



THE WORLD BANK
IBRD • IDA | WORLD BANK GROUP

FOR OFFICIAL USE ONLY

Managing the Lignite Transition for Coal Regions in Western Macedonia, Greece

Towards a Just Coal Transition in Western Macedonia, Greece - What Does the Labor Market Look Like?

Luc Christiaensen and Céline Ferré

Valuable data analysis was provided by the team at EIEAD consisting of Stavros Gavroglou, Vaios Kotsios, Vasiliki Krommyda and Konstantia Vaiopoulou.

FINAL

September 2020

Presented to:

The European Commission, Ministry of Environment and Energy, the Governor of Western Macedonia and the Coal Regions in Transition Working Group for Western Macedonia

Acronyms

EIEAD	<i>Ethniko Institutouto Ergasias Kai Anthropinou Dinamikou</i> – National Institute of Labor and Human Resources (HILHR)
ELSTAT	Hellenic Statistical Authority
ERGANI	Administrative employment database of firms
EL	Greece
EU	European Union
EUROSTAT	European Union Statistical Unit
EU-SILC	European Union Statistics on Income and Living Conditions
FGD	Focus Group Discussion
GVA	Gross Value Added
LFS	Labor Force Survey
NUTS	Nomenclature of Territorial Units for Statistics
OAED	<i>Organismos Apasxolisis Ergatikou Dynamikou</i> – Manpower Employment Organization (i.e. National Employment Agency (NEA))
PPC	Public Power Corporation

Table of Contents

Executive Summary	6
1. Life in a lagging region in a shrunk economy	7
1.1. Many more people inactive and many more active people unemployed.....	7
1.2. An older, rapidly aging and dependent population whose workers are leaving.....	8
1.3. Unemployment and poverty are closely linked	10
2. Where are the jobs and who is hiring?	11
2.1. Composition of the formal firm sector	11
2.2. Limited job creation, mostly in lower skilled sectors.....	12
2.3. Self-employment and temporary wage contracts prevail, signaling high job insecurity.....	13
3. Who is active? Who is getting jobs?	13
3.1. The labor force is made up of low-educated, prime-age workers	13
3.2. Unemployment affects women and youth disproportionately.....	13
4. Employment in lignite mining and power generation	15
4.1. Important for Western Macedonia, vital for some municipalities	15
4.2. Levels of employment have remained similar, but job security and earnings declined	16
4.3. Workers are predominantly older male technicians, less educated but highly skilled	18
5. Who will be affected by the transition out of lignite?	19
5.1. Relatively few currently registered jobseekers are from the mining and power sector.....	19
5.2. About half of the Public Power Corporation’s workforce will be retired by 2023	19
5.3. But many jobs in the mining and electric power value chain are possibly at stake.....	20
5.4. Generally, youth and new labor market entrants lack good basic skills.....	24
5.5. There is skills mismatch in the broader Western Macedonian labor market.....	25
5.6. Those affected by mine closure hold little hope for employment in Western Macedonia	26
6. Recommendations	27
6.1. Improve understanding of the barriers to higher employment	28
6.2. Tailor labor market programs to each jobseeker’s needs	29
6.3. Income support, training and retraining remain priorities	30
Bibliography	32
Annex 1: World Bank quantitative and qualitative surveys.....	33
Firm’s Survey	33
Qualitative Survey	35
Annex 2: Additional Tables and Graphs	38

List of figures

Figure 1: Western Macedonia records the highest unemployment rates in Greece	7
Figure 2: Few people in Western Macedonia are employed	8
Figure 3: Western Macedonia's population is aging fast and losing its younger working-age labor force	8
Figure 4: Old-age dependency ratios remain higher than in the rest of Greece and the EU	9
Figure 5: Western Macedonia's population continues to leave the region, especially from Kastoria and Grevena/Kozani	9
Figure 6: High unemployment and poverty are closely correlated	10
Figure 7: Youth, low educated households, and female-headed households are most at risk of poverty	10
Figure 8: Employment is concentrated in sectors linked to the use of natural resources	11
Figure 9: More than half of gross Value Added (GVA) in Kozani and Florina comes from the industrial sector	12
Figure 10: Prime-age and low-educated workers constitute the vast majority of the workforce in Western Macedonia	13
Figure 11: Youth and women experience the highest unemployment rates in Western Macedonia	14
Figure 12: Employment in mines is halting, while the construction of Ptolemais V keeps providing jobs in the power sector	16
Figure 13: Employment in Mining and Quarrying and Electric Power Generation, Transmission and Distribution, Western Macedonia	17
Figure 14: About 16,000 jobs would be directly and indirectly affected by mine closures.....	21
Figure 16: A substantial group of firms in Western Macedonia depends on PPC	22
Figure 17: Prime-age and middle-skilled workers constitute the vast majority of the contracted workforce	22
Figure 18: Skills mismatch, Western Macedonia	26
Figure 18: Map of mining activities in Western Macedonia	38
Figure 19: Labor Force Participation, select years	39

List of tables

Table 1: Most employees at PPC are plant and machine operators and assemblers, or craft and related trade workers	18
Table 2: Residual PPC workforce in 2023	19
Table 3: Number of jobs generated by region and value of contract with PPC.....	21
Table 4: PISA Results, Greece 2018	25
Table 5: Firms from the initial and final sample.....	33
Table 6: Final sample and post-stratification	34
Table 7: Average contract value (2017-2019) from direct estimates (1,225 firms from PPC listing) ...	34
Table 8: Average contract value (2017-2019) from indirect estimates (220 firms from sample), reweighted	34
Table 9: Gross value added of each NACE Rev. 2 sector per select geographic unit, 2011.....	39
Table 10: Net job creation, Western Macedonia, 2018.....	40

Executive Summary

In October 2014, the European Council agreed on a new 2030 Framework on Climate and Energy. The Framework implies among others a reduction in coal-derived energy for EU member states by 2030. Against this background, the Regional Government of Western Macedonia, Greece has sought the assistance of the World Bank to develop a Road Map for a Managed Transition of Coal-Dependent Regions in Western Macedonia (henceforth referred to as the Road Map) as well as the identification of concrete investment projects that can be financed by other branches of the European Commission, such as the Structural Reform Support Service (SRSS). This report feeds into this endeavor and focuses on the impact of the decarbonization process on the labor force, and its impact on the reduction in jobs in Western Macedonia.

Western Macedonia continues to be deeply affected by the economic and financial crisis of 2008, even more than the rest of the country. It is the poorest region of Greece; one in four people is below the poverty line, less than one in three persons in the region is working (84,000 out of 269,000 people), and the region records the highest unemployment rates of the country (27 percent of the active population). Against this background, it does not surprise that the region is experiencing important outmigration, both out of the region and out of the country, as people try to find better economic opportunities elsewhere.

Locally, and despite a drastic reduction in activity after the economic crisis, mining and quarrying, and the associated power generation sector have continued to play the role of a safety net for many, through the Public Power Corporation (PPC), either as a direct employer providing some of the best conditions in the region, or indirectly, as one of the biggest and most reliable sources of contracts.

An estimated total number of about 16,000 jobs could potentially be affected directly and indirectly by the mines closure. PPC is the main provider of jobs in mining and quarrying or the power sectors, for a total of 3,899 full-time positions, and 750 8-months contractuales in 2018. The employment indirectly generated by the mines and power plants is however much larger, within the mining and power sectors, and beyond. An ad-hoc survey of a sample of PPC's subcontractors estimated that an additional 11,065 indirect jobs would be affected (7,268 by subcontractors and 3,795 by sub-subcontractors). It mainly concerns an older, less educated, but medium-skilled workforce which acquired its skills on the job.

With unemployment rates already more than twice as large as those experienced in other coal regions of the EU, the social impact will undoubtedly be high if an additional 15 to 20 percent of the active population becomes directly unemployed due to the closure of the mines and possible decommissioning of the power plants. Locally the effects will be even much harder felt. Many do not expect much of a future in Western Macedonia, with most of the better-skilled seeing themselves move to other regions, also because of the substantial skills mismatch which already exists.

But much will also depend on the coal transition path chosen, including the timing and labor intensity of the power plant decommissioning and land reclamation plans, as well as the labor intensity of the new alternative activities promoted. The latter will have to be a key criterium in selecting and supporting new investments. The Road Map mentioned above proposes four pathways going forward (World Bank, 2020). With more clarity on the strategic orientation taken, better tailored and targeted active labor market programs could also be developed to help affected and other workers (especially youth) transition into the new positions. In this, timely consultations with the workers affected will be critical.

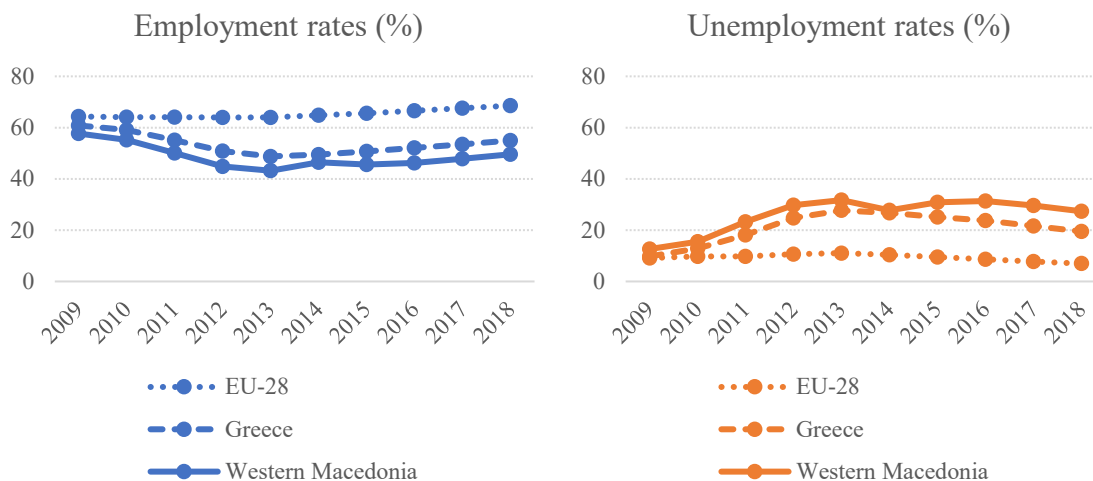
1. Life in a lagging region in a shrunk economy

1.1. Many more people inactive and many more active people unemployed

1. **The prolonged economic crisis continues to deeply affect the Greek economy.** After years of respectable growth accompanied by the emergence of significant macroeconomic imbalances, Greece endured six consecutive years of recession (2008–2013). Gross domestic product (GDP) growth turned positive only in 2016. Even so, it has remained below 2 percent since (IMF, World Economic Outlook database, 2019).

2. **Its labor market remains also heavily affected.** When Greece entered the crisis in 2008, its employment rate (the share of the working age population employed) was already 5 percentage points lower than that of the EU-28 average. Subsequently, it fell sharply between 2008 and 2013, before recovering modestly and settling at 55 percent in 2018. This is the lowest among the EU Members and almost 14 percentage points below the EU average. By the same token, the unemployment rate, or the share of the active population that is looking for work, which was almost on par with the EU-28 average when the crisis hit, rapidly increased, peaking at over 36 percent in 2013 and falling to about 24 percent in 2018. It is the highest rate in the EU and 17 percentage points higher than the average for the EU-28 (Figure 1). In general, activity rates remain among the lowest in the EU-28 (68 percent of the working-age population in 2018 compared with 74 percent in the EU-28) (Eurostat, LFS database, 2019).

Figure 1: Western Macedonia records the highest unemployment rates in Greece

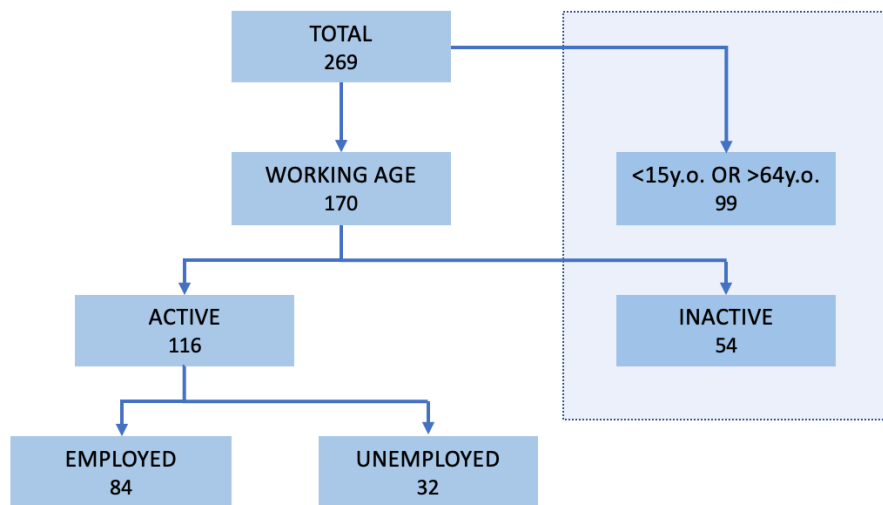


Note: the working-age population are those 15-64 years old. They are divided in those active (working or looking for work) and those inactive (unable to work or able, but not looking to work). The employment rate is the percentage of people employed relative to the population of working age. The unemployment rate is the percentage of people of working age without work and available and looking for work relative to the active population. As a result, the employment and unemployment rate do not add up to 100%. For exact Eurostat definitions of employment and unemployment rates, see https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Unemployment_rate.

Source: Authors' calculations using Eurostat LFS data (2018).

3. **The situation is even more dire in Western Macedonia.** Even if unemployment in Western Macedonia has continued to fall in recent years, the current rate remains exceedingly high (27 percent compared to 19 percent in Greece, the highest in the country) (Figure 1). Most mining NUTS-II regions in Europe have unemployment rates below 10 percent of the population (Alvares Días et al, 2018). Many in Western Macedonia are also inactive. Overall, the population is highly dependent on a limited number of working individuals: less than 1 in 3 persons is working in the region (84,000 out of 269,000) (Figure 2). This follows from low employment, further compounded by ageing and outmigration.

