INTERNATIONAL MONETARY FUND

MALTA

SELECTED ISSUES

January 2025

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SELECTED ISSUES

December 17, 2024

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European Department	(SPR), and J. Gu (SPR).

CONTENTS

TAKING STOCK OF INFRASTRUCTURE IN MALTA[1]

Malta's rapid growth over the past two decades has gone hand in hand with a significant expansion of the population. This has created bottlenecks in infrastructure, which will need to be addressed in the medium term.

A. Introduction

1.   Malta's economic performance over the past decade has been remarkable. Between 2014 and 2019, growth averaged 7½ percent per annum, and per-capita income rose from 69 percent of the Euro Area average to 84 percent, and further to 92 percent in 2023. The economy also suffered relatively little during the pandemic (output contracted by only 3.5 percent in 2020), and recovered rapidly.

2.   Economic growth has been accompanied by significant immigration to supply the labor force required to expand the tourism industry and other industries, including professional services, ICT, and gaming. As a result, since 2014 the population has grown by one-quarter to around 563,000 at end-2023, raising the population density to 1,789 persons per km^2 (and on the main island to 2,121 persons per km^2). With that, Malta is by far the most densely populated country in the EU. At the same time, tourism arrivals increased from 1.7 million in 2014 to just under 3 million in 2023 (though the average number of nights declined somewhat).

3.   The high population density, combined with high tourist arrivals, is straining Malta's infrastructure and necessitates investments to keep up with projected population growth. At the same time, limited available land constrains certain infrastructure segments, such as housing and road transport, whereas water and power supplies can be expanded significantly with adequate investment.

4.   According to Eurostat, Malta's population is projected to grow by 28 percent by 2040 under the baseline and could approach 40 percent in a high-immigration scenario.[2] This will put significant strains on public infrastructure. The following sections will discuss current and prospective capacity constraints in power supply, water supply, wastewater treatment, waste management, and transportation.

Population Projections
(1,000)

Sources: Eurostat, and IMF staff estimates and projections.

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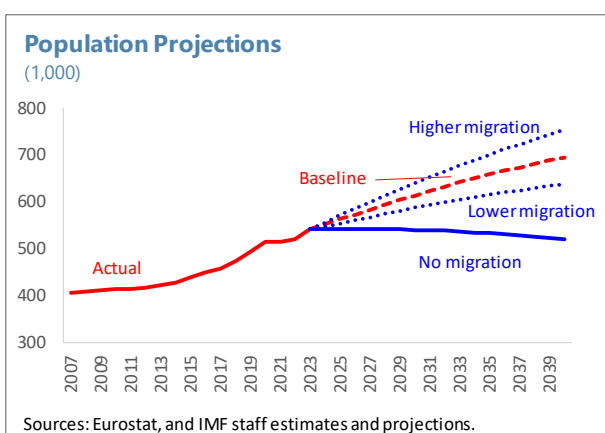
[1] Prepared by Alexander Pitt. The author thanks participants of a workshop held at the Central Bank of Malta for useful discussions and comments.

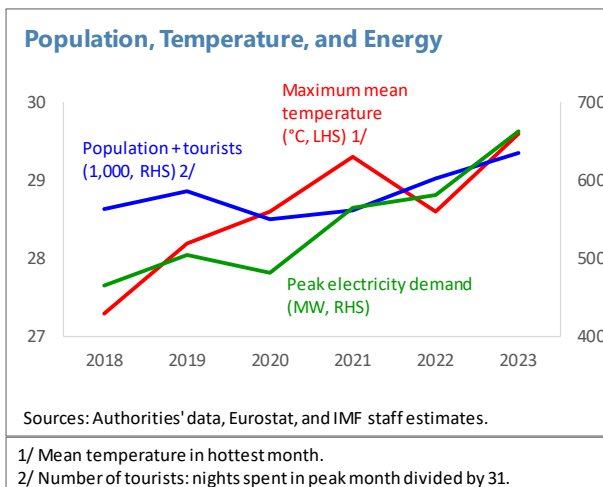[2] This assumes a gradually declining net immigration from 2028 onward.

B.   Power

5.   Peak electricity demand has increased rapidly in recent years, rising from 465 MW in 2018 to 663 MW in 2023 (an increase of 43 percent). This increase has significantly outpaced the growth in population and tourists in the peak summer season (an increase of 13 percent over the same period). In part, this may be related to the rise in mean temperatures in the hottest month from 27.3 °C to 29.6 °C.[3]

6.   While rising temperatures are likely to lead to increased demand for air conditioning and hence, electric power, other factors also play a role. Notably, Malta's fleet of electric vehicles (EVs) grew by around 50 percent in 2023 and more than doubled since 2021 (Box 1). Also, the introduction of shore-to-ship power to reduce air pollution from visiting cruise ships is adding to power demand.

Population, Temperature, and Energy

Sources: Authorities' data, Eurostat, and IMF staff estimates.

1/ Mean temperature in hottest month.
2/ Number of tourists: nights spent in peak month divided by 31.

Box 1. Malta: Electric Vehicles

Malta is an ideal environment for EVs. The islands' (Malta island and Gozo) small size makes 'range anxiety' a non-issue (except when vehicles are ferried to the European mainland). At end-2023, about 1.3 percent of passenger cars were fully electric (EU average: 1.7 percent, EU median: 1 percent), and 7.8 percent of motorcycles. Overall, 13,000 EVs (though more than 60 percent are motorcycles, e-bikes, and scooters) are registered, out of 438,000 vehicles in total.

The government aims to increase the number of EVs to 65,000 by 2030, representing about 13 percent of all vehicles.[1] To reach this ambitious target—which implies annual growth of 26 percent from end-2023—under the National Recovery and Resilience Plan (NRRP), the government has introduced large subsidies to encourage people to buy EVs. In addition, it provides scrapping incentives for conventional cars, is installing a network EV charging station, and is procuring electric buses for public transport.[2]

The expected rapid growth of EVs should significantly increase demand for electricity over the next decade. While EVs do not necessarily add to peak demand—and can even act as a battery, feeding electricity into the grid when not in use—they do add to overall demand for electric power.

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[1] This assumes that the population grows in line with baseline projections, and the ratio of vehicles to population remains constant at 0.81 (the level in 2023).

[2] The subsidies will be reduced in 2025 but remain generous when compared to other EU member states.

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[3] Peak temperatures rose from 34 °C to almost 42 °C over the same period.

7.   The installed capacity of fossil fuel-fired power plants (largely gas, dual fuel, and gas oil) and renewables (largely photovoltaic—PV), combined with the import capacity provided by the interconnector cable with Italy appears adequate for the time being (Table 1). The construction of a second interconnector (225 MW capacity) scheduled for completion in 2026, the planned addition of battery storage and a waste incinerator, and the continued growth of renewables will provide additional capacity.[4,5]

Table 1. Malta: Power Capacity

Generation	777
Fossil fuels	533
Photovoltaic	241
Other renewable	3
Import	225
Total	**1,002**

Source: NSO, authorities.

Note: Additional temporary diesel power generation capacity of 60 MW has been installed in 2023.

8.   On the demand side, the authorities project an increase of peak power demand of around 30 percent by 2040 under a high-temperature and high-population growth scenario. Under this scenario, new generation and/or import capacity would be needed around 2033. Assessments are underway to identify options for additional generation capacity post-2030, including, possibly, further interconnectivity, to address the N-1 policy to ensure security of supply. In addition, the authorities are also planning to further increase PV capacity and battery storage, as well as develop offshore wind farms. However, due to the depth of the Mediterranean Sea around Malta, the latter will have to be built on floating platforms, which is a relatively new technology compared to traditional bottom-fixed offshore wind and could lead to technical challenges.

Power Capacity and Demand
(MW)

Total capacity (excl. PV) 1/

N-1 capacity (excl. PV) 1/

Peak demand (max. temperatures)
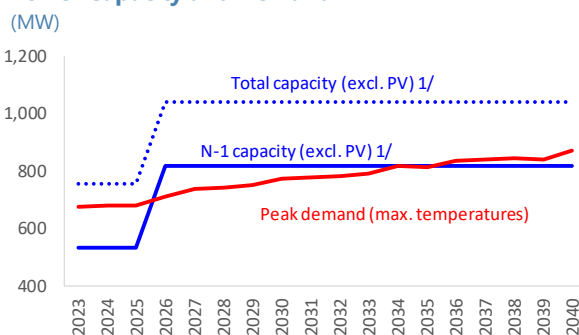
1/ Excludes temporary back-up generators.
Sources: Authorities, and IMF staff estimates and projections.

9.   The authorities also intend to incentivize energy efficiency measures and enhance consumer flexibility. This would, however, require additional investments in smart grids that can, for example, integrate EVs as flexible storage units.

C. Water

10.   The Water Services Corporation (WSC) is the main supplier of water for households and the service industries, including tourism. Ninety percent of the water supplied by the WSC is

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[4] A rise in power outages in 2023 was unrelated to the capacity of the system to provide enough power *per se*; however, the capacity of the distribution network has not kept pace with demand spikes, especially during heat waves. In response, the ENEMALTA (the main electricity supplier and sole distributor) has made significant investments in the distribution infrastructure and also added mobile decentralized (diesel) power generation capacity, and power outages in 2024 have been reduced.

[5] The authorities maintain an "N-1" policy, which stipulates that power supply must be guaranteed even in the event of the failure of the largest power plant or the interconnector with Italy (in future one of the then two interconnectors).

directed to these sectors.[6] Hence, water use from the WSC and population (including tourists) are closely correlated. Currently, around 36 percent of the public water supply comes from fresh groundwater and surface water, while the remainder is produced by reverse osmosis (RO) desalination plants. The amount of groundwater abstraction has been relatively stable at around 13 million m^3 per year, while the production of desalinated water has steadily increased, from around 17 million m^3 per year during 2004-13 to around 20 million m^3 in 2014-23 (and 24 million m^3 in 2023). Losses have been reduced significantly since 2004 but still amount to some 10 percent of total water pumped into the mains.

11.   Water demand is set to rise. With the population growing in the baseline scenario to 695,000 by 2040 and growth of tourist arrivals conservatively assumed at 3 percent per year (well below the average over the last decade) with a constant length of stay, the demand for fresh water is estimated to reach about 45 million m^3 per year by 2040. If groundwater abstraction declines from around 13 million m^3 to 10 million m^3 over the next 10 years and losses are contained at around 4 million m^3 (which would reduce the loss rate to below

Water Use and Supply Capacity
(million m^3)

Sources: Authorities' data, Eurostat, and IMF staff estimates and projections.

