendix A—Data for Figure 1

	Births			
Year	**Maltese**	**Non-Maltese**	**Total**	**% Non-Maltese**
2000	4096	211	4311	4.9
2001	3737	178	3918	4.5
2002	3662	170	3873	4.4
2003	3687	220	3995	5.6
2004	3558	168	3838	4.5
2005	3512	237	3804	6.3
2006	3491	288	3822	7.6
2007	3511	308	3853	8.1
2008	3729	402	4154	9.7
2009	3711	376	4112	9.2
2010	3581	365	3952	9.2
2011	3740	479	4226	11.4
2012	3668	501	4175	12.0
2013	3501	564	4073	13.9
2014	3533	733	4275	17.2
2015	3544	838	4385	19.1
2016	3565	889	4455	20.0
2017	3364	958	4325	22.2
2018	3345	1087	4434	24.5
2019	3163	1211	4379	27.7
2020	3111	1368	4481	30.5
2021	3012	1408	4420	31.9

Appendix Appendix B—Data for Figure 2

Age standardised fertility rate		
Year	ASFR-Maltese	ASFR-Non-Maltese
2013	1403.63	1214.72
2014	1403.26	1475.06
2015	1402.01	1290.20
2016	1393.66	1444.93
2017	1320.81	1280.30
2018	1319.41	1063.06
2019	1184.19	1270.95
2020	1167.45	1157.91
2021	1129.57	1253.27

Appendix Appendix C—Data for Figure 3

	Population			
Year	Maltese	Non-Maltese	Total	% Non-Maltese
2000	380201	8558	388759	2.2
2001	382525	8890	391415	2.3
2002	385077	9564	394641	2.4
2003	386938	10358	397296	2.6
2004	388867	11000	399867	2.8
2005	390669	11999	402668	3.0
2006	392840	12159	405616	3.0
2007	392215	13401	405616	3.3
2008	393107	14725	407832	3.6
2009	394135	16791	410926	4.1
2010	395075	18952	414027	4.6
2011	395850	19139	414989	4.6
2012	397244	20302	417546	4.9
2013	398898	23611	422509	5.6
2014	400404	29020	429424	6.8
2015	401868	37823	439691	8.6
2016	403480	46935	450415	10.4
2017	405976	54321	460297	11.8
2018	408556	67145	475701	14.1
2019	410292	83267	493559	16.9
2020	411384	103180	514564	20.1
2021	412382	103718	516100	20.1
2022	413597	107374	520971	20.6

Appendix Appendix D—Data for Figure 4

	Maltese		Non-Maltese	
Year	Maltese full time	Maltese part time	Non-Maltese full time	Non-Maltese part time
2002	133136	16418	3514	340
2003	132841	17723	3350	420
2004	133210	19276	3617	501
2005	133144	20948	4726	617
2006	133597	22353	6132	707
2007	135130	24017	7484	707
2008	136788	25103	9262	725
2009	136166	26234	8712	818
2010	138285	25803	9529	1158
2011	140101	26720	10708	1680
2012	141409	28092	12637	2205
2013	144526	28468	15842	2849
2014	148494	29401	19793	3778
2015	151748	28942	24682	4321
2016	156226	29351	30811	4955
2017	160366	29302	39234	5175
2018	164192	29063	50254	5394
2019	166758	29969	62563	5473
2020	168368	26154	65094	5281
2021	171395	26990	71110	5285
2022	171477	27663	91284	5686