Figure 2: Few people in Western Macedonia are employed



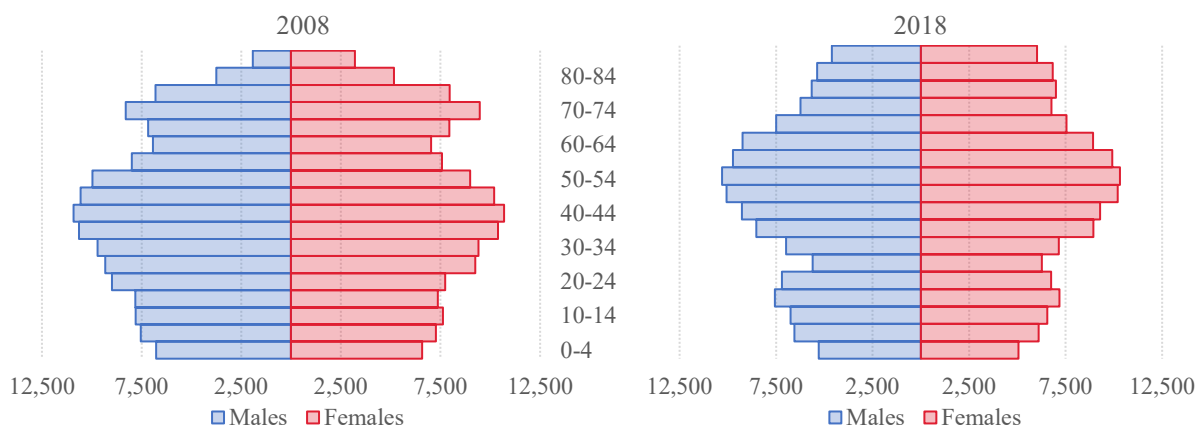
Note: numbers expressed in '000s.

Source: Authors' calculations using Eurostat LFS data (2018).

1.2. An older, rapidly aging and dependent population whose workers are leaving

4. **Over the past ten years, Western Macedonia saw its population age rapidly.** Not only was Western Macedonia's population already one of the oldest in Greece: the elderly (over 65-year-olds) represented 21.5 percent of the region's population in 2008, compared to today's average for Greece of 21.8 percent, and their share rose further to 23.6 percent in 2018. Youth (0-14-year-olds) and the working age (15-64-year-olds) make up the remaining 13.5 and 62.9 percent respectively (see Figure 3).

Figure 3: Western Macedonia's population is aging fast and losing its younger working-age labor force

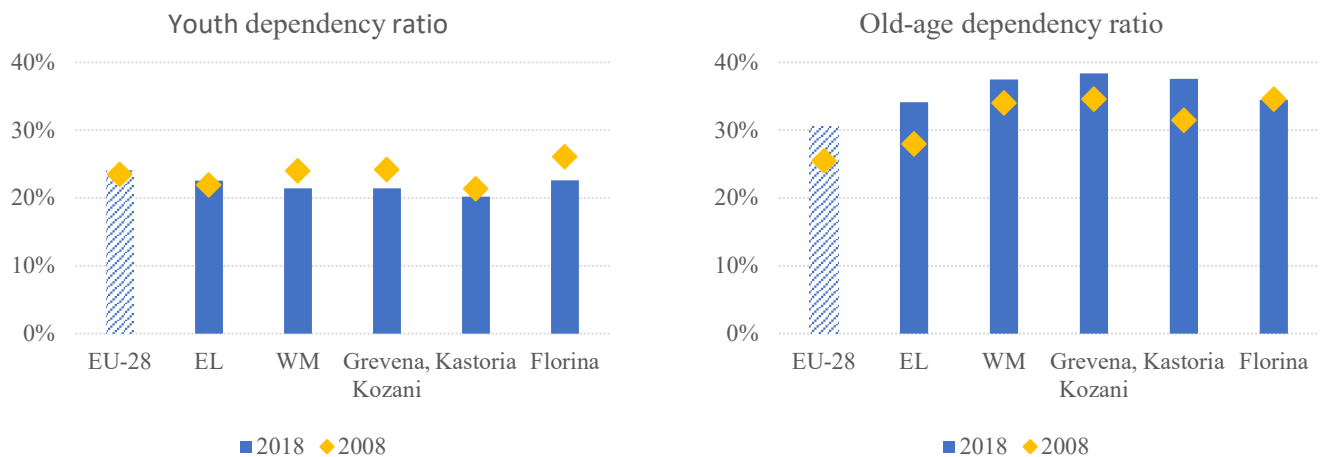


Note: Population on January 1st of each year.

Source: Authors' calculations using Eurostat population data, 2019.

5. **Old-age dependency rates are now at a record high of 37 percent (Figure 4).** For every ten working-age adults (15-64 years of age) there are four pensioners (over 65). These figures are higher than 10 years ago, and higher than the national and EU-28 averages (respectively 34 and 30 percent). Youth dependency rates are lower than in Greece and the EU, and declining, reflecting the outmigration of younger adults, who are more likely to be the ones with children under the age of 15, as illustrated below.

Figure 4: Old-age dependency ratios remain higher than in the rest of Greece and the EU

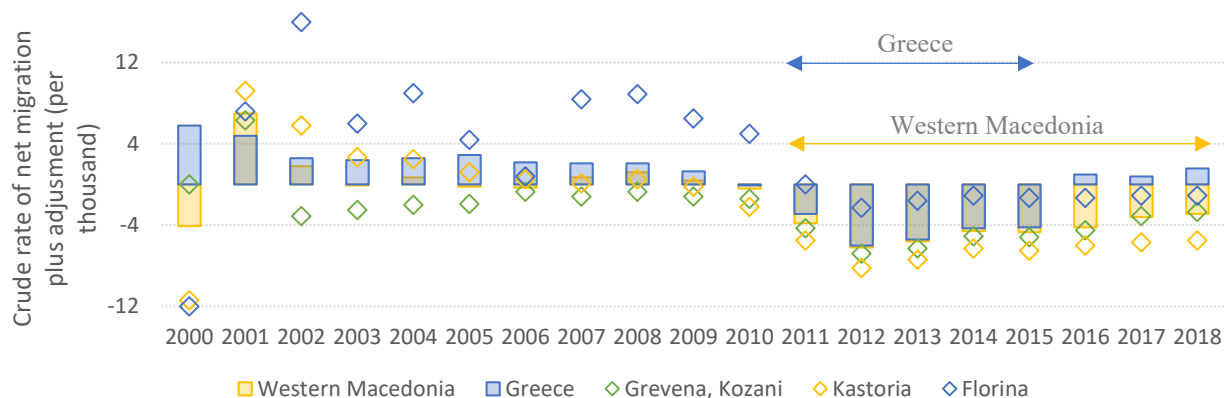


Note: The region of Western Macedonia has 4 Regional Units (R.U.): Grevena, Kozani, Kastoria and Florina (see map Appendix). Youth dependency ratio = population 0-14 y.o. / population 15-64 y.o. Old-age dependency ratio = population 65+ y.o. / population 15-64 y.o.

Source: Authors' calculations using Eurostat population data, 2019.

6. **The effects of ageing are compounded by rapid outmigration, especially of younger workers (25-35).** Over the past 10 years, Greece experienced a total population decline of almost 320 thousand people (Eurostat). Outmigration started picking up as of 2011, culminating in 2012 and 2013 with crude rates of net migration¹ at about -5 per thousand (Figure 5). Since 2016, net migration in Greece is again positive, around 1 per thousand (Eurostat). In Western Macedonia, population shrank from 287 to 269 thousand between 2008 and 2018, a 6 percent decline (Eurostat). The region started experiencing outmigration much earlier than the rest of the country. It began around 2000, with net migration rates around -4 per thousand of the population (driven by the Kastoria and Florina Regional Units, net migration rates of -11 and -12 per thousand respectively). Net migration rates continued to be negative during the 2000s for Grevena/Kozani (mines and power plants are concentrated in Kozani) and turned negative again for Western Macedonia as a whole, from 2011 onwards. Net outmigration from Western Macedonia has continued until today (with net out migration now most pronounced in Kastoria), but still around 4 per thousand in the Grevena and Kozani Regional Units.

Figure 5: Western Macedonia's population continues to leave the region, especially from Kastoria and Grevena/Kozani



¹ The crude rate of net migration plus adjustment is defined as the ratio of net migration (including statistical adjustment) during the year to the average population in that year. The value is expressed per 1,000 persons – see <https://ec.europa.eu/eurostat/web/products-datasets/-/tps00019>.

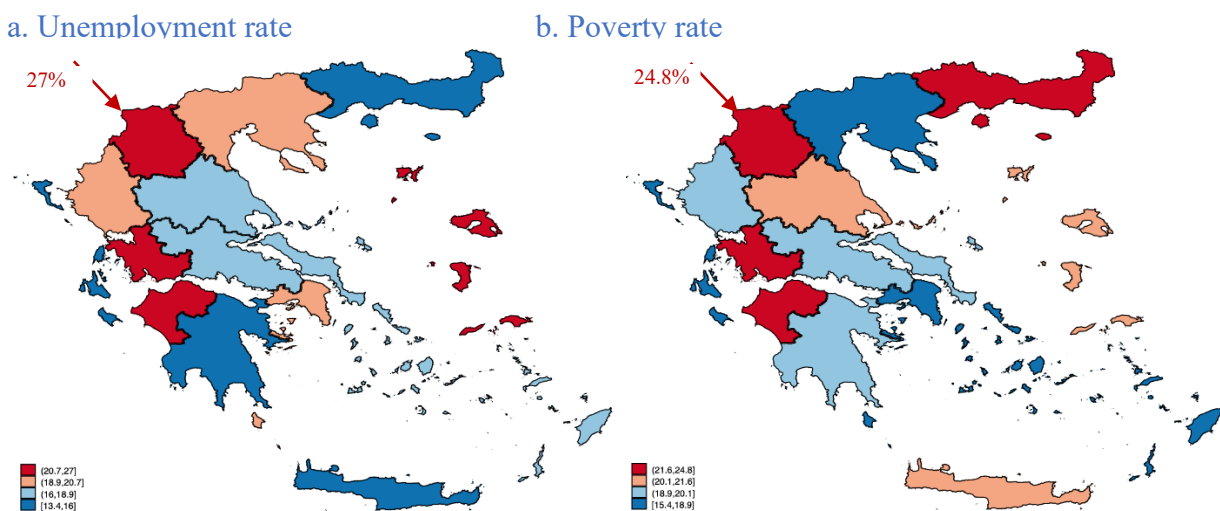
Note: The region of Western Macedonia is made of Grevena, Kozani, Kastoria and Florina Regional Units (R.U.) (see map in Annex). See footnote 2 for definition of crude rate of net migration.

Source: Authors' calculations using Eurostat population data, 2019.

1.3. Unemployment and poverty are closely linked

7. **Western Macedonia is also the poorest region in Greece.**² In 2018, 24.8 percent of the population in Western Macedonia was below the poverty line, well above the national average of 18.6 percent. Figure 6 shows the tight correlation between unemployment rates and poverty at the regional level - regions recording the highest poverty rate also have the highest unemployment rate. Three in four of the households whose household head is unemployed are poor (EU-SILC, 2018).

Figure 6: High unemployment and poverty are closely correlated

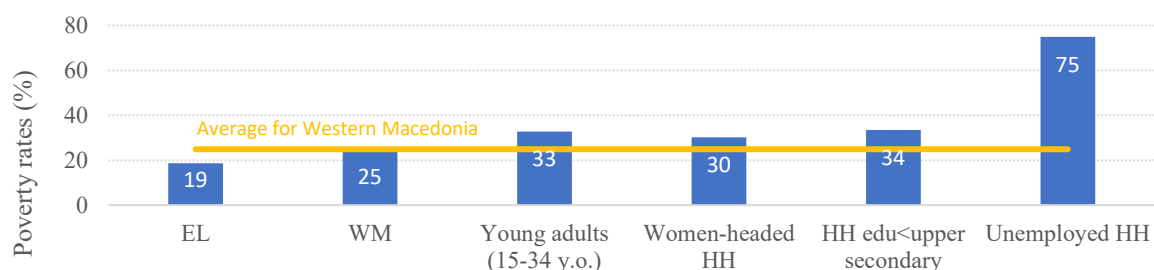


Note: Unemployment rates are displayed for the population aged 15-74 years old.

Source: Authors' calculations using Eurostat, EU-SILC (2018) and LFS (2018) data.

8. **Poverty concentrates among the younger generations, those with low levels of education, and female headed households.** Households led by someone who didn't complete at least secondary school, as well as younger adults, are most likely to be poor (one in three) (Figure 7). Female-headed households are also poorer than Western Macedonia's average (30 percent). At the household level, poverty is also highly correlated with unemployment status: 75 percent of the population living in a household lead by an unemployed individual are poor.

Figure 7: Youth, low educated households, and female-headed households are most at risk of poverty



Source: Authors' calculations using EU-SILC (2018) data.

² A household is poor if its disposable income per equivalized person after social transfers is below 60 percent of the national median.

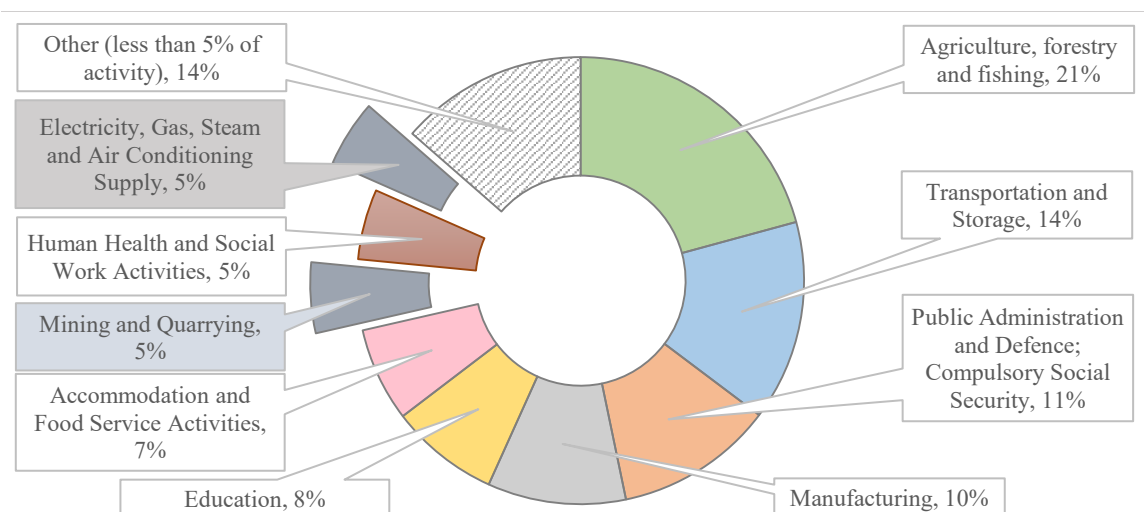
2. Where are the jobs and who is hiring?