10 percent), this implies a need to produce around 36 million m^3 of desalinated water per year then. Malta's RO plants currently have a production capacity of 35 million m^3 per year. However, investments are planned to increase capacity to 41 million m^3 in 2025 and 47 million m^3 by 2028.
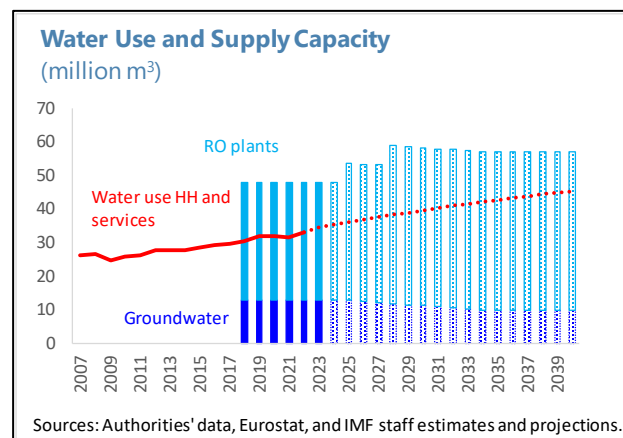
D. Wastewater

12.   The entire population of Malta is connected to wastewater treatment plants (the first country in the EU). However, the share of urban wastewater discharged untreated into the sea is rising and stands currently at 30 percent.[7] The share of wastewater receiving at least secondary treatment according to EU requirements is 7½ percent, far below the EU average of 81 percent and in violation of EU directives (though the average pollution removal rate is 80 percent). While some investments have been made to enhance the
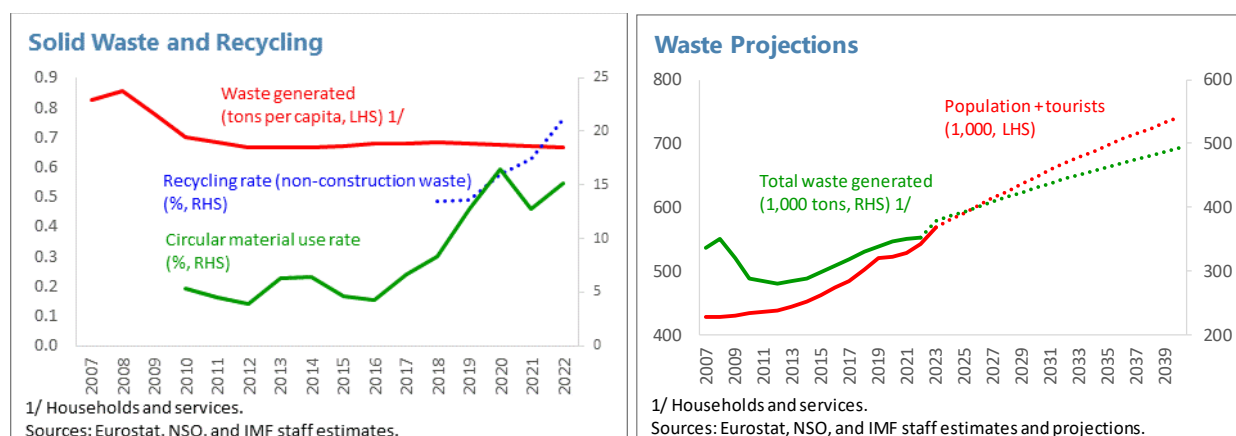

Wastewater

Source: NSO.

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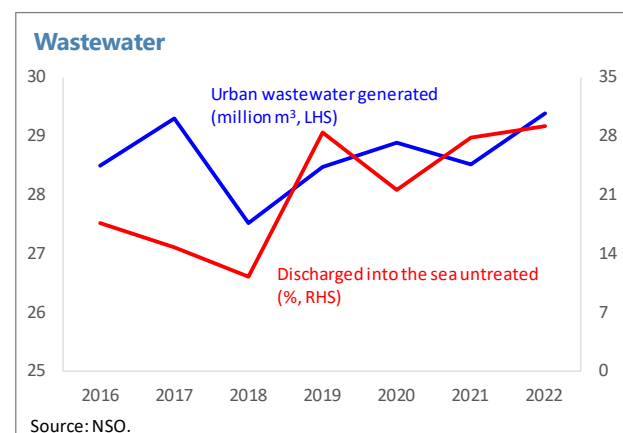
[6] Some hotels have their own water supply (reverse osmosis plants). The industrial and agricultural sectors also have their own sources, mainly groundwater abstraction.

[7] To a significant extent, this is because farmyard wastewater is connected to the urban wastewater collection system.

capacity of treatment plants, more will be needed to reach EU standards and keep pace with an expanding population and tourism flows. In this regard, several wastewater treatment and sludge management facilities are to be upgraded by 2027, and the authorities are planning to disconnect farmyard waste from the urban wastewater collection network, thereby improving the operational capacity of the current wastewater treatment infrastructure. Measures to curb seawater infiltration and stormwater runoff intrusion are also underway.

E. Solid Waste

13.   Malta has made progress in increasing its use of circular material, reaching 15 percent in 2022, one of the highest rates in the EU (average 11½ percent, median 7½ percent). It also reduced waste generation per capita (by households and service industries) to around 0.7 tons by 2010. However, since then, progress has largely stalled, and a rising population and increasing tourist arrivals have increased total waste generation. Moreover, waste in the construction sector stands at 3.9 tons per capita, well above the EU average (1.9 tons). Despite the higher waste generation, landfill usage (around 300,000 tons/year) has remained broadly unchanged, with incineration and recycling picking up.

Solid Waste and Recycling

Waste generated (tons per capita, LHS) 1/

Recycling rate (non-construction waste) (%, RHS)

Circular material use rate (%, RHS)

1/ Households and services.
Sources: Eurostat, NSO, and IMF staff estimates.

Waste Projections

Population + tourists (1,000, LHS)

Total waste generated (1,000 tons, RHS) 1/

1/ Households and services.
Sources: Eurostat, NSO, and IMF staff estimates and projections.

14.   More investments are needed to cope with increasing volumes of solid waste. Incineration is increasing, and a waste-to-energy plant is being planned. Under the NRRP, a strategy to reduce waste in the construction sector by increasing recycling rates is also being adopted.

F. Transport

15.   Malta's small size and dense population pose unique challenges for land management and transport infrastructure (Table 2). It is difficult to compare Malta with other islands: in Europe, the Spanish region of Menorca comes closest to Malta in terms of area, though it is still more than twice as large as Malta and has a much smaller population. The Balearic Islands in total— also a major tourism destination—are much larger than Malta, with a much lower population density. On the other end, Singapore, while still twice as large as Malta, is similarly densely populated. At the same time, Malta's size and population resemble those of several small- to mid-

sized central European cities.[8] Most of these cities have public transportation networks that consist not only of bus networks (like Malta) but also tram lines.

	Malta	Singapore 1/	Balearic Islands 2/
Table 2. Malta: Spatial Indicators (2022)			
Area and population			
Area (km^2)	315	736	4,984
Population (1,000)	520	6,037	1,187
Population density (persons/km^2)	1,649	8,207	238
Transport			
Road network (km)	2,841	9,644	2,155
Roads/km^2	9.0	13.1	0.4
Roads/1000 persons	5.5	1.6	1.8
Cars/road km	112	69	363
Cars/100 persons	61	11	66
Cars per km^2 of artificially covered land	3,658	1,736	1,724
Buses/road km	0.8	1.9	1.2
Buses/100 persons	0.5	0.3	0.2
Rail network	no	yes	no
Land cover and use (2018)			
Artificial land (cover, % of total)	27.5	52.3	9.1
Residential buildings (use, % of total)	17.8	14.1	8.6
Transport (use, % of total)	4.9	11.4	2.6

Sources: Eurostat, Singstat, CEIC data.

1/ 2024 (area and population), 2023 (transport data), 2020 land cover and use data.

2/ Land cover and use data from 2018.

16.   A relatively large share of Malta's land area coverage is "artificial" (mostly buildings and roads). This implies that, while car ownership is comparable to levels in the Balearics (and the EU as a whole), the number of cars per square kilometer of *artificially covered land* (where most traffic occurs) is twice as high as in the Balearics. In Singapore, in contrast, where artificial land cover is almost twice the rate in Malta, car ownership is much lower, with a well-developed public transportation network including buses, metros, and light rails.

17.   In Malta, public transport is free for residents, and the bus fleet is relatively large—one bus for every 200 persons, more than twice as many as in the Balearics. However, while take-up has increased significantly, it remains limited, as travel times are relatively long, and buses are also affected by congestion. The government is planning some initiatives to ease congestion, e.g., by managing traffic flows better over the course of the day and introducing express bus lines. However, reducing car use would likely also require measures to increase costs, for example, by raising fuel

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[8] Malta is divided into two NUTS 3 regions: Malta, and Gozo and Comino. Gozo and Comino (two smaller islands off the main island of Malta) have a population density of 552 persons per square kilometer. For example, NUTS 3 regions comparable to Malta in terms of area and population density are Katowice, Copenhagen surroundings, Krakow, Lodz, Poznan, Riga, Szczecin, and Wroclaw.

prices, raising vehicle taxes, and introducing charges for public parking spaces, which the government currently does not intend to pursue.

18. **The road network is already very dense**—nine kilometers of road per square kilometer, 21 times as many as in the Balearics, though only two-thirds of Singapore's level. A relatively high share of the total land area is devoted to transport infrastructure. Moreover, experience in other countries suggests that the expansion of the road network only briefly relieves congestion as car ownership and use tend to rise with more roads available. On the other hand, a rail-based public transport system could be effective to limit congestion and offer attractive alternatives to car use. However, this would be either very costly (a metro would require investments amounting to about 34 percent of GDP, though spread over 15-20 years), or encounter geographic constraints (a tram network would, while more efficient than buses, require space for its tracks which would mostly have to be on the surface to contain costs).[9]

G. Conclusions

19. **Malta is facing significant investment needs in the short and medium term.** While power and water supply capacities are adequate in the short term, investments to enhance capacity in the medium term are needed. In areas such as wastewater treatment and solid waste disposal, investments are needed to reduce environmental stress and comply with EU targets. Transport is the area where the need for action to ease congestion is urgent, while the costs for a sustainable solution are high and implementation would take time. Pricing actions—e.g., on vehicle and fuel taxes, or parking charges—would be helpful.

20. **Planning ahead is therefore important.** The planned launch of a strategic development plan (the "Vision Malta 2050") offers an opportunity to spell out a longer-term development strategy. Such a strategy, however, would also need to spell out the investment needs and costs that arise from them.

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[9] Times of Malta ([Government unveils 25-station, €6.2 billion underground Metro proposal](#)). A study conducted in 2022 concluded that a metro system of 35 km length would cost €6.2 (34 percent of 2022 GDP) and would take 15-20 years to build. A first phase could be constructed within five to eight years and cost €3.9 billion.

THE IMPACT OF ARTIFICIAL INTELLIGENCE ON MALTA'S LABOR MARKET[1]

Artificial Intelligence (AI) and Generative AI models and their use have significantly advanced in recent years, evolving from their historical role in automating routine tasks to now performing complex cognitive functions. This evolution enables AI to process vast amounts of data, recognize patterns, and make decisions. As a result, it has the potential to reshape the job landscape across a broad range of skills and sectors. Malta is digitally well-prepared to benefit from AI. Mapping occupational labor market micro data for Malta with a measure of exposure and complementary to AI indicates that Malta is slightly less susceptible to AI job displacement than other advanced economies. However, our analysis suggests that women, younger workers, and people with high school degrees only, are at a greater risk of job displacement.

A. Context

1.   Artificial Intelligence (AI) and Generative AI models have evolved significantly in recent years. AI models have progressed from earlier machine learning models to now performing cognitive functions, processing vast amounts of data, recognizing patterns, and making decisions. Today, AI systems routinely exceed human performance on standard benchmarks.[2] New multimodal models can generate coherent text in dozens of languages, process audio, and explain photographs or memes. Companies are racing to build AI-based products, and AI is increasingly being used by individuals and organizations. As AI models continue to develop and their use expands, they have the potential to reshape the job landscape across a broad range of skills and sectors. While there are productivity gains in this process, AI integration may also lead to job displacement during the transition.

2.   Malta is digitally well-prepared, but the labor market is likely to see some job displacement with the roll-out of AI. The first section of this paper assesses Malta's digital preparedness and potential to benefit from AI, using the IMF's AI Preparedness Index (AIPI) and other indicators of digital skills, intensity, and AI use. Malta is generally found to be well-prepared. The second section analyzes the characteristics of the Maltese labor market, mapping an index of exposure and complementarity onto occupational micro data. The analysis shows some risks of job displacement in Malta, especially for women, younger workers, and people with high school education only. The third section provides policy considerations.
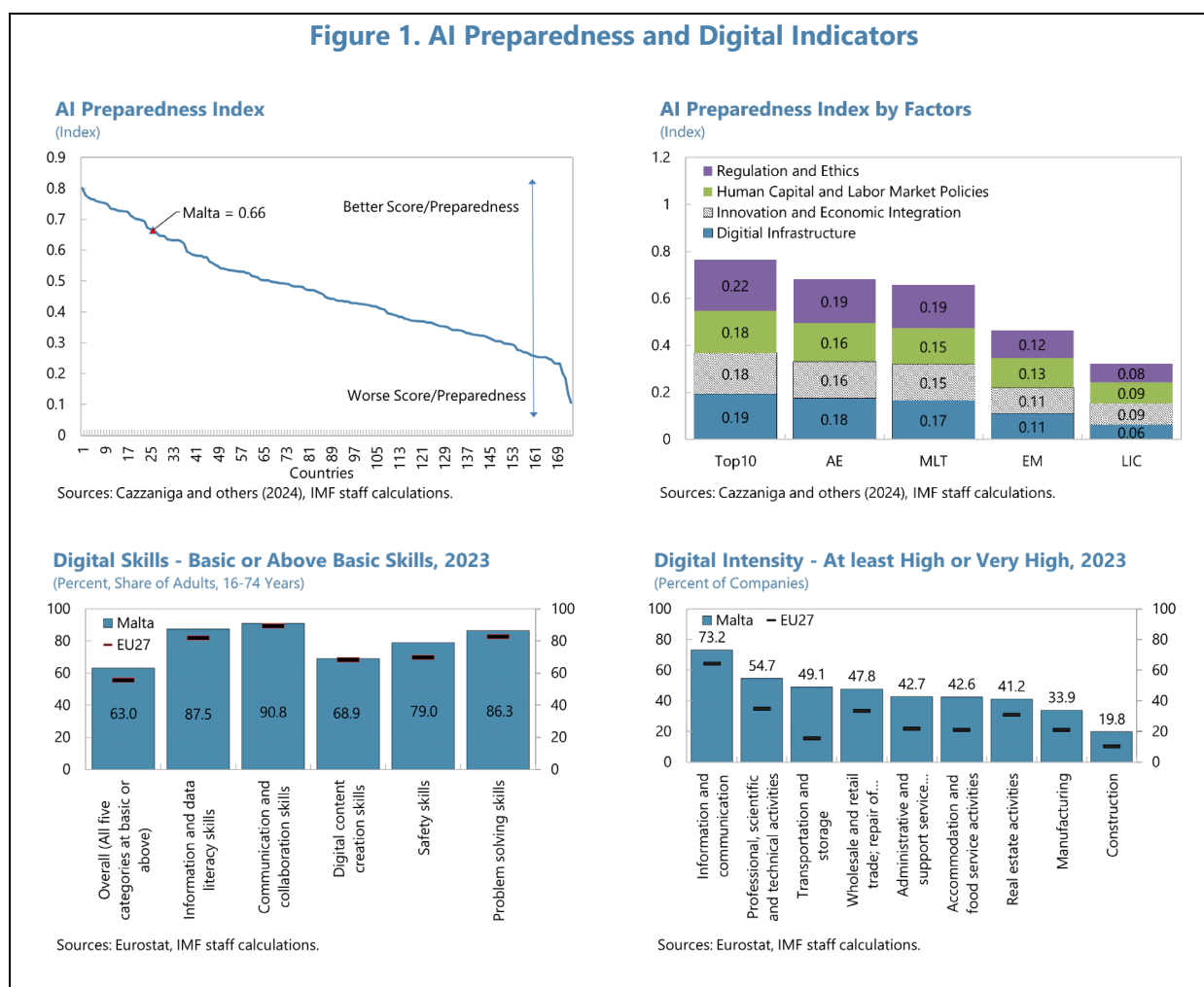
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[1] Prepared by Thomas Gade (EUR). The author thanks participants of a workshop held at the Central Bank of Malta for useful discussions and comments.

[2] See "The AI Index 2024 Annual Report," AI Index Steering Committee, Institute for Human-Centered AI, Stanford University, Stanford, CA, April 2024.

B. Infrastructure, Human Capital, and Digital Preparedness in Malta

3.   The Malta authorities are prioritizing digital transition to strengthen digital preparedness and the use of AI. The authorities allocate a significant part of multi-year funds from the EU's Recovery and Resilience Fund and cohesion funds – €196 million or 1.0 percent of 2023 GDP - for digital transformation.[3] They have developed a workplan for digital transition in the 2021-2027 Smart Specialization Strategy and outlined six initiatives to gain competitive advantage as a leader in AI outlined in the National AI Strategy.[4] These strategies focus on investment needs as well as public and private sector adoption, supported by initiatives related to the education system and workforce, the legal and ethical framework, as well as infrastructure. With 80 percent of the existing AI strategy completed, an updated AI strategy is being prepared to align with new AI technologies, sectoral trends and priorities, risks, and regulations.

Figure 1. AI Preparedness and Digital Indicators

AI Preparedness Index
(Index)

Malta = 0.66

Better Score/Preparedness

Worse Score/Preparedness

Countries

Sources: Cazzaniga and others (2024), IMF staff calculations.

AI Preparedness Index by Factors
(Index)

- Regulation and Ethics
- Human Capital and Labor Market Policies
- Innovation and Economic Integration
- Digitial Infrastructure

	Top10	AE	MLT	EM	LIC
Regulation and Ethics	0.22	0.19	0.19	0.12	0.08
Human Capital and Labor Market Policies	0.18	0.16	0.15	0.13	0.09
Innovation and Economic Integration	0.18	0.16	0.15	0.11	0.09
Digitial Infrastructure	0.19	0.18	0.17	0.11	0.06

Sources: Cazzaniga and others (2024), IMF staff calculations.

Digital Skills - Basic or Above Basic Skills, 2023
(Percent, Share of Adults, 16-74 Years)

- Malta
- EU27

Overall (All five categories at basic or above)	Information and data literacy skills	Communication and collaboration skills	Digital content creation skills	Safety skills	Problem solving skills
63.0	87.5	90.8	68.9	79.0	86.3

Sources: Eurostat, IMF staff calculations.

Digital Intensity - At least High or Very High, 2023
(Percent of Companies)

- Malta
- EU27

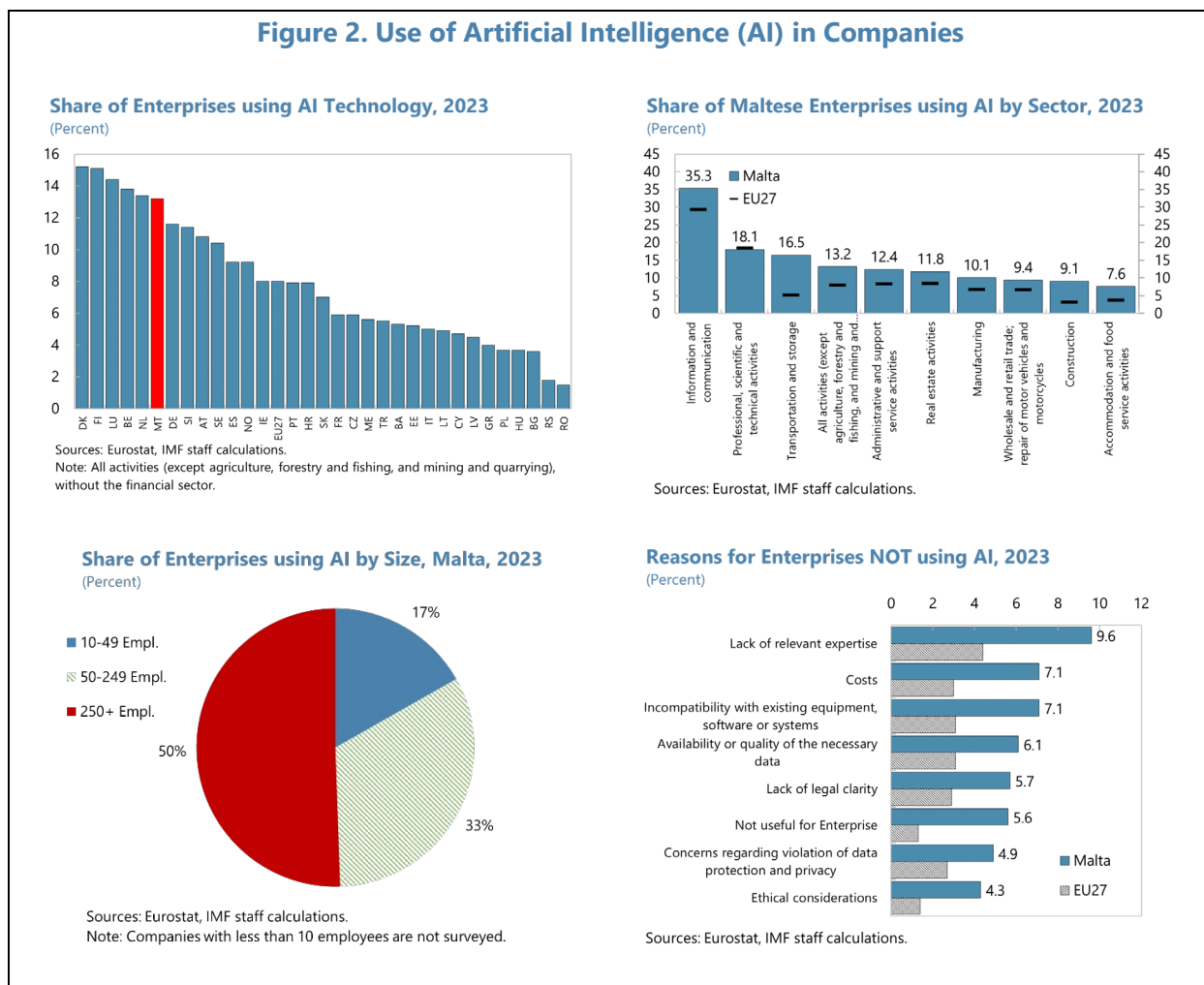| Information and communication	Professional, scientific and technical activities	Transportation and storage	Wholesale and retail trade; repair of...	Administrative and support service...	Accommodation and food service activities	Real estate activities	Manufacturing	Construction
73.2	54.7	49.1	47.8	42.7	42.6	41.2	33.9	19.8

Sources: Eurostat, IMF staff calculations.

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[3] See 2024 Country Report – Malta, European Commission, SWD (2024) 618.

[4] See Malta's Digital Innovation Authority.

4.   Malta is well-placed to benefit from AI. The IMF's AIPI indicates that Malta is positioned well to roll out AI effectively and capitalize on potential benefits.[5] Malta's AI preparedness aligns broadly with the average of advanced economies across a range of measures covering "Regulation and Ethics," "Human Capital and Labor Market Policies," "Innovation and Economic Integration," and "Digital Infrastructure" (see Figure 1). Also, digital skills are relatively sound in Malta with 63 percent of the working age population having basic or above-basic digital skills, with particularly high skills in areas like information and data literacy, communication, collaboration, and problem solving. Maltese companies' digital intensity is relatively high, compared to the EU-27 average, suggesting that both individuals and companies have the necessary skills and capacity to adopt digital technologies such as AI.[6]

Figure 2. Use of Artificial Intelligence (AI) in Companies

Share of Enterprises using AI Technology, 2023
(Percent)

Sources: Eurostat, IMF staff calculations.
Note: All activities (except agriculture, forestry and fishing, and mining and quarrying), without the financial sector.

Share of Maltese Enterprises using AI by Sector, 2023
(Percent)

Sources: Eurostat, IMF staff calculations.

Share of Enterprises using AI by Size, Malta, 2023
(Percent)

- 10-49 Empl.
- 50-249 Empl.
- 250+ Empl.

17%
33%
50%

Sources: Eurostat, IMF staff calculations.
Note: Companies with less than 10 employees are not surveyed.