2.1. Composition of the formal firm sector

9. **Much of Western Macedonia's employment³ is concentrated in sectors directly or indirectly linked to the use of its natural resources: land and mining (Figure 8).** Agriculture, forestry and fishing constitutes the largest sector (21 percent of employment). Within agriculture, growing of non-perennial crops itself represents over 10,000 jobs, or 12 percent of total employment in the region. Agriculture, forestry and fishing is followed closely by transport and storage (14 percent of total employment), public administration (11 percent). At the regional level, mining and quarrying (NACE Rev 2 sector B) and electricity and power generation (NACE Rev 2 sector E) represent each 5 percent of available jobs. By way of comparison, in Greece, agriculture, forestry and fishing represent only 12.3 percent of total employment, and the largest sector is made of wholesale and retail trade, providing 18 percent of the country's employment, while manufacturing and the public sector represent each less than 10 percent of employment (LFS, 2018).

Figure 8: Employment is concentrated in sectors linked to the use of natural resources

Distribution of employment by NACE Rev.2 sectors, Western Macedonia, 2018



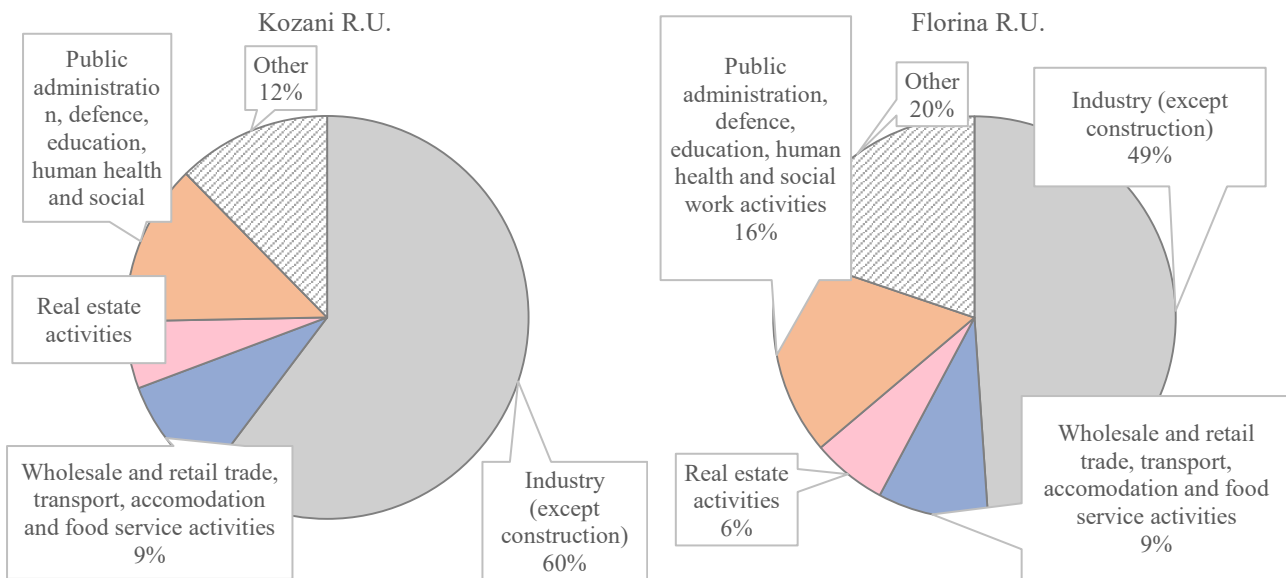
Source: Authors' calculations using EIEAD data, 2018.

10. **Most of Western Macedonia's Gross Value Added (GVA), however, comes from the industrial sectors (mining, manufacturing, power generation, and water).⁴** Half of Western Macedonia's GVA is generated by the traditional industrial sectors, as compared to 13 percent for Greece as a whole, highlighting the preponderance of the sector in generating value (see Table 4 in the Annex). The industrial sector is especially important in Kozani R.U. and Florina R.U., where it accounts for 60 and 49 percent of GVA respectively (Figure 9). Public administration represents the second largest sector in Western Macedonia (accounting for 16 percent of the regional GVA). Finally, wholesale and retail trade, tourism and transportation come in the third place, but represent only 11 percent of the regional GVA (compared to 25 percent at the national level).

³ Statistics come from ERGANI data which only records formal firms of more than 1 person. Self-employment and informal employment are not included in the statistics.

⁴ Data don't allow us to have a breakdown of GVA within the NACE Rev. 2 industry sector (B through E).

Figure 9: More than half of gross Value Added (GVA) in Kozani and Florina comes from the industrial sector



Note: All sectors of activity representing less than 5 percent of the R.U. GVA is lumped in the category "other."
 Source: Authors' calculations using EUROSTAT data, 2011 (most recent year available).

2.2. Limited job creation, mostly in lower skilled sectors

11. **In 2018, 1,763 net new jobs were created⁵ in Western Macedonia, or about 2 percent of the stock of total employment** (37,911 jobs were destroyed, and 39,674 jobs were created). Most jobs were created in the Kozani Regional Unit (1,227 new jobs net), mainly in the municipality of Kozani (829 new jobs net); but also in the R.U of Florina (211 new jobs net), mainly in the municipality of Florina (167 new jobs net). This is consistent with the observed deceleration of outmigration in Grevena/Kozani since 2016 (with not much change in the (already lower) outmigration patterns in Florina (Figure 5 above)).

12. **Between 2013 and 2018, the sectors with most net job additions in Western Macedonia are in leisure, agriculture, trade, construction and computer programming (EIEAD, 2019).**⁶ While some sector may have natural high turnover or seasonal patterns (hotels, retail and trade, agriculture), some other are less subject to large waves of hiring and firing (services to the community, medical and dental practices, computer programming).⁷

⁵ Definition: new jobs = hirings – firings. Jobs are only counted in the formal sector, in firms with over one employee (ERGANI data).

⁶ These correspond in particular to the following NACE REV2 codes : Restaurants and mobile food service activities (NACE Rev.2 sector 561), hotels and accommodation (551), growing of perennial crops (012), retail sale in specialized stores (477), sports activities (931), provision of services to the community (842), medical and dental practice activities (862), retail sale of food, beverages and tobacco (472), computer programming, consultancy and related activities (620), construction of roads and railways (421).

⁷ Greece does not produce a national or regional labor market forecasts, which would help determine which occupations will become redundant in the short-term, or those that will become in high demand. At the national level, the following occupations are identified as being the most dynamic from 2013 to 2018: shop and sales representatives (522), waiters and bartenders (513), food preparation assistants (941), client information workers (422), child care workers and teachers' aides (531), ICT operations and user supports technicians (351), manufacturing laborers (932), protective service workers (541), and car/van/motorcycle drivers (832) (EIEAD, 2019).

2.3. Self-employment and temporary wage contracts prevail, signaling high job insecurity

13. **Finally, another distinguishing characteristic of the Greek labor market is a high share of self-employment**, especially in Western Macedonia where half of the working population is self-employed.⁸ Although self-employment has fallen since the crisis, the share of self-employment in the Greek labor market is unusually high, at 33 percent in 2018 (the EU-28 average for the same year was 15 percent (Eurostat, 2018). It is 50 percent higher in Western Macedonia, where half of those employed are self-employed (LFS, 2018).

14. **Only 50 percent of employees in western Macedonia have a permanent job, indicating high jobs insecurity (LFS, 2018)**. The prevalence of temporary contracts is much higher than in the rest of the country, where less than 40 percent of employees lack a permanent contract (LFS, 2018).

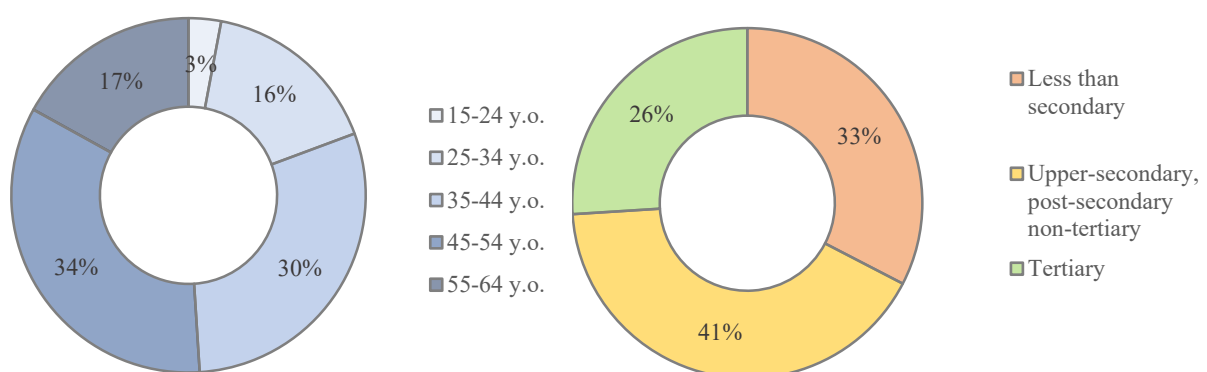
3. Who is active? Who is getting jobs?

3.1. The labor force is made up of low-educated, prime-age workers

15. **The vast majority of employed individuals in Western Macedonia are prime-age workers**, i.e. individuals between the ages of 35 and 54. They represent 64 percent of the employed workforce (Figure 10). Youth – or those aged 15-24 – represent less than 10 percent of the workforce, which could be explained by the challenges they face to enter the labor market, as well as outmigration in the past decade. 20 percent of them are not in employment, education or training (NEET), which is 6 percentage points above the national average. Similarly, only 24.3 percent of those aged 15 to 34 who graduated within the last 3 years are employed, suggesting difficulties in school-to-work transition.

16. **Educational attainment in Western Macedonia is lower than in Greece**, mainly due to a higher share of people whose highest degree was less than secondary school (1 in 3 in Western Macedonia compared with 1 in 5 in Greece). However, education increased sharply over the past decade in Western Macedonia (as it did in Greece): in 2008, 52 percent of the workforce had at most completed basic secondary school, when in 2018 only a third had not studied beyond basic secondary school.

Figure 10: Prime-age and low-educated workers constitute the vast majority of the workforce in Western Macedonia



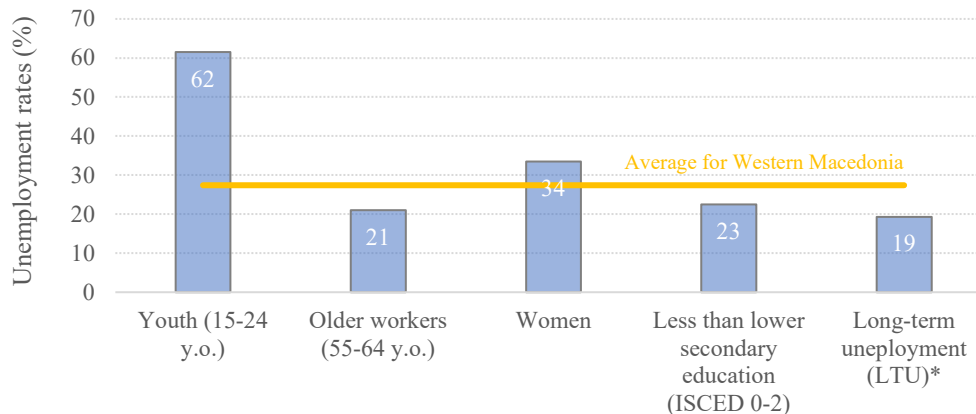
Source: Eurostat, LFS (2018) data.

3.2. Unemployment affects women and youth disproportionately

⁸ Self-employment includes self-employed with employees, without employees, and family workers.

17. **Unemployment rates are particularly high for a subset of the population in Western Macedonia: youth and women.** Those aged 15-24 experience record-high unemployment rates above 60 percent⁹, which is twice the regional unemployment rate, and almost 10 percentage points higher than the national average for that age group. 34 percent of women in Western Macedonia are unemployed, slightly above the regional average. Interestingly, older workers experience lower-than-average unemployment rates, which could be explained by early retirement plans (check). Long-term unemployment (LTU) is also particularly high, with 19 percent of the active population unemployed for over 12 months. In other words, two in three unemployed have been out of work for more than 12 months, highlighting the difficulty to find a job in the region.

Figure 11: Youth and women experience the highest unemployment rates in Western Macedonia



*: share of total active population.

Source: Authors' calculations using Eurostat, LFS (2018) data.

⁹ The 60 percent unemployment rate among 15-24-year olds is not to be confused with the 30% NEET rate for the 18-24 year old. Apart from the slight difference in reference group (15-24 vs 18-24-year olds), the unemployment rate refers to the share of unemployed relative to the sum of those employed and those looking for work (excluding those not looking for work). The NEET rate is relative to everyone in the age group concerned.

4. Employment in lignite mining and power generation¹⁰

4.1. Important for Western Macedonia, vital for some municipalities¹¹

18. **At 5 percent of employment, the *direct* contribution of lignite mining to overall employment in Western Macedonia may appear low.** For Western Macedonia, employment in lignite mining accounted for between three to five thousand jobs per year over the past decade (Figure 12), or about 5 percent of its employment. As such, the *direct* contribution of mining to employment in the region is low compared to its contribution to GVA and the attention to the sector.¹²

19. **Yet, lignite mining also provides the basis for power generation, which is directly responsible for another 5 percent of employment in Western Macedonia.** The generation, transmission and distribution of electricity represents about 5 percent of total employment in Western Macedonia. Contrary to lignite mining, which is almost exclusively extracted in Western Macedonia (accounting for 90.7 percent of all jobs in Greece related to mining of lignite), power generation and transmission is more dispersed across the country, with only about 15 percent of jobs in the sector located in Western Macedonia (EIEAD, 2019).

20. **And lignite mining and power generation activities dominate employment in the Florina-Kozani corridor, where they directly account for about 30 percent of employment.** Mining and power generation activities in Western Macedonia are concentrated in the eastern part, along the Florina-Kozani axis which comprises the municipalities of Florina, Amynteo, Eordea and Kozani. In 2018, both sectors employed between 5 and 8 thousand people, or 22 to 33 percent of all employment in these municipalities.¹³

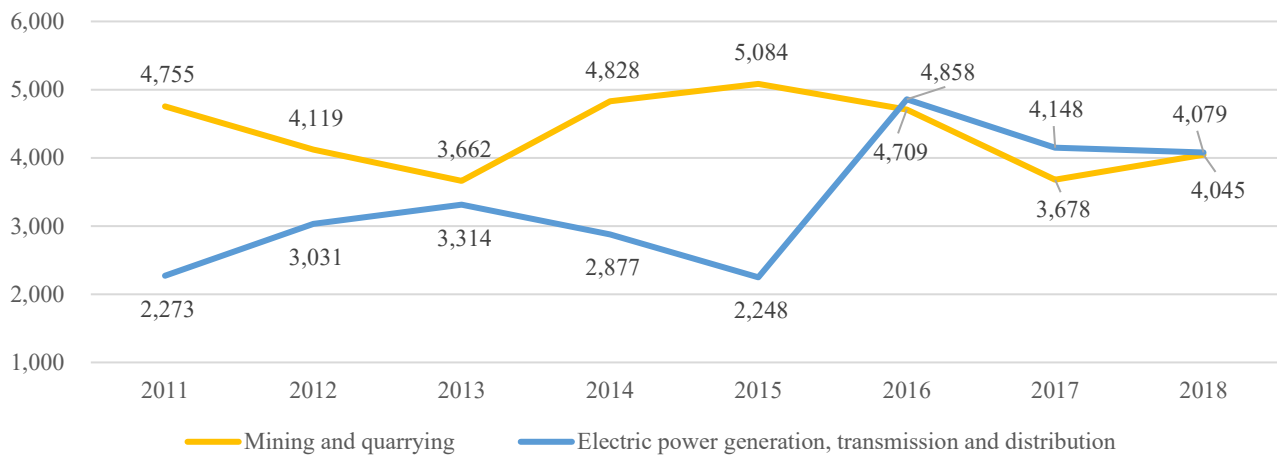
¹⁰ This section elaborates on the role of the mining and power generation activities in Western Macedonia as captured under the NACE Rev. 2 classification of economic activities “Mining and Quarrying (section B)” and “Electricity, Gas, Steam and Air Conditioning Supply (section D)”. Under section B, the focus is on Mining of Coal and Lignite (05), Mining of Metal Ores (07), Other Mining and Quarrying (08) and Mining Support Service Activities (09); Section D has only one subsection “Electricity, gas steam and air conditioning supply” numbered (35). Indirect effects of the mining and power generation activities on the rest of the local and national economy, through purchases of goods and services along the lignite chain, which are not classified under the NACE Rev2 listed are not considered here. The findings of a separate survey of the employment content of the goods and services provided to the Public Power Company (PPC) which manages the mines and the power generation plants are discussed in section 5. For more information on the NACE Rev 2 classification, see https://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=LST_NOM_DTL&StrNom=NACE_REV2&StrLanguageCode=EN.

¹¹ Lignite mining and power generation activities are concentrated in a limited number of municipalities (Florina, Amynteo, Eordea, Kozani). Yet, information on the number and profile of the people employed in lignite mining and power generation and distribution in each municipality is hard to come by as the three data sources available (Labor Force Survey, ERGANI, and PPC) cover each different employment categories (all employed people, wage employees, or own employees) and at different levels of geographic disaggregation (Western Macedonia (NUTS-2), Regional Units (NUTS-3), which include both mining and non-mining municipalities), and municipal level). This section draws on all three data sources including to compile some additional statistics. Given different data sources, some discrepancy in the figures reported is inevitable, but consistency in order of magnitude has been checked.

¹² Industry in Western Macedonia which is largely made up of lignite mining and power generation and distribution directly contributes 50 percent to its Gross Value Added (Table 4), while direct employment in mining and power generation and distribution accounts for about 10 percent of its total employment (Figure 8).

¹³ According to the ERGANI database, in 2018, 5,558 people were directly employed in the mining and power sectors in the 4 municipalities where lignite extraction and power generation are concentrated, out of a total of 24,813 registered employees, that is, a share of 22 percent. This may be an underestimate as it is unclear how employees of firms registered outside these municipalities but in fact working in these 4 municipalities are accounted for. The Labor Force Survey (2018) which is survey based and reports by the employee’s residence, records 8,124 people employed in mining and power activities (or 33 percent of total employment), but this is the number for Western Macedonia as a whole. To the extent that mining and power activities are confined to the 4 municipalities mentioned, this number is more accurate.

Figure 12: Employment in mines is halting, while the construction of Ptolemais V keeps providing jobs in the power sector



Source: EIEAD, 2011-2018 LFS data. <https://lmd.eiead.gr/ANNUAL-REPORT-2019/>.

21. **Western Macedonia's direct employment within the mining and power sectors is shifting to the municipality of Kozani.** In 2018, 4,208 persons of those employed in the mining and power sectors in Western Macedonia are employed in Kozani, a sharp increase from 320 in 2016 (ERGANI data), and consistent with the decline in net outmigration reflected in Figure 5. Most hirings from 2016 to 2018 were for machinery mechanics, fitters and repairers of electrical and electronic equipment, virtually all (97 percent) in the production of electricity. Eordea lost many jobs in the mining sector, reducing its sectoral workforce from 1,464 jobs in 2016 to 144 in 2018. Among the positions lost were mostly drivers and mobile equipment operators, and machinery mechanics, fitters, and repairers of electrical and electronic equipment (ERGANI data). Only 423 persons are employed in Amynteo in the mining and power sectors and 783 persons in Florina. As was the case in Amynteo, their positions are mainly in the production of electricity.

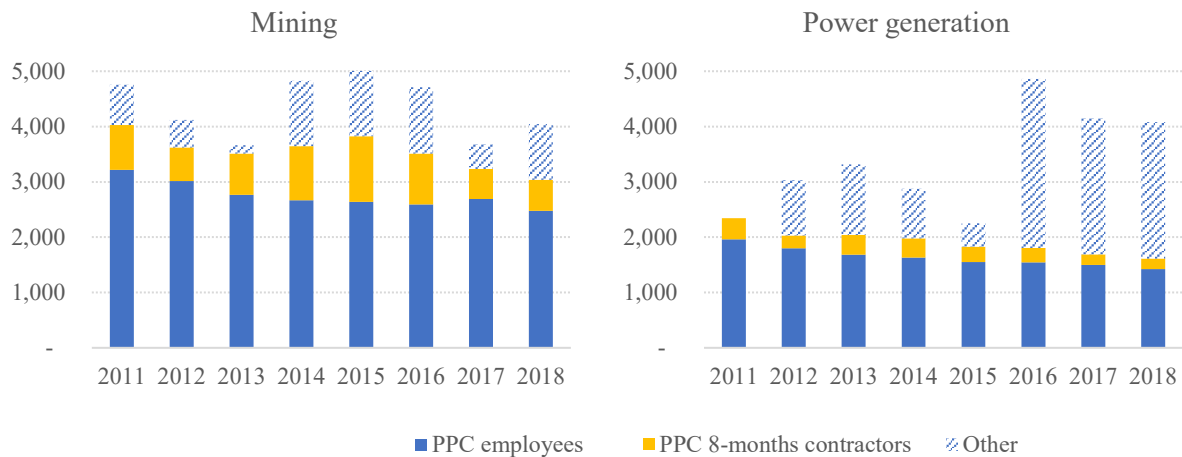
4.2. Levels of employment have remained similar, but job security and earnings declined

22. **Since 2010, direct employment in mining and power generation has hovered around 7,500 jobs,** with a peak of 9,567 employees in 2016, linked to the construction of Ptolemais V (Figure 12). Contrary to the first half of the 2010s, currently more workers are employed in power generation than in mining.

23. **Yet, employment contracts have become more temporary.** The Public Power Corporation (PPC) has been the most important employer both in mining and power generation in Western Macedonia. In 2011, PPC was even the sole provider of jobs in power generation and transmission. Yet, this dropped to 30 percent in 2018 (Figure 13). In the mining sector, it still provided two thirds of the jobs. This followed a shift in hiring practices. From 2008 onwards, PPC has stopped hiring permanent employees. Its permanent workforce decreased from 3,538 and 2,130 people in the mining and power sector respectively in 2009 to 2,289 and 1,271 in 2018. These were predominantly exits of PPC workers at retirement age (or early retirement).

24. **In addition, PPC replaced its permanent workers only partially by workers on temporary 8-month contracts.**¹⁴ Temporary workers now represent 10-25 percent of employment in the mining sector in Western Macedonia. It was further mentioned that only 250 8-months contractors would be hired in 2020 (interviews with PPC staff), which is a reduction of 66 percent from 2019. 8-month contracts are already much less frequent in the power sector (5 percent).

Figure 13: Employment in Mining and Quarrying and Electric Power Generation, Transmission and Distribution, Western Macedonia



Note: The category “other” is mostly made up of subcontractors for PPC.
Source: Author’s computations using EIEAD and PPC data, 2011-2018.

25. **Most of the decline in PPC employment was absorbed by PPC’s subcontractors.** They now represent around 25 percent of overall 2018 employment in WM’s mining sector and up to 60 percent in its power sector (“others” in Figure 13). Especially the construction of Ptolemais V has given a new boost to employment in the power sector, with subcontractors providing over 2,500 jobs annually since 2016. Subcontractors are typically small entities (59 percent of subcontractors employ less than 5 persons in Western Macedonia), somehow dependent on PPC for their revenues (only 21 percent rely on PPC for more than 50 of their income). However, most of the employment is generated by large subcontractors: firms with the largest contracts with PPC, i.e. those in the top decile, provide a little over half of the jobs. Those larger firms are more likely to be highly dependent on PPC for their revenues: 70 of firms employing more than 50 persons rely on PPC for over 80 percent of their revenues (World Bank firm’s survey, 2020).

26. **The presence of PPC in Western Macedonia smoothed the impact of the 2008 recession.** The company continued to employ their employees and acted as a safety net for subcontractors. This was especially the case for those operating in construction, who lost virtually all their clients in the aftermath of the crisis (interview conducted with PPC’s major subcontractors in October 2019).

27. **At the same time, earnings in the mining and power sector have dropped substantially since 2008.** The average annual salary of someone mining coal or lignite in 2008 was €31,149 (direct remunerations, bonuses and allowances in full-time equivalent). This dropped to €18,652 in 2018. The

¹⁴ Temporary workers cannot work more than 8 months per calendar year for PPC. Anecdotal evidence suggests that a subset of temporary workers is hired on such short term 8-month contracts year after year, creating a pool of laborers that can be laid-off easily in case of economic downturn.

drop was not as drastic in the power sector, where the average annual wage decreased from €41,603 to €30,758 (Eurostat Labor Cost Surveys, 2008-2012-2016).¹⁵

4.3. Workers are predominantly older male technicians, less educated but highly skilled

28. **The majority of PPC’s permanent workforce is made up of technicians with primary or secondary education (74 percent).** These workers are almost entirely men, half of which are above 51 years old. Many of them will retire relatively soon, given early retirement rights. These older workers (over 51 y.o.) have spent their entire life working for PPC. Their salaries are higher in the mining sector than in the power sector (respectively €40,000 and €38,000 per year).

Table 1: Most employees at PPC are plant and machine operators and assemblers, or craft and related trade workers

	Current workforce	
	Mines	Power Plants
Engineers, natural sciences - University Education	78	54
Engineers - Technical Education	116	124
Technicians - Primary and Secondary Education	1,654	795
Drivers - Motor Operators	112	32
Business/IT Studies University Education	14	8
Administrative Staff - Primary and Secondary Education	71	51
Business Administration Studies Technical Education	7	8
Technical Equipment Operators, Clerks, Guardians	20	24
Cooks, Waiters	5	7
Workers	51	58
Total	2,128	1,161

Source: Author’s calculations using PPC HR data, 2019.

29. **The second largest group is made of technical engineers (3 years of university).** This group is also predominantly male and older, with half of the workers over 50 years old. Their salaries are around €55,000 per year.

30. **pattern of an older, less educated, but skilled workforce also holds for the broader workforce in the mining sector.**¹⁶ Two thirds of the workforce employed in lignite is between 45 and 54 years old and 18 percent is older and close to retirement (LFS, 2018). Thirteen percent of the workforce has less than upper-secondary education, and 67 percent has exactly an upper-secondary education degree. They are full-time employed, mostly as metal and machinery operators (28 percent), plant and machine operators (17 percent) and transport and mobile operators (16 percent). Given their age, they tend to earn relatively high wages, implying relatively high reservation wages and thus a reluctance to take up jobs in other lower paying sectors outside the mining and power industry. Focus groups discussions with PPC full-time employees highlighted that, despite the economic crisis, PPC has continued to provide some of the best conditions in the region. In order to maintain similar positions, engineers would prefer to stay in the industry, and potentially move elsewhere in Greece to secure similar jobs, while technicians would prefer to move abroad to continue working in the mining sector for similar wages (see Section 5.6).

¹⁵ In 2012, latest year for which we have estimates, this was equivalent to an average monthly wage of €2,602 in mining of coal and lignite. In 2016, latest year for which we have estimates, this was equivalent to an average monthly wage of €2,757 in the power sector.

¹⁶ All statistics are based on LFS 2018 data, at the national level, but Western Macedonia concentrates 90 percent of all lignite employment.

5. Who will be affected by the transition out of lignite?

5.1. Relatively few currently registered jobseekers are from the mining and power sector

31. **Jobseekers who were laid off from the mining and power sector make up 3.5 percent of all jobseekers currently registered in Western Macedonia** (934 persons, OAE data, June 2019). Three out of four jobseekers from the mining and power sector in Western Macedonia are men. They are mostly prime-age workers (25-54 years old), consistent with the population pyramid of the workforce. Most have been unemployed for less than 12 months (short-term unemployment). Before becoming unemployed, they were working as manufacturing industries laborers (19 percent) and applicators/conservators for internal combustion engines (7 percent). The majority (53 percent) has a secondary education degree, usually secondary vocational education with technical specializations responding to the needs of the local labor market.

32. **They are mostly looking for vacancies in the mining and power sector.** The main occupations that they seek are truck and heavy truck drivers, applicators/conservators for internal combustion engines, industrial machinery engineers and technicians, machinery and construction machinery distributors, operators of earthmoving machinery and construction machinery, and manufacturing industries laborers (OEAD data, June 2019).

5.2. About half of the Public Power Corporation's workforce will be retired by 2023

33. **By 2023, about half of PPC's current employees will reach retirement age.** PPC hasn't hired permanent staff since 2008. Its workforce is aging, and about half of its employees will be retired by 2023. Table 2 below shows that *without any new hires and natural attrition*, 1,073 PPC full-time employees will be left in the mines at the end of 2023, and 511 in the power plants.¹⁷ Most workers still active after 2023 will be technicians (1,109 persons), working mostly in the mines (822 persons). A smaller number of engineers is predicted to be active still (155), and even fewer administrative and support staff (respectively 119 and 128 persons). The vast majority of the remaining staff will be around 50 years old, that is people who still have about 10 years of working life ahead of them. They will have rather high reservation wages. In the mines, there will also be a large number of younger workers, 517 persons under the age of 45.

Table 2: Residual PPC workforce in 2023

	Still active after 2023			Still active after 2023	
	Mines	Power Plants		Mines	Power Plants
Engineers	72	83	< 36-year-olds	61	12
Technicians (up to sec. education)	822	287	36-40-year-olds	207	40
Drivers and motor operators	53	20	41-45-year-olds	249	98
Administrative staff	69	50	46-50-year-olds	416	199
Technical equipment operators, clerks, guardians, cooks, waiters...	57	71	51-55-year-olds	100	100
			> 55-year-olds	40	62
Total	1,073	511	Total	1,073	511

Source: Author's calculations using PPC HR data, 2019.