Reasons for Enterprises NOT using AI, 2023
(Percent)

| Reason	Malta
Lack of relevant expertise	9.6
Costs	7.1
Incompatibility with existing equipment, software or systems	7.1
Availability or quality of the necessary data	6.1
Lack of legal clarity	5.7
Not useful for Enterprise	5.6
Concerns regarding violation of data protection and privacy	4.9
Ethical considerations	4.3

Sources: Eurostat, IMF staff calculations.

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[5] The IMF's AIPI (Cazzaniga and others, 2024) assesses the level of AI preparedness as of 2023 across 174 countries, based on a rich set of macro-structural indicators that cover the countries' digital infrastructure, human capital and labor market policies, innovation and economic integration, and regulation and ethics.

[6] The Digital Skills Indicator (DSI) and the Digital Intensity Indicator (DII) are compiled by Eurostat. The DSI is a composite indicator related to internet or software use by individuals in five specific areas (information and data literacy, communication and collaboration, digital content creation, safety, and problem solving). The DII is a composite indicator, derived from the survey on ICT usage and e-commerce in enterprises.

5.   **Maltese companies are already using AI, but a lack of expertise, high costs, and system incompatibility hinder greater adoption.** In 2023, 13.2 percent of companies in Malta, excluding agriculture, fishing, mining, and the financial sector, used at least one AI technology, which is relatively high in Europe (see Figure 2). Most of AI-using companies are large with more than 50 employees (83 percent). While the share of AI-using companies in the information and communication sector is the highest (35.3 percent), the use of AI is also high in other sectors, compared to other EU countries, such as administrative and support service activities (12.4 percent), manufacturing (10.1 percent), wholesale and retail trade (9.4 percent) and accommodation and food services (7.6 percent). However, a large majority of firms in Malta, especially SMEs, have yet to adopt AI technologies, suggesting a high potential for further use of AI. Companies not yet using AI technology indicate a lack of relevant expertise, high costs, and system incompatibility as key barriers, challenges that are significantly higher than the EU average, suggesting potential labor and skill shortages as well as financial constraints.
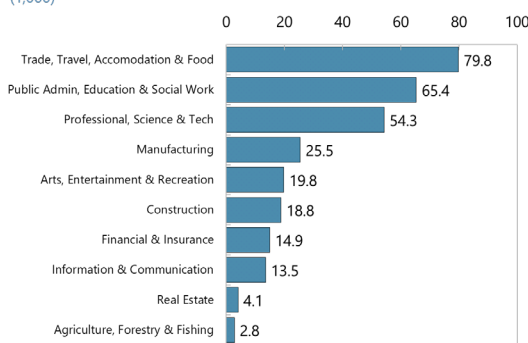
Figure 3. Value Added and Employment Characteristics in Malta

Gross Value Added (GVA) by Economic Activity, 2023
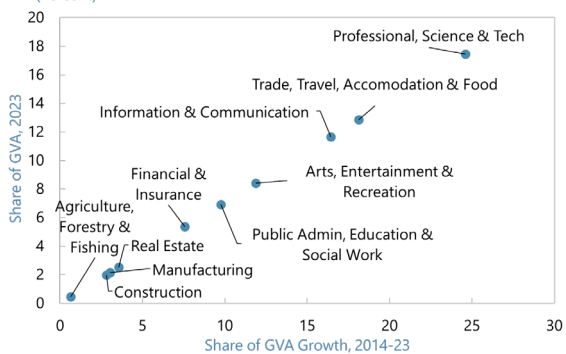(Million, EUR)   (1,000 EUR)
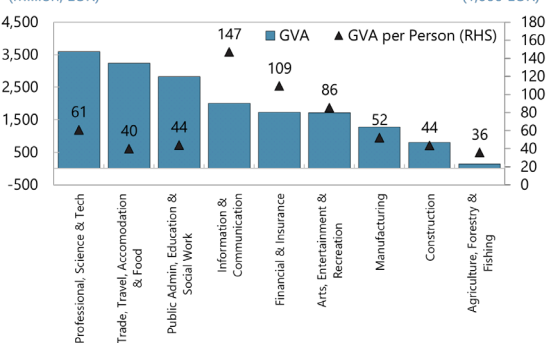
Sources: Haver Analytics, NSO Malta, IMF staff calculations.

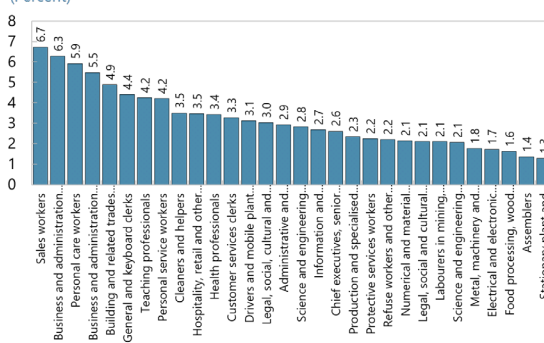**Employment by Economic Activity, 2023**
(1,000)

Sources: Haver Analytics, NSO Malta, IMF staff calculations.

Share of GVA and GVA Growth 2014-23
(Percent)

Sources: Haver Analytics, NSO, IMF staff calculations.

Main Occupations in Malta, 2023
(Percent)

Sources: Eurostat, IMF staff calculations.

C. Labor Market Exposure and Complementary to AI

6.   The economy and labor market of Malta are relatively well-diversified. The largest economic activities in Malta, measured both by gross value added and number of employees, are related to professional, scientific, and technical activities, trade, travel, accommodation, food services, and public services (see Figure 3). These activities account for roughly half of economic output and two-thirds of employment. While manufacturing, arts, entertainment and recreation, construction, financial services, ICT, real estate services, and agriculture comprise the other half of output, they only account for one-third of employment. The main occupations in Malta are business administration professionals, sales workers, and personal care workers.

7.   We measure exposure and complementarity to AI of different job types. Felten et al (2021) developed a measure of occupational exposure to AI, linking AI applications to workplace skills and occupations, using US occupational data. Pizzinelli et al (2023) also consider the social, ethical, and physical contexts of occupations, extending Felten's measure of exposure with the concept of complementarity to determine whether AI may complement or replace jobs. These measures are categorized into four dimensions: 'High Exposure and High Complementarity' (HEHC), 'High Exposure and Low Complementarity' (HELC), 'Low Exposure and High Complementarity' (LEHC), and 'Low Exposure and Low Complementarity' (LELC) (see Annex 1).[7] We apply these measures to micro data of Malta from the 2023 Labor Force Survey, using approximately 10,000 observations. This allows us to assess exposure and complementarity in Malta across 40 occupations, 21 economic activities, 5 age groups, gender, 4 educational attainment groups, income, and 3 'country of birth' groupings.[8]

8.   The results suggest that the labor market of Malta will likely see some job displacement within services-related occupations. Around 60 percent of the labor market of Malta is highly exposed to AI, indicating an overlap between AI applications and the skills required for these jobs (see Figure 4).[9] The relatively high share of business administration professionals, sales workers, general clerical and other administrative support roles - functions with low complementarity – implies that approximately 30 percent of the labor market is at risk of job displacement. This share is broadly similar to that estimated for other advanced economies. However, the labor market of Malta exhibits slightly higher complementarity than other advanced economies, suggesting that the risk of job displacement and potential productivity gains could be higher in Malta than in the average advanced economy.

9.   Women, younger workers, and people with only a high school education are more vulnerable to job displacement. Women face a higher risk of job displacement than men given

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[7] Cazzaniga and others (2024) apply these measures in a cross-country comparison.

[8] When disaggregating the data into subgroups and joint subgroups, the number of observations within each group and especially joint subgroups declines significantly, which increases the statistical uncertainty of the results.

[9] The term 'highly-exposed' should be used with caution. It reflects the job occupations with an exposure score higher than the median across occupations, using the Felten et al (2021) occupational exposure index. It therefore measures exposure in a relative sense against all other occupations, and not necessarily in an absolute sense.

their prevalence in service-related sectors with high exposure and low complementarity, such as sales, business administration, and clerical support. Approximately 41 percent of women employees fall into this category, compared to only 27 percent of men (see Figure 5). The difference also reflects a higher share of men working in physical occupations (construction, drivers, agriculture). Tertiary education is valuable, as it is associated with very high complementarity (see Figure 6), while 40 percent of those with only a high school degree are in the high exposure and low complementarity category. The same applies to age and income, with young people under 30 and those with low and lower-middle incomes being more at risk of job displacement. There are no major differences in the high exposure and low complementarity category between Maltese nationals and immigrants.

Figure 4. Exposure and Complementarity to AI

Employment Exposure and Complementarity to AI, 2023
(Percent)
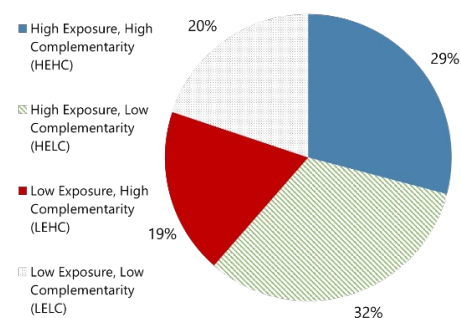
Sources: Eurostat, Cazzaniga and others (2024), Felten et al (2021), IMF staff calc.

Employment Exposure and Complementarity to AI, 2023
(Percent)
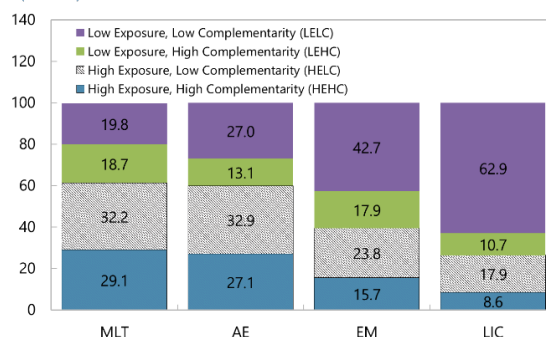
Sources: Eurostat, Cazzaniga and others (2024), Felten et al (2021), IMF staff calc.

Activity - Employment Exposure and Compl. to AI, 2023
(Percent)

Sources: NSO, IMF staff calculations.

Occupational Exposure and Complementarity to AI, 2023
(Z-scores, Size of Circle = Share of Employment)

Sources: Eurostat, Cazzaniga and others (2024), Felten et al (2021), IMF staff calc.

Figure 5. Gender Differences

Gender - Employment Exposure and Compl. to AI, 2023
(Percent)

Women Employment by Economic Activity, 2023
(Percent

Sources: NSO, IMF staff calculations.
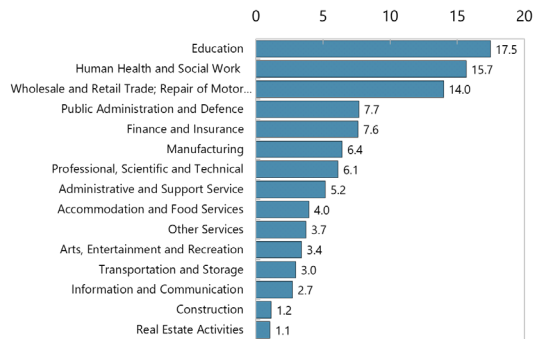
Sources: NSO, IMF staff calculations.