¹⁷ Under this scenario, no new people will be hired between now and 2023, current employees will be employed by PPC until they retire, and those who reach retirement age before 2023 will be retired. The status of an additional 81 mine employees, and 146 power plant employees is unknown.

5.3. But many jobs in the mining and electric power value chain are possibly at stake

34. **An estimated total number of 16,000 jobs are potentially affected directly and indirectly by the mines closure.** In addition to PPC employees, many other workers stand to be affected, within the mining and power sectors and beyond. Estimating the indirect and induced labor effects is challenging,¹⁸ and often relies on modeling, with estimates widely varying depending on the underlying assumptions. Instead, for this study a firm survey was conducted in May and June 2020, based on the list of contractors working for PPC between 2017 and 2019.¹⁹ In particular, a representative sample of all firms which provided goods, materials, projects or services to PPC were contacted and asked about the nature of their activities with PPC over the past 3 years (2017-2019) and the number of people employed in Western Macedonia in producing these goods and services for PPC in 2019 (Annex 1 provides more detail). It is thus estimated that in 2019, 7,268 people were employed in Western Macedonia by contractors of PPC. Those PPC contractors often further rely on subcontractors themselves, which are estimated to generate an additional 3,795 jobs (Figure 14). In sum, these survey-based findings suggest that a total of about 16,000 jobs are generated by PPC's mining and power activities in Western Macedonia, of which 4,650 directly (3,899 permanent and 751 temporary) and 11,065 indirectly (7,268 by subcontractors and 3,795 by sub-subcontractors²⁰) (Figure 14).²¹ Whether and when they will be actually lost depends obviously on the actual transition and conversion plans as well as the construction and operating schedule of Ptolemais V.

35. **Half of the activity of these PPC contractors is generated by construction firms** (Figure 14). This is partly explained by the fact that over 50 percent of the firms subcontracted by PPC are working on the construction of Ptolemais V. The second largest sector of activity is professional, scientific and technical advisory services, which generates 17 percent of the jobs. Mining and quarrying represent only 8 percent of the subcontracted labor, while power generation represents about 4 percent, confirming PPC's continuing dominance in the actual mining and power generation activities.

¹⁸ Indirect labor effects capture the labor content of the goods and services purchased by PPC. Induced labor effects refer to the jobs created from spending the salary mass generated by the mining and power activities.

¹⁹ See Annex 1 for complete description of World Bank firm's survey (2020).

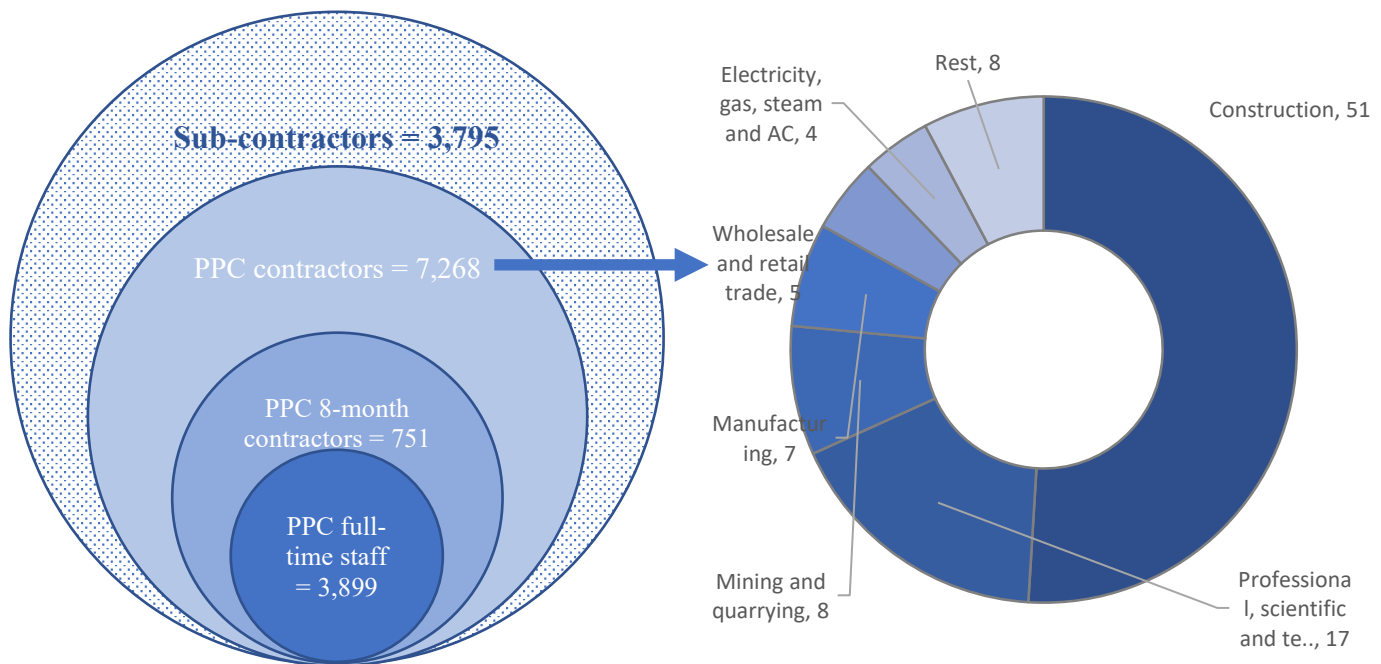
²⁰ The 95 percent confidence interval for subcontractors (7,268 employees) is [7,215-7,320]. For sub-subcontractors (3,795), the 95 percent confidence interval is [3,738-3,853].

²¹ The firm survey abstracts from jobs generated outside Western Macedonia through PPC subcontracting. It also does not account for the induced labor effects. Estimating the induced effects requires regional general equilibrium modeling, which not only introduces a lot of assumptions, it also falls outside the scope of the study. More generally, estimates of jobs affected in case of large firm closures are typically confined to direct job loss, at best complemented with an estimate of the indirect job loss in the related supply chains.

Figure 14: About 16,000 jobs would be directly and indirectly affected by mine closures

i. Direct and indirect workforce

ii. PPC contractors



Note: The right-hand side (ii) only displays the sectors of activity of PPC subcontractors. Sectors with more than 4 percent of the activity are listed, the other ones are lumped into "rest". NACE Rev. 2 one-digit classification. Source: PPC internal data (reference year: 2018) and World Bank firms survey data (reference year: 2019).

36. **Two in three jobs provided by PPC contractors are generated by firms registered in Western Macedonia.** This is particularly true among firms with the largest contracts with PPC (61 percent of the jobs), but also for medium firms (D5 through D9), where Western Macedonia generates between 60 and 90 percent of all jobs (see Table 3). This is mainly driven by the fact that bigger firms that are not located in Western Macedonia tend to employ a limited number of staff locally. Only 8 percent of the firms located in the region of Attica with contracts with PPC in 2019 employ some staff locally (41 percent of firms located in other regions in the country), compared with 81 percent of firms located in Western Macedonia (World Bank firm's survey, 2020). Firms headquartered in Western Macedonia are mostly engaged in manufacturing (24 percent), wholesale and retail trade (20 percent), and to a lesser extent professional, scientific and advisory services (14 percent), construction (13 percent), services (12 percent), and mining and quarrying (10 percent) (World Bank firm survey, 2020).

Table 3: Number of jobs generated by region and value of contract with PPC

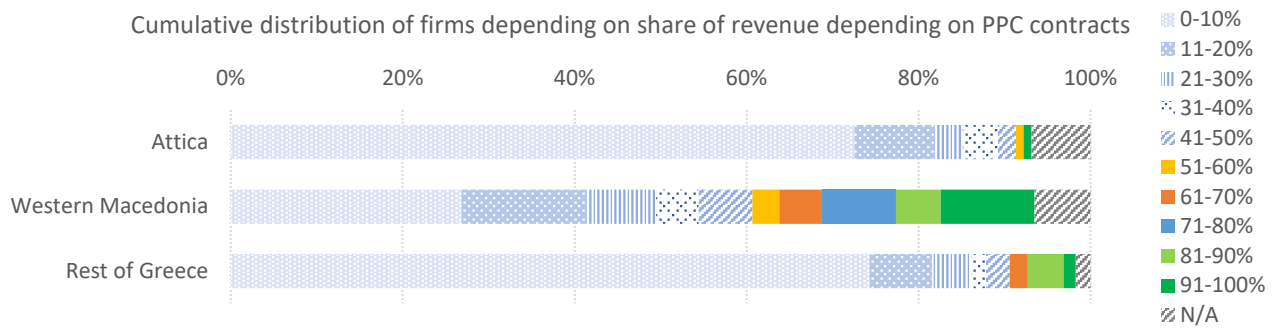
	D1+D2	D3+D4	D5+D6	D7+D8	D9	D10	Total
Attica	0	40	55	27	9	904	1,034
Western Macedonia	109	360	719	464	621	2,502	4,775
Rest	279	227	17	61	180	695	1,460
Total	388	627	791	552	810	4,100	7,268

Note: D1+D2 = bottom two deciles of firm contracts with PPC over 2017-2019, D3+D4 = next two deciles, D5+D6 = next two deciles, D7+D8 = next two deciles, D9 = penultimate decile, D10 = top decile.

37. **Several Western Macedonian contractors depend heavily on PPC for their revenues.** In Western Macedonia, one third of PPC subcontracting firms relies on PPC for more than half of their

revenues. This holds for less than 2 percent of firms from the region of Attica, and 8 percent of the firms in the rest of Greece (see Figure 16).

Figure 15: A substantial group of firms in Western Macedonia depends on PPC

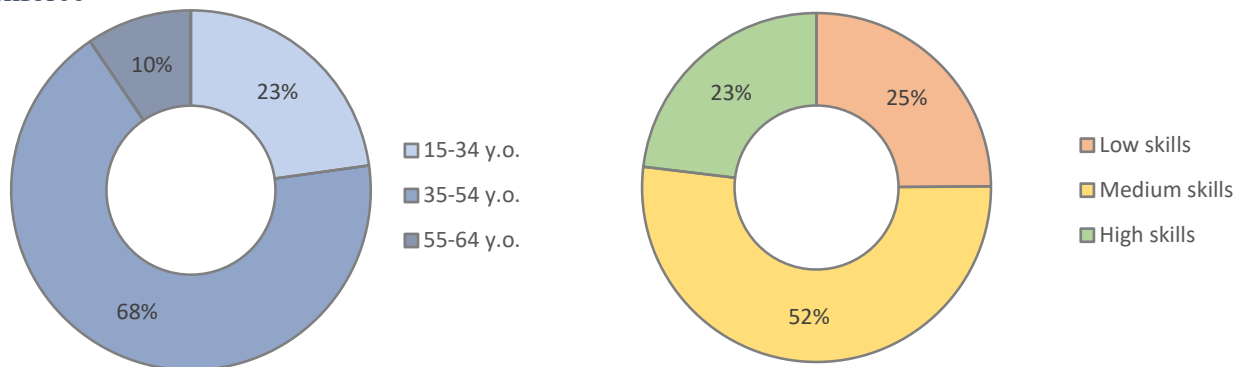


Source: World Bank firm’s survey (2020).

38. **Firms operating in the mining sector, and the largest firms are those most dependent on contracts with PPC.** Smaller firms display the lowest dependence on PPC contracts: 79 percent of the firms employing less than 5 persons in Western Macedonia rely on PPC for less than 50 percent of their revenue. On the other hand, firms employing more than 50 persons in Western Macedonia rely mostly on PPC for their revenues (71 percent have more than 80 percent of their revenues relying on PPC contracts). Dependence is largest for firms operating in the mining industry (41 percent rely on PPC for at least 50 percent of their revenues), but remains much lower for all other sectors: 10 percent of firms in the retail sector rely on PPC for over 50 percent of their revenues, 21 percent in the services sector, 21 percent in manufacturing, 26 percent in professional and scientific advisory, and 26 in construction (World Bank firm’s survey, 2020).

39. **PPC’s contractors mainly employ prime-age middle-skilled workers.** Two thirds of the contracted labor force are made of workers aged 35 to 54, and one in two has medium skills. The contractor workforce is hence slightly younger than PPC’s workforce (only 10 percent are over 55, as compared to 17 percent for PPC), suggesting that a lower share of current employees will be retired by the time mines are fully closed. On the other hand, the contracted workforce is highly concentrated in the middle-skilled part of the distribution, with a small share of employees either with low skills (25 percent) or high skills (23 percent), suggesting that most of the positions are held by specialized technicians, whose expertise is not so easily transferable to other occupations (see Figure 17).

Figure 16: Prime-age and middle-skilled workers constitute the vast majority of the contracted workforce



Note: The different levels of skills were categorized accordingly to ISCO Skills level distribution: 1) Low skilled (blue collars, occupations that require hand use of tools, janitors, continuous miner operators, simple tasks such as cleaning, digging, lifting, and carrying materials, storing goods by hands, etc.). 2) Medium skilled (pipefitters, heavy duty equipment mechanics, industrial electricians, welders, heavy equipment operators, millwrights, explosive workers,

blasters machinery, electronic equipment, driving vehicles, maintenance and repairing machines and electronic equipment, etc.). 3) High Skilled (mining engineers, geological engineers, civil engineers, operations engineers, geologists, information systems analysts, transportation managers, human resources specialists, managers, executives).

Source: World Bank firm's survey (2020).

40. **The World Bank firm survey employment estimates suggest an indirect-to-direct jobs ratio of about 2.4,²² which is well above other European-led studies predicting ratios between 0.5 and 1.3.** At country-level, EUROCOAL provides some estimation of indirect jobs related to coal mining which include power generation, equipment supplies, services and R&D. EUROCOAL estimates an indirect-to-direct jobs ratio of 0.5 in Greece, which would mean that an additional 2,438 people would be indirectly employed in the mining sector, which include power generation, equipment supply, services and R&D. This ratio is among the lowest in Europe, with Germany and Slovakia (respectively 0.3 and 0.2). It also seems an underestimate, as PPC alone already employs about half as many employees in its power generation plants as it employs in its mining activities (Table 1), without accounting any of the workforce in its supply chains. Alves Días et al. (2018) conducted a more refined analysis, including intra-regional and inter-regional indirect effects. They estimate that 1,843 jobs are indirectly linked to coal activities within the extracting regions, and an additional 4,166 jobs are indirectly linked to mining activities in other regions.²³

41. **The multiplier effect estimated by this study (factor of 2.4) may be overestimating the impact of mines closure on the labor market:** (i) our sample is biased towards larger firms, (ii) there may be some double counting when subcontractors working for PPC contractors report their work also as PPC work, and (iii) much of the Ptolemais V related construction work will no longer continue once the plant is completed. Overestimation related to (i) and (ii) is considered less of a concern. Calculations were corrected for large firm sample bias²⁴ and there are no immediate signs that double counting has been a serious issue. However, inclusion of the indirect employment related to the construction of Ptolemais is likely to exaggerate indirect job creation in the long run. There are no exact figures about the number of people annually employed in the construction of Ptolemais, but based on the available information, they could range between 2500 (number of indirect jobs in power generation reported in Fig 13) and 5640 (all construction related employment reported by contractors and subcontractors in the World Bank survey – Fig 14).²⁵ Omitting this one time operation brings the total number of indirectly employed to 5420. This is still about 3 times more than the number of indirect intra-coal region jobs estimated by Alves Días et al. (only people employed in Western Macedonia are accounted for in the World Bank firm survey). It results in a jobs multiplier of 1.16, as opposed to 2.4, but it is still more than twice as high as the Eurocoal estimate of 0.5.

42. **Irrespectively, with unemployment rates already more than twice as large as those experienced in other coal regions of the EU, Western Macedonia's economy is likely to be very sensitive to mine closure** (Alves Días et al, 2018): most mining NUTS-II regions in Europe have unemployment rates below 10 percent, where Western Macedonia's unemployment rates are at 27 percent. The region as a whole will likely face a very high social impact if an additional 15 to 20 percent of the active population becomes unemployed due to the closure of the mines and possible

²² That is $(7,268+3,795)/(3,899+751)$.

²³ The estimation of indirect employment in the coal sector relied on the use of input-output tables and multipliers developed by the EU Joint Research Center, originally, for predicting the impacts of a change in the final demand of one sector on other related sectors (Thissen and Mandras, 2017). Indirect employment was estimated by applying the same multipliers to the number of coal direct jobs. The indices used, besides extending the supply-chain coverage to all sectors that might be impacted by changes in coal mining and coal power plants activities, are assessed at intra-regional level, and also consider spill-over effects at inter-regional level.

²⁴ The post-stratification reweighting should correct non-response rates of smaller firms.

²⁵ $0.51*(7268+3795)=5642$. This assumes that the share of subcontracted employees in construction is the same as this for contracted employees (51 percent) and that all those employed in construction were working on Ptolemais related construction.

decommissioning of the power plants. Locally the effects will be even much harder felt. But much will also depend on the coal transition path chosen, including the timing and labor intensity of the power plant decommissioning and land reclamation plans, as well as the labor intensity of the new alternative activities promoted. The latter will have to be a key criterium in selecting and supporting new investments.

5.4. Generally, youth and new labor market entrants lack good basic skills

43. **With no more job creation in the mining and power sectors, the challenge is even more pronounced for youth in Western Macedonia**, which has already been affected most by its economic decline. Two young adults in three are not working but looking for a job (LFS, 2018), and 20 percent of 15-24-year-olds are neither in employment, education nor training (NEET) as opposed to 14 percent at the national level (Eurostat, 2018), leaving a large share of the youth idle.

44. **Greek youth in general has lower and declining literacy, numeracy, and information-processing skills compared to the rest of the OECD.** According to the latest Program for International Student Assessment (PISA), Greek 15-year-olds are performing below OECD averages, and their performance is worsening (Table 4; OECD, 2018). Mean science performance declined steadily since 2006, by an average of 5.9 score points per 3-year period. Similarly, mean reading performance can be described as hump-shaped, with a steady decline in performance since its peak in 2009. 25-34-year-olds have literacy scores similar to 55-65-year-olds (PIAAC, 2016). It seems that the large expansion of education in Greece has not translated into an improvement in literacy over the generations.

45. **Youth in Western Macedonia are likely to have even lower literacy and numeracy skills than the rest of the country, because they are less educated, poorer, and more likely to come from disadvantaged backgrounds.** While PISA doesn't disaggregate results by regions within Greece, Western Macedonia records larger shares of the population with lower educational attainment (less than upper-secondary school), as described in Section 3.1. Among 16-24-year-olds, those who left school before attaining an upper secondary degree score 42 points lower in literacy than those who are still in school or have completed upper-secondary education (PIAAC, 2016). Moreover, the average difference between advantaged and disadvantaged students in reading is 84 points, and socio-economic status explains 11 percent of the variance in reading performance. This suggests that Western Macedonian youth is performing worse than the rest of the country.

Table 4: PISA Results, Greece 2018

Snapshot of performance trends in GREECE

Mean performance	Reading	Mathematics	Science
PISA 2000	474*		
PISA 2003	472	445	
PISA 2006	460	459	473*
PISA 2009	483*	466*	470*
PISA 2012	477*	453	467*
PISA 2015	467	454	455
PISA 2018	457	451	452
Average 3-year trend in mean performance	-1.5	+0.1	-5.9*
Short-term change in mean performance (2015 to 2018)	-9.6	-2.3	-3.2
Overall performance trajectory	hump-shaped (more negative over more recent years)	hump-shaped (more negative over more recent years)	steadily negative
Proficiency levels	Reading (2009 to 2018)	Mathematics (2012 to 2018)	Science (2006 to 2018)
Percentage-point change in top-performing students (Level 5 or 6)	-2.0*	-0.2	-2.1*
Percentage-point change in low-achieving students (below Level 2)	+9.2*	+0.1	+7.7*
Variation in performance	Reading (2000 to 2018)	Mathematics (2003 to 2018)	Science (2006 to 2018)
Average trend amongst the highest-achieving students (90th percentile)	-1.5	-0.8	-6.4*
Average trend amongst the lowest-achieving students (10th percentile)	-0.8	+0.5	-5.3*
Gap in learning outcomes between the highest- and lowest-achieving students	stable gap	stable gap	stable gap

* indicates statistically significant trends and changes, or mean-performance estimates that are significantly above or below PISA 2018 estimates.

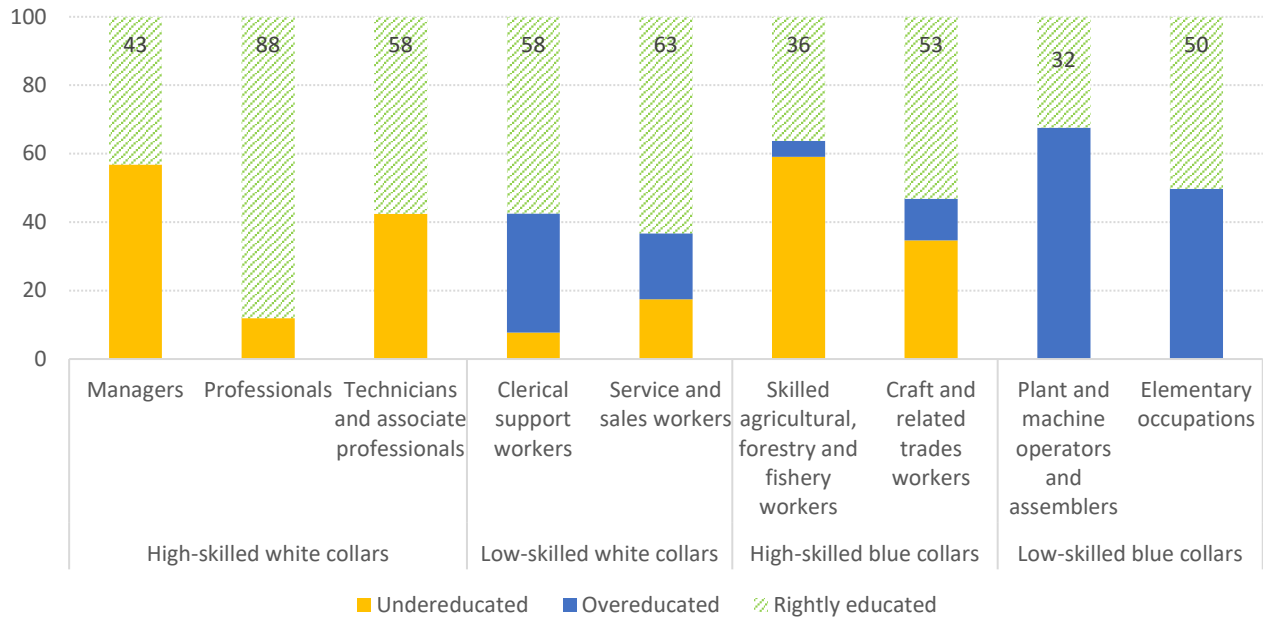
Source: OECD, PISA 2018 Database, Tables I.B1.7–I.B1.15 and I.B1.28–I.B1.30.

5.5. There is skills mismatch in the broader Western Macedonian labor market

46. **Most occupations in Western Macedonia display skills mismatches, especially among low-skilled blue collars (see Figure 18).** Beyond professionals, whose educational attainments largely match the requirements of their jobs (only 12 percent are undereducated), there are important skills mismatches across the different occupations. High-skilled blue collars are often undereducated, especially among skilled agricultural, forestry, and fishery workers. This suggests that the sector fails to attract employees with the right education and employs lower educated workers instead. On the other hand, low-skilled white and blue collars are often overeducated, suggesting that skilled white and blue collars are facing limited work prospects and accept positions below their qualifications, either as clerical support workers (white collars), or as plant and machine operators and assemblers (blue collars). The latter could be reflecting the specificity of the mining sector, where wages are far above averages and could attract over-qualified workers. According to the findings from the focus group discussions (FGDs), PPC contractors usually design and deliver training courses for their new recruited technicians and workers so as to develop the required skills for delivering the expected project services and results. Such in company trainings attempt in principle to reduce the existing skills gap, but also to ensure that technicians and workers follow prescribed rules and working protocols set by the company, whereby health and safety issues prevail.

47. **In general, it is educational attainment, rather than proficiency, that has the strongest impact on employment and earnings in Greece.** In fact, higher proficiency in literacy and numeracy is not rewarded by higher wages (PIAAC, 2016). If higher proficiency in literacy is not rewarded with higher wages, workers may have little incentive to seek jobs that match their skill levels. It suggests rigidity in labor market entry and induces a skills mismatch. Employers, and the economy as a whole, stand to benefit by rewarding skills. It also does not bode well for the many workers in the mining and power related sectors who are highly skilled, mainly obtained through on the job learning rather than formal education.

Figure 17: Skills mismatch, Western Macedonia



Note: the correspondence between occupations and skills is using the ILO nomenclature. High-skilled white collars are expected to have tertiary education (ISCED 5-8), low-skilled white collars and high-skilled blue collars are expected to have more than upper-secondary non-tertiary education (ISCED 3-4), and low-skilled blue collars are expected to have up to upper-secondary education (ISCED 0-2).

Source: Authors' computations, EU-SILC, 2018.

5.6. Those affected by mine closure hold little hope for employment in Western Macedonia

48. **What do affected workers themselves think?** To obtain a better understanding of how the transition is perceived by affected workers, their skills, aspirations and coping strategies, 13 focus groups discussions were held during June-July 2020 with different professional groups within PPC and its subcontracting firms. Annex 1 provides more details on the coverage and guiding questions. A detailed overview of the findings is provided in PLAS Human Resources (2020). In general, the higher skilled in mining and power related sectors are likely to move, while the lower-skilled stay behind.

49. **For those possibly affected by the mine closure (directly and indirectly), PPC remains the focus of employment and attention.** FGDs confirmed that, despite a drastic reduction in activity after the economic crisis, PPC has continued to play the role of a safety net for many, either as a direct employer for PPC full-time workers providing some of the best conditions in the region, or indirectly, as one of the biggest and most reliable sources of contracts. More recently, labor demand has been sustained by the construction of Ptolemais V, but this is scheduled to be completed in the near future. As such the region (and particularly the coal dependent municipalities within it) have not yet prepared for a post coal world. This is not unlike in many other coal-dominated regions (e.g. Appalachia in the US). This happens for a number of reasons, including overadaptation to coal mining (taking busts as cyclical and temporary, overspecialization and lower educational attainment) and the emergence of a “coal culture” over time, but also structural (geography and remoteness from cities which limit the development of alternatives) and institutional (social cohesion, local government capacity) constraints (Lobao, et al. 2020). FGDs also confirmed a strong intergenerational transference of family business over 35-40 years in Western Macedonia. The older generation founded the business with the younger generation now trying to grow it further, whereby the expected mine closure is affecting this intergenerational agreement.

50. **The most promising option, and main coping strategy for a post coal world seems to be moving out of the region and finding employment opportunities elsewhere.** The dominant perception

of moving as the best strategy underlines three already existing Western Macedonian realities: (i) large outmigration rates, which picked up after the global financial and economic crisis of 2008, (ii) the limitation of local employment opportunities in a region with 27 percent of unemployment (2018), and (iii) even more limited opportunities for young people who enroll mostly in TVET courses related to the current mining and power dominated labor market and face challenges in securing a first job or internship. Yet, there are important differences across subgroups depending on the employer (PPC or PPC subcontractor), the employment contract (permanent or temporary), and the worker's profession and skills.

51. **PPC's full-time staff is mostly protected from the mines closure due to their lifetime contracts.** Most older employees are either awaiting their retirement or considering early-retirement packages. The situation is slightly more complex for younger employees, who are reluctant to move out of the region for fear of accepting lesser positions, even through internal rotations with PPC, especially as they seem to be tied down to Western Macedonia by their family.

52. **Engineers are potentially the most flexible and resilient category of workers.** Many of them argue that their skills are transferable to other industries, which would allow them to look for work elsewhere in Greece, either for private or public institutions. Continuous on the job learning in the mines and power generation sector kept their skills up to date.

53. **Qualified technicians, on the other hand, acquired mainly skills that are very specific to mining and power:** with mine closure, they are unlikely to find opportunities that fit their specialization and level of salary in Western Macedonia, especially since their formal educational attainment is often more limited, while educational attainment is closely linked with employment and earning levels. As a consequence, they consider leaving the region to find equivalent work elsewhere (Germany, the Netherlands, Cyprus, etc.) as their best-case scenario. Yet, with Europe embarking on its transition out of coal, this is unlikely a viable path either. Qualified technicians with families further expressed reservations about migrating abroad. Undoubtedly, they want to have a specific job offer and a fixed contract lined up before moving in another country. Younger qualified technicians without families are more willing to move abroad without job security.

54. **Low-skilled staff will most likely be hit the hardest.** In a region with the highest rate of unemployment (27 percent), those with little or no qualifications will have a hard time securing new jobs if they are dismissed due to the mine closure. Unlike engineers and qualified technicians, most of these people are likely to stay in the region and survive on unemployment benefits and on social assistance programs such as the Guaranteed Minimum Income (GMI).