Mens' Occupational Exposure and Complementarity to AI
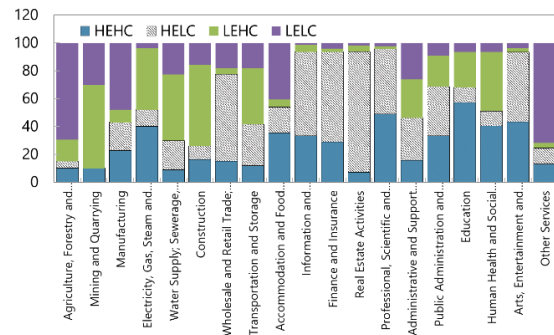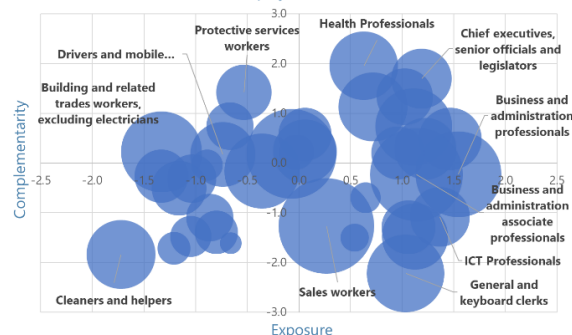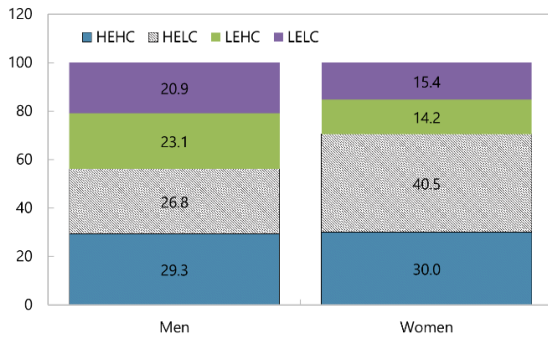(Z-scores, Size of Circle = Share of Employment)
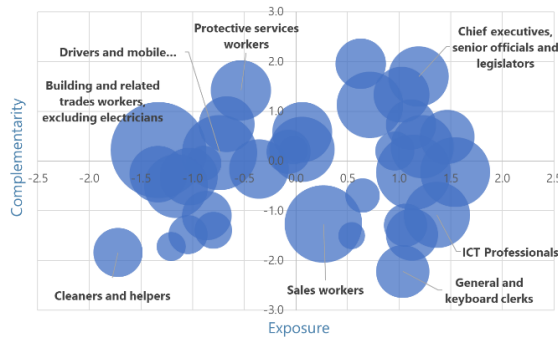
Women Occupational Exposure and Complementarity to AI
(Z-scores, Size of Circle = Share of Employment)

Sources: Eurostat, Cazzaniga and others (2024), Felten et al (2021), IMF staff calc.
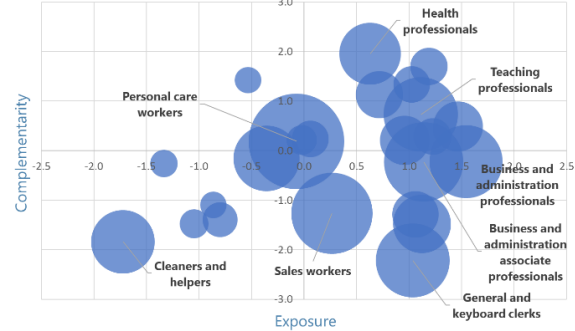
Sources: Eurostat, Cazzaniga and others (2024), Felten et al (2021), IMF staff calc.

D.   Conclusions and Policy Considerations

10.   Malta is well-prepared to reap the benefits of AI but may experience job displacement, especially among women, younger workers, and people with only high school degrees. Malta is digitally equipped to harness the potential of AI. The digital infrastructure is advanced, digital intensity in companies is high, and people have strong digital skills. The labor market of Malta is slightly less susceptible to AI-related job displacement than other advanced economies due to higher complementarity. However, approximately one-third of the labor force is at risk of job displacement, with women, young, and people with only high school degrees being particularly vulnerable. A mitigating factor in Malta is its already tight labor market.

Figure 6. Education, Income, and Age

Education - Employment Exposure and Compl. to AI, 2023
(Percent)

Legend: HEHC, HELC, LEHC, LELC

Category	LELC	LEHC	HELC	HEHC
Less than primary, primary and lower secondary education (levels 0-2)	37.0	31.7	23.2	8.1
Upper secondary and post-secondary non-tertiary education (levels 3 and 4)	16.6	19.8	41.7	21.9
Tertiary education (levels 5-8)	3.8	6.9	30.2	59.1

Sources: NSO, IMF staff calculations.

Income - Employment Exposure and Compl. to AI, 2023
(Percent)

Legend: HEHC, HELC, LEHC, LELC

Category	LELC	LEHC	HELC	HEHC
Less than 25th Percentile	33.3	21.5	38.1	7.1
Between 25th and 75th Percentile	15.7	25.1	33.8	25.5
Higher than 75th Percentile	2.7	3.6	30.0	63.6

Sources: NSO, IMF staff calculations.

Age - Employment Exposure and Compl. to AI, 2023
(Percent)

Legend: HEHC, HELC, LEHC, LELC

Category	LELC	LEHC	HELC	HEHC
Less than 30	16.2	13.2	43.2	27.4
30 - 49	16.9	18.2	32.0	33.0
More than 50	23.4	25.5	26.4	24.7

Sources: NSO, IMF staff calculations.

Immigrant - Employment Exposure and Compl. to AI, 2023
(Percent)

Legend: HEHC, HELC, LEHC, LELC

Category	LELC	LEHC	HELC	HEHC
National	17.6	19.5	33.2	29.7
Foreign	23.3	18.5	29.8	28.4

Sources: NSO, IMF staff calculations.

11.   Prioritizing reskilling and upskilling of the labor force is essential. The authorities are prioritizing upskilling and reskilling of the labor force and through the education system and life-long learning. The National Education Strategy 2024-30 and the Lifelong Learning Strategy 2023-30 are pillars of this strategy. The authorities have also extended the Enterprise Skills Development Scheme intended to support small, medium-sized, and large enterprises to provide training to existing and new employees, in order to develop and update their skills and knowledge, and the authorities could review both the size of support and target groups.

12.   Bringing Malta closer to the frontier of digitalization is important, especially for private sector adoption in SMEs. The authorities are prioritizing digital adoption and digital skills. The Digital Decade Strategic Roadmap 2023-30 is a key pillar in these efforts.[10] The authorities have implemented a digitalization grant, supported by funds under the EU's Recovery and Resilience Facility, covering 50 percent of expenses in digitalization of operations up to a maximum of €50,000. This grant is particularly important as it targets SMEs, which make up the large majority of

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[10] See Ministry of Economy, Digital Decade Strategic Roadmap, 2023-30.

companies in Malta, and where digitalization may be hindered by costs. Lowering the administrative burden of accessing public support schemes and continuing to roll out e-Government can play a key role in private sector adoption and greater efficiency.

Annex I. Measuring Exposure and Complimentary to AI

Measuring Exposure to AI

1. Felten et. al. (2021) develop a measure of occupational exposure to AI, linking common and general applications of AI (e.g., abstract strategy games, real-time video games, image recognition, image generation, reading comprehension, language modelling, translation and speech recognition) to workplace skills and occupations, using US occupational characteristics from the O*NET database. The index is essentially a measure of the overlap between AI and human skills, which is then weighted by the degree of importance and complexity of such skills in each job. High exposure occupations are typically service-related (see figure below).

Measuring Complimentary to AI

2. Pizzinelli and others (2023) develop an index of complementarity, drawing also on the O*NET database, but from 'work contexts' and 'skills', adding an element of physical and social context. The authors argue that in some societies may be less likely to allow unsupervised use of AI in some cases. For instance, the criticality of decisions and the gravity of the consequences of errors may motivate societies to require humans, although highly exposed to AI, to make final decisions or take actions. These include e.g. health professionals, judges, and certain types of technical experts and operators (see figure below).

Bringing Exposure and Complimentary Together Conceptually

3. The measures of exposure and complementarity can conceptually be thought of as a matrix of four dimensions: 'High Exposure and High Complementarity' (HEHC), 'High Exposure and Low Complementarity' (HELC), 'Low Exposure and High Complementarity' (LEHC), and 'Low Exposure and Low Complementarity' (LELC), using the medians across all exposure and complementarity values as thresholds. The measure of High Exposure and Low

General Occupational Exposure and Complementarity
(Z-scores)

Sources: Eurostat, Cazzaniga and others (2024), Felten et al (2021), IMF staff calc. Note: The use of z-scores deviate slightly from the measures, although the median and means are broadly similar.

Complementarity (lower right dimension in the figure) can be interpreted as occupations which are at higher risk of job displacement.
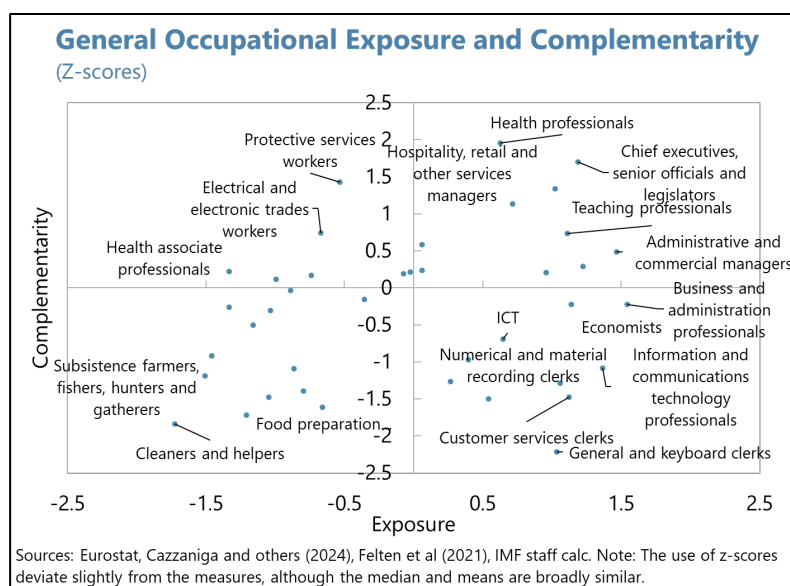
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Pizzinelli, C., A. Panton, M. M. Tavares, M. Cazzaniga, and L. Li. 2023. "*Labor Market Exposure to AI: Cross-Country Differences and Distributional Implications.*" IMF Working Paper 2023/216, International Monetary Fund, Washington, DC.

ASSESSING GENDER GAPS IN MALTA[1]

The authorities of Malta have made significant progress towards gender equality over the last two decades. Supportive government policies and a steady inflow of foreign labor have played a key role in increasing women's participation in the labor market. In addition, the attainment of higher education levels and skills have significantly improved.[2] However, women's representation in senior public and private sector positions still lags behind that of men. An empirical study using microdata from the labor force surveys indicates that while the overall gender income gap has decreased over the last decade, gender income gaps remain pervasive in Malta, after controlling for other characteristics impacting incomes.

A.   Malta's Progress Towards Greater Gender Equality—Participation, Education, and Representation

Labor Force Participation

1.   Female labor force participation in Malta has significantly increased over the past two decades, driven by targeted government policies, inflows of foreign labor, and societal shifts towards gender equality. The participation rate of women has risen from 36 percent in the early 2000s—a European laggard—to 73 percent today, above the EU27 average (see Figure 1). This increase is particularly notable for women in the 25-49 age bracket, rising from 38 percent in 2004 to 86 percent in 2023. While participation among women in the 50-64 age bracket has significantly increased, the rate remains low at 54 percent. Although a higher share of women work part-time compared to men, the increased participation largely reflects an increase in full-time employment. Importantly, the overall improvement also reflects the steady inflow of foreign labor over the last decade, where foreign women by 2023 represented approximately one-third of employed women.

2.   Targeted government policies have played a key role in strengthening women's participation in the labor market. In 2014, the authorities started implementing a set of policies aimed at increasing female participation (see Box 1). These policies include free childcare, tax incentives to alleviate the costs of having children and reentering the labor market, as well as employment schemes for inactive persons. The policy measures successfully targeted women who were willing to work but not actively seeking work, as they often attribute this to family and care reasons, more so than for men (see Figure 1). Micallef (2018) estimates that the reforms account for

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[2] Malta's achievements in this area align with the IMF's emphasis on the macro-criticality of gender equality. The 2022 IMF Strategy Toward Mainstreaming Gender and the 2024 Interim Guidance Note on Mainstreaming Gender at the IMF collectively mark significant advancements in integrating gender considerations into the Fund's economic analysis, policy advice, and operational methodologies. The frameworks underscore the many benefits of gender equality, including bolstering economic resilience and fostering inclusive growth.

half of the increase in the female participation rate between 2008 and 2015, contributing to an estimated increase in potential GDP growth by around 0.3 percentage points during this period.