6. Recommendations

55. **The challenge for Western Macedonia is as much the increase in unemployment brought about by the mines closure as its already very high level of unemployment** (one third of the population and two third of youth are unemployed). Any employment strategy will need to consider the broader picture, providing employment opportunities, training and retraining for youth and the long-term-unemployed, as well as individuals affected directly and indirectly by the transition out of coal. Increasing demand for labor, and thus attracting private as well as public investment, is the number one challenge. Such investments might utilize a) the existing qualified technicians and engineers, b) the current infrastructure in terms of working fields, machines, heavy trucks, etc., c) the capitalized knowhow of local companies in manufacturing and construction sectors, and d) the limited resistance of the local society in developing new manufacturing or construction work fields. It is crucial to implement such investments soon, before the workforce migrates abroad or to other cities in Greece and before the companies shut down their activities. A road map with a series of options to do so linked to the closure

of the mines is laid out in “A Road Map for Managing the Coal Transition in Western Macedonia” to which this report is a background paper.

56. **Efforts to gather reliable information on the discrepancy between labor supply and demand are needed.** Information about the discrepancy between supply and demand of labor is limited. Greece hasn’t implemented a labor market forecast survey recently. Some information is available from ad hoc reports from industry associations and social partners, but generic information at the national level is not available, let alone for Western Macedonia. As a result, a complete picture of jobseekers’ barriers to employments or the extent to which lack of a qualified labor force is a constraint for investment and job creation remains missing. Efforts are needed to generate and use labor market information, to bridge the information and skills gaps.

57. **Finally, already riddled with high unemployment, the social impact of the job loss and foregone employment opportunities from the mine closures and power plant decommissioning** is bound to be substantial, especially along the Florina-Kozani axis. The exact contours of the employment challenge, including its trajectory over time, will also very much depend on the contours of the transition plans, such as the (temporary) employment generated in land repurposing and land reclamation and plant decommissioning. The expansion of existing active labor market programs (ALMPs), and their adaptation to the specificity of the Western Macedonian context will be fundamental to assist in the adjustment process. It requires close collaboration between the employment services and the coal transition planning process.

6.1. Improve understanding of the barriers to higher employment

58. **Anticipating labor market requirements and skills needs should be a top priority for OAED** in order to (i) promote better anticipation of future skills needs, (ii) develop better matching between skills and labor market needs, and (iii) bridge the gap between education and work. Labor market anticipation and matching is the process of producing and building on available employers’ surveys to achieve a better balance between skill supply and demand and to promote economic development through targeted skills investments by individuals, countries, regions, sectors or enterprises.

59. **Information on labor market demand should be gathered using quantitative and qualitative information collection processes to identify labor and skill demand.** While information on labor supply is readily available through LFS data, detailed information on the demand side need to be gathered through a labor market forecast survey, or employers’ survey. OAED should implement at a minimum a national survey that is also representative at the regional level (NUTS-II level) to better grasp local specificities. Local results from the quantitative survey should be discussed and corroborated by local private sector consultations (see Box 2).

60. **An alternative approach could consist of having a large employer, or cluster of employers, propose specific tailor-made trainings.** This industry-led approach was suggested by OAED during consultations with the World Bank team in charge of improving the design and delivery of ALMPs (see Box 1) and corresponds to international best-practice. The approach can build on expertise that the Ministry of Labor, Social Security and Social Security has acquired in recent years. It corresponds to the situation of the municipalities affected by the mine closure, where PPC plays a predominant role, and already has a facility for training and retraining purposes.²⁶

²⁶ One of the lessons learned from the Elefsina pilot was that important opportunities were foregone in the reform by not exploiting the partnerships with key stakeholders more (including employer associations and social partners).

61. Finally, once detailed information on the discrepancies between labor supply and demand, as well as profiles of the labor force are available at the regional level, a broader development strategy for the region should be discussed and used to narrow down the set of ALMP options.

Box 1: Greece's National Employment Agency (OAED)

Greece's national employment agency (OAED) is in charge of delivering services and programs to both jobseekers and unemployed. OAED is managing 1) Active Labor Market Programs (ALMPs) for halting unemployment, promoting employment, and Vocational Training for unemployed and employed citizens; 2) Passive Labor Market Policies (PLMPs) concerning unemployment insurance measures (regular unemployment benefit) and other social security benefits and allowances; and 3) Vocational Training (traditional vocational and on-the-job training). It cooperates with social and local bodies within the framework of local employment programs, in which the local public employment service (KPA2) plays a central role.

OAED's role is rather limited. Local public employment agencies provide the typical set of services to jobseekers (individual counseling services, intermediation and matching, career guidance, job clubs, motivation workshops, job fairs, self-service, etc.); services to employers (vacancy registration and participating in the wage subsidies program); and (referrals to) vocational training, wage subsidies, and public works programs (*Koinofelis*). The set of available ALMPs is limited however and local employment agencies lack client-orientation: there is no profiling of jobseekers (differentiation between jobseekers who are market-ready and those who face multiple barriers to finding a job), nor are there any individual action plans (IAP) to guide and counsel jobseekers.

Finally, information on labor market demand is not gathered systematically at the national or local level. Some ad hoc sector specific surveys are implemented, and information from firms registry (ERGANI data) is available, but full-blown employers' surveys are not conducted. These are needed to assess systematically which occupations and specializations are in high demand and require more trained jobseekers.

Lessons can be learned from the *Elefsina* pilot currently implemented in the municipalities of Elefsina, Aspropyrgos, and Mandra (Region of West Attica). Three main ALMPs were included: wage subsidies, entrepreneurship and demand-responsive training (theoretical training and internship). Profiling, in-depth counseling sessions and differentiation of recommendations through the elaboration of an individual action plan (IAP) were piloted. In addition, a demand-responsive training (DRT) component was introduced to make regionally relevant professional skills development training available on a continuous basis to registered unemployed participants. Local labor market data is used to identify skills gaps and employers' needs. The programs designed to address these needs were modular and based on occupational standards approved by industry associations and employers.²⁷

6.2. Tailor labor market programs to each jobseeker's needs

62. **OAED should reinforce the individualization of support provided to jobseekers, through a client-centered approach.** This will allow the local public employment agency (KPA2) to reduce its overload and service jobseekers more efficiently. International best-practice recommends focusing on those who are most in need of services and programs to reintegrate the labor market, while leaving market-ready jobseekers most of the initiative to find a job. These are also the lessons from the pilot of the new delivery system for active labor market policies (comprising the cities of Elefsina, Mandra and Aspropyrgos). OAED should design and provide integrated services as well as targeted and individualized

²⁷ The identification of the training specialties was tailored to local labor market needs through the use of administrative data (EIEAD/ERGANI) and an employer survey that took place in the pilot area (EIEAD and firm conducted the interviews): 10 specialties were finally chosen, and the content of the specialties' curricula was updated based on industry standards. The training program was also endorsed through employer consultations.

support to the unemployed in Western Macedonia, considering the characteristics of the local economy in transition, the consistently high comparative unemployment rates over time and single-sector dominance of Power Production (mines excavation, construction, etc.)²⁸

63. **Capacity building of KPA2 staff and stronger coordination with local stakeholders will be needed.** Job counselors might need further training so as to implement the new reform, including the ability to use local labor market information, to explain the rationale for training assessments, to consider factors other than experience in guiding the unemployed in selecting appropriate training specialties, and to serve individuals who are the furthest from the labor market after profiling. Reinforced communication with local stakeholders will also be central to servicing the unemployed more efficiently. A strong collaboration with local stakeholders such as social partners, youth organizations and VET schools will foster the delivery of integrated services to the unemployed, including retraining programmes, apprenticeships for adults, entrepreneurship support, public works and wage subsidies.

64. **The client-centered approach should be supported by the development of a skill profile of each jobseeker.** Together with data on labor and skill demand, information on the skill profile of each jobseeker should be used for two main purposes. First, it would help determine whether an unemployed worker is eligible for training. Second, it would inform the IAP drawn up by the counsellor with the beneficiary. For these reasons OAED should apply its developed methodology on Individual Profiling, which classifies each unemployed to levels 1-5, depending on his/her capacity and preparedness to take a job offer, but also the skills assessment tool. Public works programs and on-the-job training should only be offered to those with the highest barriers to entering the labor market, as jobseekers in these categories are likely never to have worked and need experience. Collaboration with other institutions to provide safety nets to the most vulnerable will also be key (guaranteed minimum income for instance). (Re)training should be offered only to those whose profiling results place them among those with medium barriers to reentering the labor market, as jobseekers in these categories are likely to have had an occupation and need re-skilling or upskilling, therefore training should increase their likelihood of employment. Individuals with low barriers to entering the labor market should immediately be directed to online services.

6.3. Income support, training and retraining remain priorities

65. **Efficient administration of income support programs and active labor market policies will be critical to cushion the impact of the transition for those losing their jobs.** The availability of, and interactions with, existing social safety nets will set the conditions for deploying supplemental social protection and labor programs. The precise design of income support instruments will significantly affect the coverage and adequacy of financial support. Temporary income support can be channeled through: (i) severance or other forms of termination payments; (ii) unemployment insurance; (iii) social assistance payments; and (iv) early retirement incentives. Salaried workers will be the least vulnerable, as they should be covered by severance or unemployment insurance, while some of the older worker could be directed towards early retirement: the most vulnerable, i.e. younger workers with term contracts and the self-employed will be those most in need of complete packages to cushion the impact of unemployment through social assistance programs.

66. **Training needs, to reskill and upskill the newly unemployed should be determined by labor market demand analysis, in combination with information on the skills profile of the unemployed,** to determine which skills the unemployed should acquire via training; ensuring that the training that is available provides the unemployed with these skills; and measuring labor market outcomes to help

²⁸ Such a recommendation is provided in the recently published "Enhanced Surveillance – Greece, May 2020" by the European Commission. Online document: https://ec.europa.eu/info/sites/info/files/economy-finance/ip127_en.pdf

improve the effectiveness and efficiency of training provision. Given that the majority of the affected employees are medium skilled and high skilled technicians it will be important to design training programmes that include also Work Based Learning (WBL). Especially for the younger unemployed (20-35 years old) WBL in form of apprenticeships would increase the likelihood to get a permanent work placement within the training company. WBL social security costs will be subsidized by OAED.

67. Labor market information should be used (i) to determine which training programs to fund and offer, and (ii) to support the counselling of jobseekers. To serve these purposes, the labor market information that would be generated needs to be sufficiently accurate and disaggregated. In addition, the information needs to be provided to the intended users in a clear and appropriate format. The Ministry of Labor and Social Affairs (MoLSA) and OAED have been piloting demand-responsive training programs that could be learned from: at each stage of the process, all activities guarantee that those unemployed who are eligible for the programs receive training that is of sufficient quality and that provides them with the skills that are most likely to improve their employment outcomes, in a cost-efficient manner. This effort should not be limited to the newly unemployed, but could also be used to prioritize specialties for technical and vocational education and training (TVET) in upper-secondary non-tertiary curricula, ensuring that new entrants on the labor market are equipped with skills that are in demand on the labor market.²⁹

68. Finally, once detailed information on the discrepancies between labor supply and demand, as well as profiles of the labor force are available at the regional level, a broader development strategy for the region should be discussed and used to narrow down the set of ALMP options.

²⁹ Here again, the lessons from the Elefsina pilot give insight into what should be prioritized: exploiting partnerships with key stakeholders (including employer associations and social partners) to boost the full potential of the reforms.

Bibliography

Alves Días, P. et al., 2018. “EU Coal Regions: Opportunities and Challenges Ahead,” EUR 29292 EN, Publications Office of the European Union, Luxembourg.

Lobao L., M. Partridge, O. Hean, P. Kelly, and S.H. Chung, 2020. “Technical Assistance for Support Energy Transitions in Coal Regions – Socioeconomic Transition: One Country Case Study,” Ohio State University. Mimeographed.

PLAS Human Resources, 2020. “Focus group discussions of subcontractors and PPC staff in the mining and power sector,” Background paper prepared for this report.

World Bank, 2020. "A Road Map for Managing the Coal Transition in Western Macedonia. Mimeographed.

Annex 1: World Bank quantitative and qualitative surveys

The World Bank collected additional information through two additional surveys: a firm’s survey and a set of 13 Focus Group Discussions (FDGs), both among PPC subcontractors in Western Macedonia.

Firm’s Survey

The objective of the firm’s survey was to estimate the total number of workers who are indirectly involved in mining and energy production in Western Macedonia. The total number of workers employed by the Public Power Corporation (PPC) is already known through PPC HR, and constitutes the workforce directly involved in mining and energy. To gauge the total number of indirect workers in mining and energy production, the World Bank used a listing of all PPC subcontractors who had at least one contract with PPC between 2017 and 2019.

Sampling methodology. The list of 1,225 national subcontractors for PPC³⁰ was secured through the PPC headquarters in Western Macedonia. The only information available from the listing was the region where the subcontractor main office was located, as well as the size of contract for 2017, 2018 and 2019. The contractors list covered 10 out of the 13 Regions of Greece. The initial listing was then split by region, and subcontractors were ranked by decreasing order of total value of contract of the entire period (2017 through 2019). A sample of 293 firms was drawn according to the following sampling methodology: (i) firms were stratified by region (10 regions), and (ii) starting with the fourth largest firm in each region, the sample consisted of every fifth firm going down in total value of contract during 2017-2019.³¹ The replacement methodology for non-response consisted of reaching “neighboring” firms from the one that wasn’t available, i.e. one number above or one number below, and if not available, two steps above or two numbers below, etc... until the enumerator was reaching the next (or previous) firm to be originally sampled.

In practice, the final sample consisted of 260 firms, characterized as follows: 83 firms that were originally sampled, 101 firms that replaced non-responses from the original sample, 52 firms that were not replacing any specific firm from the initial sample but were nonetheless reached (to compensate for low response rates in some of the regions outside Western Macedonia), and 14 firms whose status is unclear as their unique ID number was lost.³² Furthermore, only 220 firms (out of 260) were matched from the initial listing to the sample of firms, reducing our final “working” sample to 220 firms.

Table 5: Firms from the initial and final sample

Type of firm	Number of firms
(i) Initial sample	83
(ii) From initial sampled, replaced	101
(iii) From initial sample, not replaced	110
(iv) Replacement for initial sample	101
(v) Included in the sample, but not replacing any initial firm	52
(vi) Included in the sample, missing ID/status	14
Total sample (i)+(iv)+(v)+(vi)	260

³⁰ There were an additional 25 international firms that were discarded from the sampling framework.

³¹ The initial methodology planned to interview every fourth firm in each region, but in practice, there was an error of implementation. Because of this, larger firms were more likely to be sampled. The sample was reweighted to correct for this (as well as systematically higher non-response rates among firms with small contracts over the past couple of years), so as to replicate the original population’s distribution of contract values.

³² This means that 110 firms from the initial sample of 294 firms refused/did not respond.

Reweighting. The World Bank team tested different reweighting schemes to control for irregularities in the implementation of the sampling methodology, as well as non-response. The final reweighting scheme was implemented in two stages.

- **Two-stage stratification.** First, firms were reweighted according to a 2-stage post-stratification: (i) the initial listing of 1,225 national subcontractors was stratified into 3 regional groups: the Attica region, Western Macedonia, and the other 8 regions together, and (ii) then further stratified into 6 groups according to the total value of contracts with PPC between 2017 and 2019 (first quintile (Q1), Q2, Q3, Q4, penultimate decile (D9), top decile (D10)). Weights were created for all $6 \times 3 = 18$ bins. The weights were created using the post-stratification design in order for the sample to have the same number of firms in each cell as in the firm census.³³

Table 6: Final sample and post-stratification

	Number of firms in listing	Final sample (220 firms)					
		D1+D2	D3+D4	D5+D6	D7+D8	D9	D10
Attica	474	9	12	19	21	11	10
Western Macedonia	448	6	28	19	18	9	8
Central Macedonia	228						
Central Greece	19						
Crete	1						
Eastern Macedonia and Thrace	10	7	11	7	11	5	9
Epirus	6						
Peloponnese	9						
South Aegean	1						
Thessaloniki	29						

- **Additional correction for top decile (D10).** The estimated (indirect) total value of contracts from the top decile (D10) was substantially different from the “true” (direct) value obtained from the 1,225-firm listing (Tables 7 and 8), so the discrepancy between the direct and indirect estimates of the total value of contracts with PPC was corrected according to the following ratio: weights for the top decile in Attica were divided by 1.16 (ratio of total value of indirect/direct estimates), 1.20 in Western Macedonia, and 0.7 for the rest of the regions.³⁴

Table 7: Average contract value (2017-2019) from direct estimates (1,225 firms from PPC listing)

	D1+D2	D3+D4	D5+D6	D7+D8	D9	D10	All
Attica	1,163	4,367	13,742	43,838	145,513	1,376,431	163,559
WM	624	2,410	7,984	45,563	159,393	2,215,821	246,474
Rest	1,030	2,976	7,141	30,321	164,684	1,553,814	178,473
Total	937	3,317	10,035	41,062	155,314	1,721,558	197,046

Note: D1+D2 = bottom two deciles, D3+D4 = next two deciles, D5+D6 = next two deciles, D7+D8 = next two deciles, D9 = penultimate decile, D10 = top decile.

Table 8: Average contract value (2017-2019) from indirect estimates (220 firms from sample), reweighted

³³ Post-stratification weight = (number of firms from the census in the bin) / (number of firms sampled in the bin).

³⁴ As a consequence of the final reweighting, the last column of Tables 6 and 7 are similar, and correct for the discrepancies observed in column D10.

	D1+D2	D3+D4	D5+D6	D7+D8	D9	D10	All
Attica	868	4,277	15,538	40,430	154,576	1,628,878	169,124
WM	786	2,364	8,090	48,894	162,527	2,666,622	252,287
Rest	1,030	2,976	7,141	30,321	164,684	1,090,116	172,887
Total	864	3,237	10,780	40,603	164,216	1,747,126	199,481

Note: D1+D2 = bottom two deciles, D3+D4 = next two deciles, D5+D6 = next two deciles, D7+D8 = next two deciles, D9 = penultimate decile, D10 = top decile.

Data collection. Firms were reached in May and June 2020, and given a link to the online survey to be filled by the person responsible for human resources or the head of the company when the former was not available. All 260 surveys were collected between May 27th and June 24th, 2020.

Qualitative Survey

The qualitative survey aimed at conducting Focus Groups Discussions (FDGs) with PPC contractors, suppliers, PPC technicians and engineers and subcontractors who were active in the field of the mining and power energy economy. To this regard, the objective was to understand the skills and aspirations of the labor force that would be:

- Directly affected by the coal transition: full-time employees and 8-month contractors of PPC
- Indirectly affected by the coal transition: PPC contractors and PPC subcontractors

Fifteen focus group discussions were organized according to skills groups and the type of goods/services provided:

- Technicians (4 FDGs):
 - 1 FGD with PPC full-time technicians
 - 1 FGD with PPC 8-month technicians
 - 2 FDGs with direct contractors of PPC
- Engineers (3 FDGs):
 - 1 FGD with PPC full-time engineers
 - 2 FDGs with engineers from PPC contractors
- Technicians, Engineers and Support Staff together (3 FDGs)³⁵
 - 2 FDGs with sub-subcontractors
 - 1 FGD with a contractor
- Goods/Services Provider (5 FDGs)
 - 3 FDGs with goods providers/ contractors of PPC
 - 1 FGDs with support staff / subcontractors (sales, administrative staff, etc.)
 - 1 FGD with Service Provider / subcontractor

The FDGs consisted of semi-structured interviews, according to the following guidelines.

Opening questions

- What is your job title? How does it relate to PPC's core business?

³⁵ While it was intended to hold separate sessions with different skill groups, this was not always possible in practice.

Objective: to introduce participants smoothly in the conversation with an easy to answer question, like short self-presentation, but also to obtain information about different jobs and professions related to PPC core business.

- We would like to understand more your job and current skills by the following three short questions: A) How easy is for you to find job opportunities in your field? B) While being in a job do you can apply your knowledge and skills? Are there any difficulties? Furthermore, do you find your job interesting? C) Have you already gone through upskilling trainings so far during your careers, and how did it go? Who paid for that? You, your employer, your professional body? Someone else?

Objective: to contextualize the skill levels associated with the different occupations and their potential for reskilling. The rationale is based on CEDEFOP's concept in Panorama Skills Index, which stresses the understanding of skills in the three following interdependent dimensions, where hereby each dimension is equivalent to the three short questions of this Opening Question: A) Skills activation, B) Skills mismatch and C) Skills development.³⁶

Core Questions

- What have you heard about the “transition to the post-lignite era”? From where / which sources have you heard about it? Did you already express your views on this in any forum, association, or other initiative? How do you believe you can participate in the discussion around the post-lignite era, so that you can influence the development of the transition?

Objective: to understand in the first line if participants are aware of the “transition to the post-lignite era” and how do they think about it. Furthermore, to address how they think they can contribute to the discussions. How can they be included in the process of designing the masterplan? Do the participants believe that they will be able to influence the development of the post-lignite transition plan? To understand furthermore if the participants expect that their views and concerns will be reflected in the design of the transition strategy?

- What would be your ‘personal transition strategy’, ‘your individual action plan’ should your job be lost when the mines and plants close? What occupations and sectors of activity would be most preferred for you? Do you think that opportunities outside of your current professional position will necessarily imply a pay cut? Small or large? Is that a big issue/constraint for you? Do you have (i) former colleagues who have transitioned out of coal? If yes, what are the experiences?

Objective: to understand if participants have very strong preferences for remaining in the same occupation and sector, or if they have ideas of other opportunities that they would be interested in, including the type of work arrangements (self- or wage employed). In addition, how do they assess a potential pay cut in their fees if they decide for another profession or another economic sector?

- How does it sound for you to explore job and career opportunities outside your living city or even outside the Region of WM? How flexible would you be to undertake a job outside your area? And, what are for you the main obstacles for not seeing opportunities outside your living city, the Region or even the country? (family, skills shortages, uncertainty, etc.)

³⁶ CEDEFOP (2020): 2020 European Skills Index. Technical Report. https://www.cedefop.europa.eu/files/esi_-_technical_report_2020.pdf

Objective: to understand if the participants have given thoughts on existing opportunities outside of current work, would they consider self-employment, informal work, or working for extended family? If participants were unable to identify work opportunities in WM, would they be willing to move elsewhere for work? The objective of this question is to understand how mobile the participants are. Would they move alone, temporarily or for good, with or without their family, elsewhere in Greece or abroad, etc.

- Adapting ourselves to change, especially in times of uncertainty, requires a competitive skillset. How possible is it for you to attend continuing vocational and education (CVET) programs for upgrading, developing, or even obtaining new skills in your current profession or in another profession? In which fields and sectors? Who would pay for that? And by the way, do you know anybody who has attended e.g. CVET programs and by upgrading his/her skills managed to get a new job in midcareer? Objective: If participants were unable to identify work opportunities, would they be willing to attend trainings, for how long, and in which fields?

The objective of this question is to understand the willingness of participants to switch to other sectors of activity that require retraining/upskilling.

- Just imagine you are a parent of a youngster living in the Region of WM. What would you suggest him to do for living? What career options would be more attractive for him? Would you also think to propose to him options outside the Region?

Objective: What do the participants think the prospects are for their children? The objective of this question is to understand what the future looks like for youth/younger generations. One underlying element here is to understand if participants see a future in Western Macedonia, or only see prospects through migration.

- Which options sound to you efficient to ensure the employment status or even to face unemployment? Reskilling programs, workplace training, subsidized contributions to employers for new jobs, Start-up incentives to become entrepreneur, programs for companies' structural adaptations, including training of workers? Unemployment allowance and other benefits from public employment services? Do you know which public authority is running such initiatives and Programs? Has your company or your professional association thoughts and plans to deal with the challenges of mines closure?

Objective: What options do they anticipate coping with ensuring employment or facing job loss, whereby alternatives from available and country-specific Active and Passive Labor Market Policies are listed, but also options beyond employment. Additionally, we ask for their knowledge of KPA2 (PES Branch Offices) and its services, programs, etc.

Field work. The FGDs were carried out over a period of 5 weeks between June 18 and July 24, 2020. The duration of each FG was on average 70 - 90 minutes, and the number of participants varied from 1 to 7 people. All FGDs were carried out remotely due to COVID19 related restriction of movement and social distancing required by the Greek government.

Annex 2: Additional Tables and Graphs

Western Macedonia is a NUT-II level region in North-Western Greece. It is made of three regional units corresponding to NUTS-III geographic level: Grevena and Kozani³⁷ (population of respectively 32 and 150 thousand), Kastoria (population of 50 thousand), and Florina (population of 51 thousand).

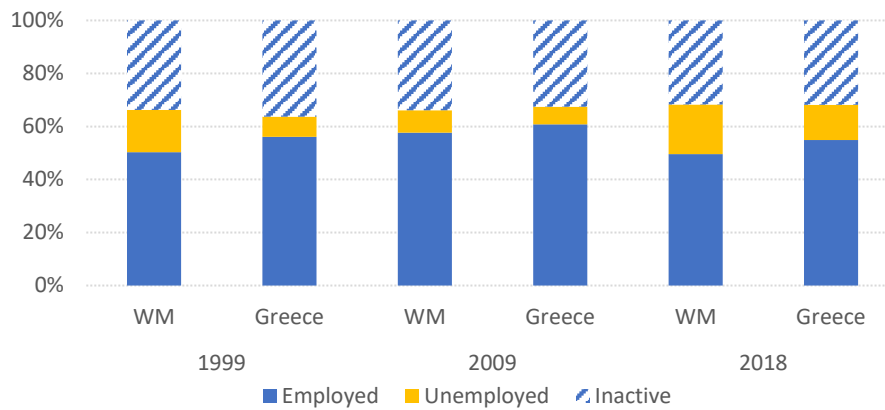
Figure 18: Map of mining activities in Western Macedonia



No major difference in terms of activity rates between WM and Greece. Most of the difference comes from unemployment rates. Interestingly, there were no major differences in 2009, right after the global economic and financial crisis.

³⁷ The regional units of Grevena and Kozani were merged in xxx.

Figure 19: Labor Force Participation, select years



Source: Eurostat, LFS (2018) data.

Table 9: Gross value added of each NACE Rev. 2 sector per select geographic unit, 2011

		Greece	WM	Grevena	Kastoria	Kozani	Florina
Agriculture, forestry and fishing	A	3%	5%	8%	11%	3%	7%
Industry (except construction)	B-E	13%	50%	6%	17%	60%	49%
Manufacturing	C	9%	5%	5%	15%	3%	4%
Construction	F	2%	3%	5%	3%	2%	3%
Wholesale and retail trade, transport, accommodation and food service activities	G-I	25%	11%	18%	19%	9%	9%
Information and communication	J	5%	1%	4%	1%	0%	3%
Financial and insurance activities	K	5%	2%	3%	3%	2%	2%
Real estate activities	L	16%	7%	25%	10%	5%	6%
Professional, scientific and technical activities; administrative and support service activities	M-N	5%	2%	2%	5%	2%	2%
Public administration, defense, education, human health and social work activities	O-Q	20%	16%	23%	27%	13%	16%
Arts, entertainment and recreation; other service activities; activities of household and extra-territorial organizations and bodies	R-U	5%	3%	5%	4%	3%	2%
Total - All NACE activities	TOTAL	100%	100%	100%	100%	100%	100%
Share of national GVA		100%	3%	0%	0%	2%	1%

Note: The Gross Value-Added series was discontinued in 2015 and no data beyond 2011 is available for Greece.

Source: Author's calculations using Eurostat, latest data available.

Table 10: Net job creation, Western Macedonia, 2018

Net job creation	WM	Kozani	Eordaia	Florina	Amyntaio
Accommodation and Food Service Activities	453	169	-27	72	26
Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles	448	204	113	35	10
Construction	160	144	61	2	0
Manufacturing	159	116	53	45	50
Education	146	66	-7	19	-2
Human Health and Social Work Activities	139	57	38	6	3
Other Service Activities	96	23	21	2	7
Transportation and Storage	86	37	13	0	-2
Professional, Scientific and Technical Activities	77	3	31	17	-2
Arts, Entertainment and Recreation	50	4	5	-19	-7
Agriculture, forestry and fishing	24	12	5	2	9
Water Supply; Sewerage, Waste Management and Remediation Activities	15	-16	3	26	0
Information and communication	14	4	7	1	1
Public Administration and Defense, Compulsory Social Security	9	50	-15	1	-11
Real Estate Activities	6	3	2	1	0
Mining and Quarrying	-16	0	15	-3	-12
Administrative and Support Service Activities	-21	10	2	-18	-8
Financial and Insurance Activities	-39	-18	-4	-1	-4
Electricity, Gas, Steam and Air Conditioning Supply	-61	-38	8	-20	-14

Source: EIEAD, 2011-2018 data. <https://lmd.eiead.gr/ANNUAL-REPORT-2019/>.