Figure 1. Labor Force and Employment Indicators

Female Participation Rate, 15-64 Years
(Percent)
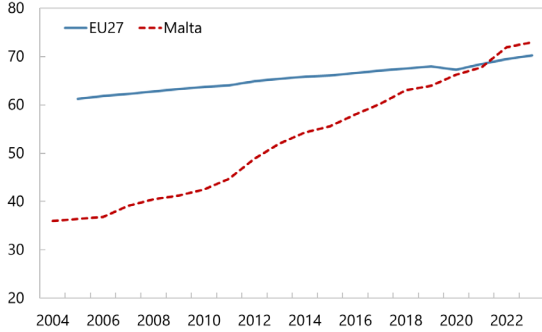
Sources: Eurostat, IMF staff calculations.

Labor Force Participation Rates
(Percent)

Females
	15 to 64 Years	15 to 24 Years	25 to 49 Years	50 to 64 Years
2004	36.0	50.6	37.5	15.5
2023	72.9	52.2	85.5	54.2

Males
	15 to 64 Years	15 to 24 Years	25 to 49 Years	50 to 64 Years
2004	80.3	59.9	95.0	69.5
2023	87.3	57.2	96.9	78.4
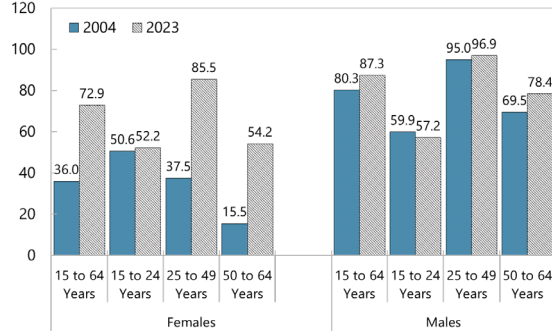
Sources: Eurostat, IMF staff calculations.

Female Participation Rate in Malta by Citizenship
(Percent)
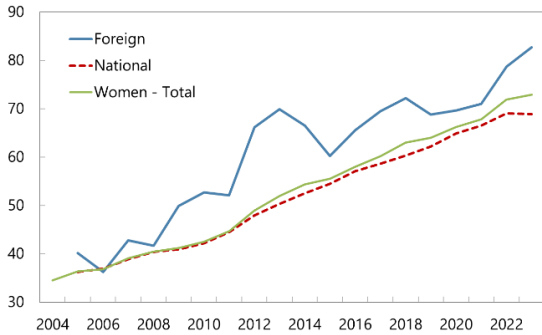
Sources: Eurostat, IMF staff calculations.

Reasons for Not Seeking Work While Inactive, 2019
(Percent)

	Women	Men
Other family or personal reasons	27.0	
Care of adults with disabilities or children and other family or personal reasons	44.9	
Care of adults with disabilities or children	17.9	
Education or training	25.7	72.1
Own illness or disability	7.7	13.9
Other reason	18.1	
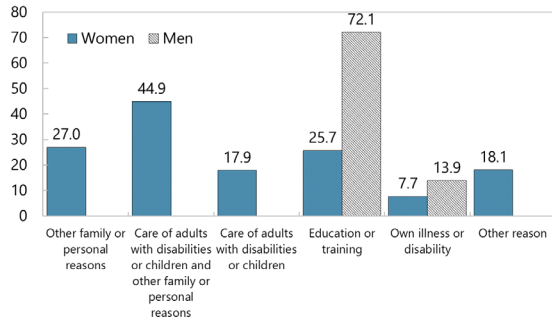
Sources: Eurostat, IMF staff calculations.
Note: Data limitations post 2019. Multiple responses are possible.

Box 1. Measures to Strengthen Women's Labor Market Participation over the Last Decade

The 2014 National Employment Policy introduced active labor market strategies, with a particular focus on attracting women to the labor market. One of the key measures was the provision of free childcare services, enabling many women having given birth to re-enter the workforce. The authorities also introduced new tax credits and deductions targeted at women and parents. These include (i) a tax credit for women returning to work after having children (which helps offset children-related costs) and (ii) tax deductions for childcare expenses, school fees, and medical expenses, along with the long-standing child allowance.

The authorities have also adopted further measures to improve work-life balance. Additional work-life balance entitlements were introduced in 2022. These measures seek to further enhance the quality of life for families, including an extended period of paternity leave, parental leave, carers' leave, and the right to request flexible working arrangements for caregiving purposes. Paid maternity leave was increased from 14 weeks to 18 weeks, and additional unpaid parental leave increased from three months to four months.

Other financial support measures aimed at self-employed women, and low-income families. The In-Work Benefit Scheme was introduced in 2015. This is a means-tested benefit scheme to support low-income working families and single parents, and encourage employment. In 2019, the maternity benefit rate of self-employed women was raised to the national minimum wage.

Sources: Malta authorities, Caruana (2023) and Micallef (2018).

Educational Attainment

3.   **Female educational attainment in Malta has significantly improved over recent years, with women now surpassing men in higher education enrollment and graduation rates.** Women in Malta excel in various academic fields, particularly in social sciences, humanities, and education, but remain underrepresented in STEM disciplines (see Figure 2). The share of women with tertiary education has risen to 34 percent, up from 10 percent two decades ago, and is higher than the 27.6 percent share of men with tertiary education. This "reverse" gender gap continues to grow, as the share of women graduating with a tertiary education significantly outpaces that of men. Despite these educational achievements, women face challenges translating their qualifications into equivalent career opportunities and advancement.

4.   **The government and educational institutions are implementing initiatives to encourage women to pursue diverse fields of study and ensure their skills are recognized in the labor market.** The national education system in Malta has implemented measures to encourage women to pursue diverse fields of study. These measures include: (i) initiatives to boost female participation in STEM through scholarships, mentorships, and partnerships with industry leaders; (ii)

inclusive education policies to eliminate gender biases and support the aspirations of female students; (iii) gender equality programs designed to challenge stereotypes and promote gender balance in various academic disciplines and careers, including awareness campaigns that encourage girls and young women to explore non-traditional fields; and (iv) support for work-life balance and career advancement for women by enhancing access to professional development opportunities and flexible working arrangements.

Figure 2. Educational Attainment

Tertiary Education Level, Share of Females 16-64 Years
(Percent, Females)

Sources: Eurostat, IMF staff calculations.

Educational Attainment, Females 16-64 Years
(Percent)

Sources: Eurostat, IMF staff calculations.

Female STEM Graduates from Tertiary Education
(Percent) (Persons)

Sources: Eurostat, IMF staff calculations.

Educational Attainment, 15-64 Years
(Percent)

Sources: Eurostat, IMF staff calculations.

Representation, Legal Framework and Financial Access

5.   The representation of women in senior positions remains a significant challenge despite progress in gender-equality initiatives. While women are well represented in senior roles in public administration, they are underrepresented in leadership roles across various sectors, including in government and businesses (see Figure 3). Continued efforts are needed to bridge the gap between educational attainment and equitable professional outcomes for women in Malta. Malta introduced a gender-equalizing mechanism in the national parliament in its most recent election. Policies promoting gender diversity in parliament, on boards, via mentoring programs, and

through leadership-training initiatives are steps forward, but achieving gender parity at the senior level requires sustained efforts and broader societal support.

Figure 3. Representation of Women in Senior Positions

Women in Senior Positions, 2023
(Percent)

Women In Senior Positions in the Public Administration
(Percent)

Sources: Eurostat, European Institute of Gender Equality, IMF staff calculations.

Sources: European Institute for Gender Equality, IMF staff calculations.

Women Executives, Private Sector
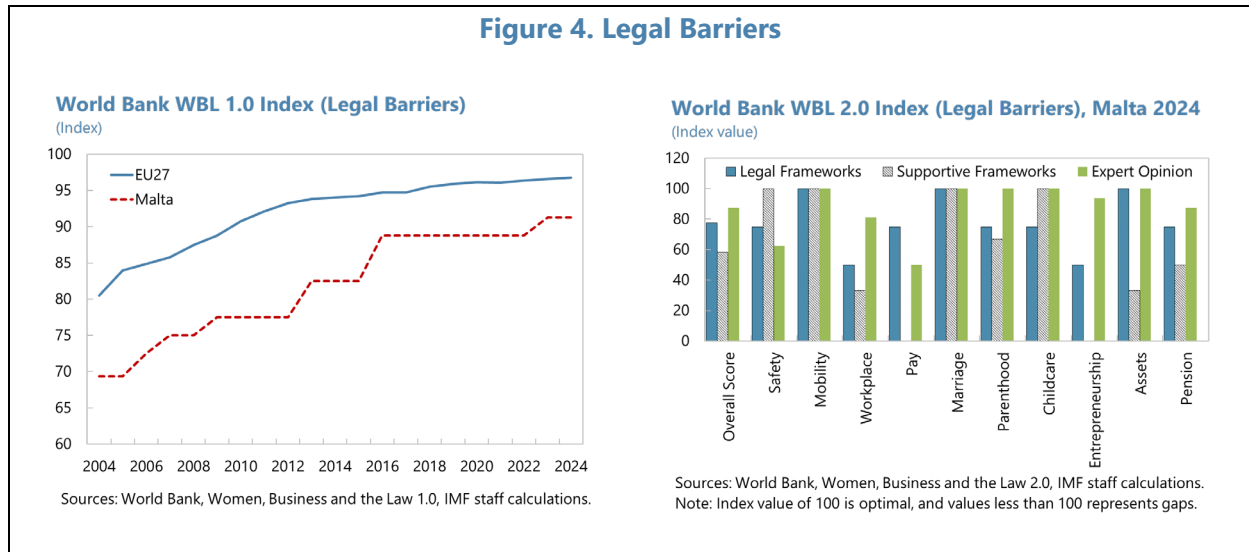(Percent)

Women Board Members, Private Sector
(Percent)

Sources: Eurostat, IMF staff calculations.

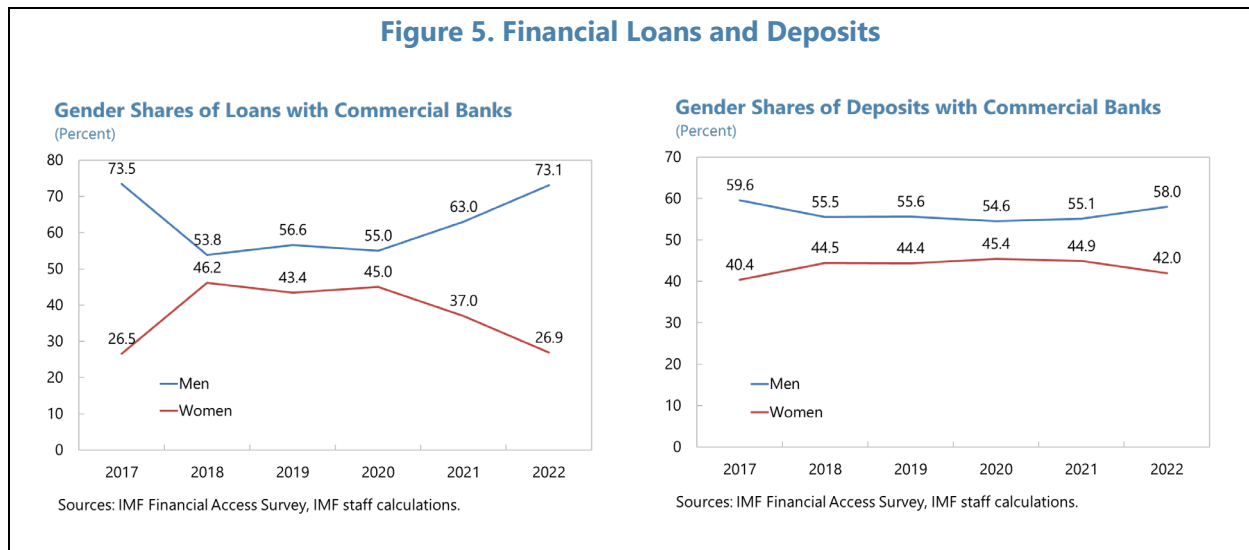Sources: Eurostat, IMF staff calculations.

6.   Malta's legal framework for preventing gender-based discrimination has been strengthened. Over the years, Malta has adopted legislation that prevents gender-based discrimination and several EU directives, including the Equal Treatment Directive, the Gender Equality Directive, as well as the Women on Boards Directive. In the World Bank Women, Business and the Law (WBL) Index, Malta's legal frameworks score was 77.5, still below the EU average, but indicating strong *de jure* provisions for women's rights (see Figure 4). Supportive frameworks for implementing these laws, with a score of 58.3, also reflects effective *de jure* policies in areas such as Safety, Mobility, Marriage, and Childcare. Yet, greater implementation of support in areas related to equity in the Workplace, Pay, Parenthood, Entrepreneurship, and Pensions are needed. Expert opinions, scoring 87.5, affirm strong *de facto* perceptions of gender equality in several domains, but highlight the room for improvements in workplace pay equity. Overall, while Malta demonstrates considerable progress, targeted efforts in specific areas could further strengthen gender equality and economic empowerment both *de jure* and *de facto*.

Figure 4. Legal Barriers

World Bank WBL 1.0 Index (Legal Barriers)
(Index)

World Bank WBL 2.0 Index (Legal Barriers), Malta 2024
(Index value)

Sources: World Bank, Women, Business and the Law 1.0, IMF staff calculations.

Sources: World Bank, Women, Business and the Law 2.0, IMF staff calculations.
Note: Index value of 100 is optimal, and values less than 100 represents gaps.

7.   In addition, some gaps remain related to financial access. While many women have gained increased access to financial services and resources, including banking and credit facilities, disparities still exist. The female share of outstanding household loans with commercial banks (26.9 percent) was significantly lower than men (73.1 percent) in 2022 (see Figure 5). While the difference is less, the 42 percent female share of household deposits is also lower than the 58 percent for men. Loans in Malta are generally provided on a risk-based approach, and while there is no clear evidence, the gender difference may in part be attributed to the general gaps in the labor market where women are less likely to work, have lower incomes, and own fewer assets, therefore having a lower collateral base (see Figure 5).

Figure 5. Financial Loans and Deposits

Gender Shares of Loans with Commercial Banks
(Percent)

Sources: IMF Financial Access Survey, IMF staff calculations.

Gender Shares of Deposits with Commercial Banks
(Percent)

Sources: IMF Financial Access Survey, IMF staff calculations.

B.   An Empirical Study of Gender Income Gaps

8.   Income gaps in Malta have narrowed significantly, yet still persist. Using approximately 20,000 anonymized micro data observations from Labor Force Surveys in 2013 and 2023, made available by Malta's National Statistical Office (NSO), we can analyze income gaps across age, occupation, economic activity, education, gender, and immigrant status. Overall, real yearly incomes—adjusted for inflation—increased for both men and women between 2013 and 2023 (see Figure 6). The median gender income gap was about 14 percent in 2014, narrowing to about 4 percent in 2023. Although the gender income gap in Malta is on aggregate in line with the EU27 average, women in Malta typically earn less than their male counterparts, even when holding similar qualifications and job roles. This disparity might be attributed to various factors, including occupational segregation, where women are overrepresented in lower-paying sectors, or prevalent gender norms that influence career choices and progression.

Figure 6. Income Distribution in 2013 and 2023
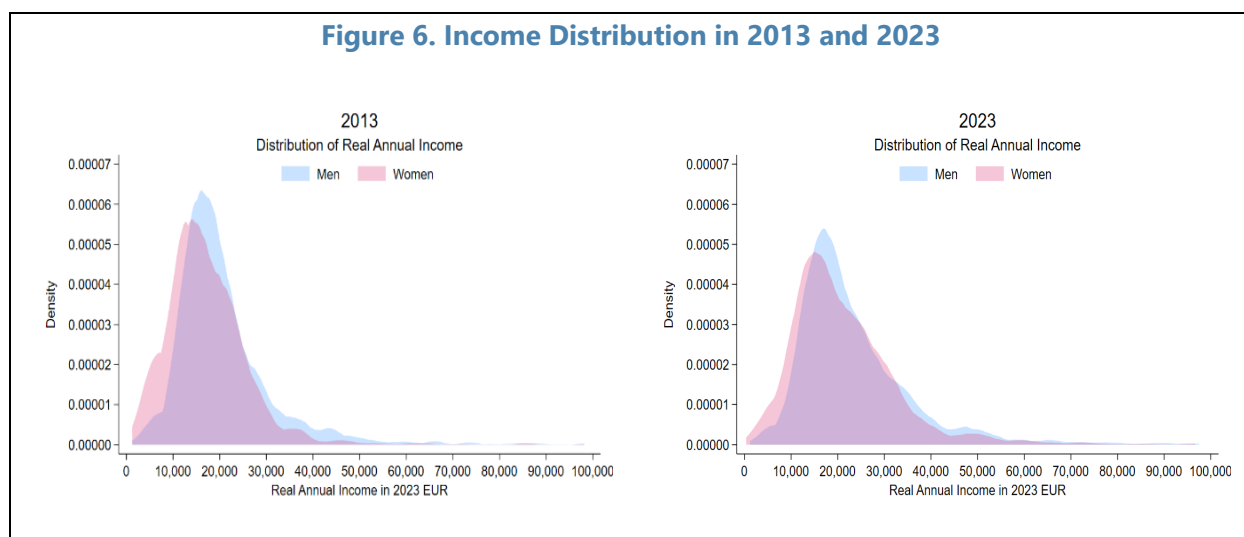
9.   Our regression exercises are designed to quantify the percentage differences in real yearly salaries between men and women.[3] Regressions are estimated separately for 2013 and 2023; sample weights and primary sample units (PSU) provided with the data were used in the estimation to ensure representative and unbiased results.[4] To estimate the gender gap in mean

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[3] Our analysis uses yearly salary as the dependent variable rather than hourly wages, as annual working hours are not available in the dataset. While we control the regressions for part-time versus full-time status, we acknowledge this binary indicator may not fully capture differences in working hours between men and women.

[4] Standard errors for the estimates are calculated using the Huber/White/sandwich estimator, which does not require the errors to follow a normal distribution or to be identically distributed across observations, ensuring robustness to heteroskedasticity.

income, we use Ordinary Least Squares (OLS) regressions with the log of real yearly salary as the dependent variable.[5] The model is specified as follows:

$$\ln(\text{Income}_i) = \alpha + \beta \text{Female}_i + \gamma X_i + \varepsilon_i, \tag{1}$$

where $\ln(\text{Income}_i)$ is the natural logarithm of the real yearly salary of individual i, Female_i is a binary variable indicating the gender of the individual (one if female, zero if male), X_i represents a vector of control variables, and ε_i is the error term.[6] The coefficient β captures, approximately, the percentage difference in mean income between men and women. We further employ a quantile regression approach to estimate the gender gap in selected percentiles of annual income, including the median.[7] The model for the qth quantile is specified as follows:

$$Q_q(\ln(\text{Income}_i)) = \alpha_q + \beta_q \text{Female}_i + \gamma_q X_i + \varepsilon_i, \tag{2}$$

where $Q_q(\ln(\text{Income}_i))$ represents the conditional qth quantile of real yearly salary. For instance, the coefficient $\beta_{0.5}$ provides an estimate for the percentage gender gap in median income.
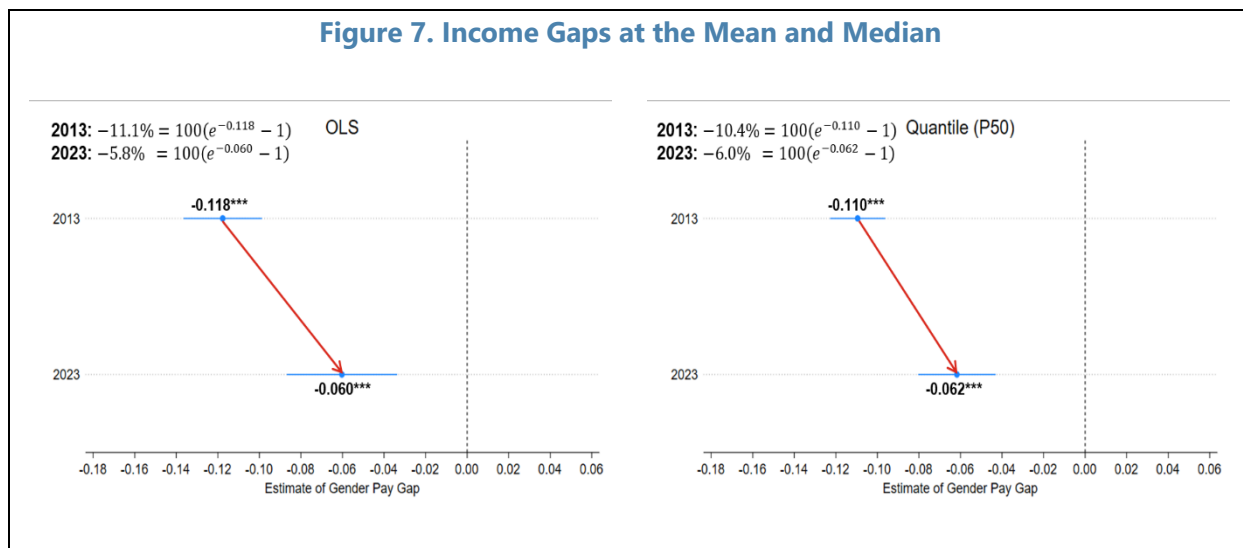
10.   The regression results (Model 1) indicate that the gender pay gap in Malta has narrowed significantly over the past decade but remains substantial. On average, the pay gap between men and women dropped from 11.1 percent in 2013 to 5.8 percent in 2023, controlling for similar characteristics (Figure 7).[8] At the median, the gap declined from 10.4 percent in 2013 to 6.0 percent in 2023. Despite this improvement, the estimates underscore that women in Malta still face a notable earnings disadvantage compared to men.

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[5] Given the skewness in the distribution of real yearly salaries, logging the dependent variable helps to stabilize variance and normalize the distribution.

[6] All regressions are controlled for 7 age groups, 4 education levels, 3 different birth places, 10 industries, 10 occupations, and a part- vs full-time indicator. The analysis is constrained by data availability in the Labor Force Survey. While additional controls for household composition (marital status, number and age of children) and job characteristics (job tenure, work experience, overtime hours, managerial responsibilities) would be valuable for understanding gender pay differences, these variables are not available in our dataset. The absence of these controls may affect our estimates of the gender pay gap, though the direction and magnitude of potential bias is ambiguous and would depend on the correlation between these omitted variables and included controls.

[7] Unlike OLS, which focuses on the mean of the dependent variable, the quantile regression estimates the effects at different points in the distribution, providing a more comprehensive understanding of the gender gap across the income distribution.

[8] We used the following formula to obtain exact percentage differences from the estimated coefficients: $\%\text{Diff} = 100(\exp(\hat{\beta}) - 1)$.

Figure 7. Income Gaps at the Mean and Median

2013: $-11.1\% = 100(e^{-0.118} - 1)$ OLS
2023: $-5.8\% = 100(e^{-0.060} - 1)$

2013   **-0.118*****

2023   **-0.060*****

-0.18 -0.16 -0.14 -0.12 -0.10 -0.08 -0.06 -0.04 -0.02 0.00 0.02 0.04 0.06
Estimate of Gender Pay Gap

2013: $-10.4\% = 100(e^{-0.110} - 1)$ Quantile (P50)
2023: $-6.0\% = 100(e^{-0.062} - 1)$

2013   **-0.110*****

2023   **-0.062*****

-0.18 -0.16 -0.14 -0.12 -0.10 -0.08 -0.06 -0.04 -0.02 0.00 0.02 0.04 0.06
Estimate of Gender Pay Gap

11.   The results of quantile regressions (Model 2) suggest that the gender pay gap increases with income levels but has decreased over time across the income distribution. In 2013, women in the 90th income percentile earned approximately 14 percent less than men, while the gap at the 10th percentile was around 10 percent (see Figure 8). By 2023, the gap narrowed at all income levels, with the disparity at the 90th percentile decreasing to 7.5 percent and at the 10th percentile dropping to about 6 percent. These results highlight significant progress in closing the gender pay gap, particularly for lower-income earners, although challenges remain particularly at the higher end of the income distribution.

Figure 8. Income Gaps Across the Income Distribution

2013
Quantile Estimates

P90
P80
P70
P60
P50
P40
P30
P20
P10

-0.18 -0.16 -0.14 -0.12 -0.10 -0.08 -0.06 -0.04 -0.02 0.00 0.02 0.04 0.06
Estimate of Gender Pay Gap

2023
Quantile Estimates

P90
P80
P70
P60
P50
P40
P30
P20
P10

-0.18 -0.16 -0.14 -0.12 -0.10 -0.08 -0.06 -0.04 -0.02 0.00 0.02 0.04 0.06
Estimate of Gender Pay Gap
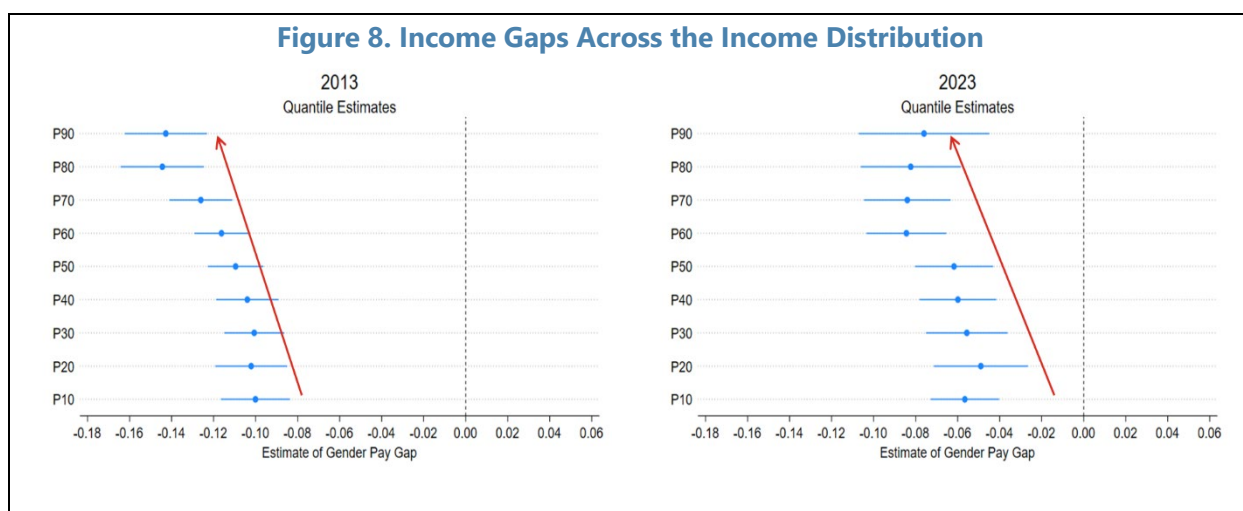
12.   Further regression analysis is conducted to assess differences in gender pay gaps based on individual characteristics. The estimation setup is the same as above, but now we

include an interaction term between the female indicator and each characteristic of interest, as follows:

$$\ln(\text{Income}_i) = \alpha + \beta\text{Female}_i + \gamma\text{Characteristic}_i + \delta(\text{Female}_i \times \text{Characteristic}_i) + \theta X_i + \varepsilon_i, \qquad (3)$$

where Characteristic_i represents the set of individual i's characteristics of interest, and the remainder of the notation is the same as before. Note that the vector of controls now excludes the characteristic being assessed. The interaction term's coefficient δ in this context captures the differential effect of the characteristic of interest on the mean gender income gap. [9]

13.   The results show that the gender pay gap in Malta has narrowed across multiple dimensions over the past decade, reflecting widespread progress in reducing income disparities. From 2013 to 2023, gender pay gaps shrank across all age groups (See Table 1). Tertiary education shows a significant reduction in gender pay gaps, while gaps persist among those with lower education attainment. The gap also declined across different places of birth, with non-EU workers driving much of this progress. Among full-time workers, the gender pay gap halved, while it remained statistically insignificant for part-time workers. The services sector led the way in closing wage gaps, and higher-skilled jobs demonstrated the strongest progress in pay equality.

Table 1. Malta: Gender Income Gaps in Malta for Selected Worker Characteristics		
	2013	**2023**
Age groups		
10-19	-0.122**	-0.079
	(0.055)	(0.084)
20-29	-0.112***	-0.068***
	(0.016)	(0.024)
30-39	-0.102***	-0.032
	(0.018)	(0.024)
40-49	-0.114***	-0.075***
	(0.021)	(0.024)
50-59	-0.143***	-0.072***
	(0.022)	(0.027)
60-69	-0.165***	-0.102**
	(0.061)	(0.045)
70-79	-0.515***	-0.107
	(0.139)	(0.293)
Education levels		
No formal education, primary or lower secondary education	-0.149***	-0.118***
	(0.015)	(0.024)

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[9] As presented in Table 1, for the first category of a characteristic, the gender pay gap is equal to the coefficient of the female dummy variable. For other categories of the characteristic, the gender pay gap is calculated by adding the coefficient of the female dummy variable to the coefficient of the interaction term for that category. The interaction term quantifies the additional impact of being female for that specific category, beyond the baseline effect.

**Table 1. Malta: Gender Income Gaps in Malta for Selected Worker
Characteristics** (Continued)

	2013	2023
Upper secondary education	-0.070***	-0.085***
	(0.018)	(0.021)
Post-secondary education	-0.047*	-0.012
	(0.027)	(0.055)
Short-cycle tertiary education, Bachelor's, Master's or Doctoral level or equivalent	-0.141***	-0.024
	(0.019)	(0.021)
Place of birth		
Malta	-0.114***	-0.076***
	(0.009)	(0.013)
Other EU-27 country	-0.097	-0.010
	(0.075)	(0.058)
Other non-EU-27 country	-0.248***	-0.046
	(0.063)	(0.030)
Job type		
Full-time job	-0.128***	-0.064***
	(0.009)	(0.014)
Part-time job	-0.055	-0.024
	(0.039)	(0.057)
Industry		
Agriculture, forestry, and fishing	-0.214**	0.007
	(0.102)	(0.064)
Manufacturing, energy, and utilities	-0.087***	-0.097**
	2013	**2023**
	(0.022)	(0.040)
Construction	-0.092	-0.140*
	(0.065)	(0.076)
Trade, transport, accommodation, and food services	-0.138***	-0.075***
	(0.020)	(0.028)
Information and communication	-0.125***	0.029
	(0.047)	(0.071)
Finance and insurance	-0.051	-0.046
	(0.039)	(0.051)
Real estate	-0.257**	0.063
	(0.118)	(0.111)
Professional, business, and support services	-0.158***	-0.029
	(0.041)	(0.040)
Public administration, education, health, and social work	-0.115***	-0.060***
	(0.013)	(0.019)
Arts, entertainment, and other services	-0.123**	-0.062

Table 1. Malta: Gender Income Gaps in Malta for Selected Worker Characteristics (Concluded)		
	(0.055)	(0.053)
Occupation		
Managers	-0.131***	-0.015
	(0.035)	(0.049)
Professionals	-0.145***	-0.055**
	(0.022)	(0.026)
Technicians and Associate Professionals	-0.069***	-0.019
	(0.024)	(0.031)
Clerical Support Workers	-0.017	-0.022
	(0.023)	(0.033)
Service and Sales Workers	-0.146***	-0.067***
	(0.020)	(0.026)
Skilled Agricultural, Forestry, and Fishery Workers	-0.214**	0.013
	(0.100)	(0.064)
Craft and Related Trades Workers	-0.035	-0.162
	(0.052)	(0.131)
Plant and Machine Operators, and Assemblers	-0.156***	-0.121***
	(0.030)	(0.046)
Elementary Occupations	-0.200***	-0.195***
	(0.031)	(0.044)
Armed Forces Occupations	0.086***	0.220***
	(0.027)	(0.044)
Note: The numbers depict the average marginal effects of being a woman conditional on belonging to the relevant characteristic group. Robust standard errors calculated using the Delta method in parentheses. *** p<0.01, ** p<0.05, * p<0.1		

14.   The "Oaxaca-Blinder decomposition" suggests that the narrowing of the gender pay gap in Malta between 2013 and 2023 was primarily driven by reductions in differences in observable worker characteristics. The Oaxaca-Blinder decomposition (Oaxaca, 1973; Blinder, 1973) captures differences in returns to observed characteristics between groups. The analysis shows that the total average pay gap decreased significantly, from 0.209 log points in 2013 to 0.092 log points in 2023 (See Table 2). The explained portion of the gap, reflecting differences in observable characteristics, dropped substantially, accounting for only 10 percent of the total gap in 2023 compared to 43 percent in 2013.[10] Conversely, the unexplained portion, which captures differences in how observable characteristics are rewarded, became more dominant, increasing its share from 57

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[10] The observable characteristics considered are the same as those used as controls in the regressions.

percent to 89 percent.[11] This shift highlights significant progress in equalizing observable worker attributes.

Table 2. Malta: Oaxaca-Blinder Decomposition		
	2013	**2023**
Log annual income		
Men	9.839***	9.912***
Women	9.629***	9.821***
Gap	0.209***	0.092***
Gap decomposition		
Explained	0.089***	0.009
Share	*43%*	*10%*
Unexplained	0.120***	0.082***
Share	*57%*	*89%*
*** p<0.01, ** p<0.05, * p<0.1		

C. Conclusion and Policy Considerations

15.   Malta has made significant progress reducing gender gaps over the last two decades, but some gaps remain – especially representation in senior positions and incomes. The female participation rate has increased significantly to 73 percent - above the EU average - due to active government policies and an inflow of foreign workers. Malta's legal framework for preventing gender discrimination is sound. However, despite a higher share of women with a tertiary education than men, representation of women in senior positions remain low in the private sector. In addition, income gaps remain – especially for women with less than tertiary education, in technical functions, and across most age categories, although the overall income gap narrowed significantly during the last decade.

16.   Malta has made progress in policies that support women entering and returning to the labor force, but more can be done. While enhancing parental leave, flexible work arrangements, and promoting women in leadership are important, achieving parity requires ongoing commitment to addressing both structural and cultural gender inequalities in the labor market. Looking ahead, implementation of the government's Gender Equality and Mainstreaming Strategy and Action Plan, 2022-2027, bringing a gender perspective into all stages and sectors of policymaking, should drive further narrowing of gender gaps.[12]

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[11] Note that the unexplained component of the Oaxaca-Blinder decomposition captures differences in returns to observed characteristics between groups, not omitted variables effects. While omitted variables may affect the overall estimation, they are distinct from the decomposition's unexplained portion, which specifically measures how differently the included characteristics are rewarded between men and women.

[12] See Government of Malta: Gender Equality and Mainstreaming Strategy and Action Plan, 2022-2027.

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