

AUTOMATION IN PORTS AND LABOUR RELATIONS IN XXI CENTURY

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ABSTRACT. In this part of the work we analyse mathematically the costs and benefits of automation in ports. In particular we analyse automation in cranes and its implications to labour, unemployment, and net financial benefits and losses for the operators. We studied the concept of efficiency viewed by operators and by port clients. We concluded that automation is in general not profitable for the operators. We discussed briefly the losses for the public of the automation process, measured in net loss of taxes collected by the states and by unemployment subsidies conceded to discharged dockers. Finally we discussed the losses in GNP generated by the processes of automation. This is a general study using averages to generate general results applicable to almost all cases, we had to make general simplifying assumptions always trying to minimize possible errors. Particular studies can be refined with actual data from each local port and social and legislative data for each particular country.

In the second part of this work in the first section we relate the analysis of precarious work to the state, in particular, as a direct participant functioning as both employer and mediator. In the second section we present a short overview of the evolution of casualization in the context of employment and unemployment in contemporary Portugal (1974-2014). In the third section we discuss state policies on labour relations, particularly in the context of the welfare state. Finally, we compare this present analysis with Swedish research done from the perspective of the state as a direct participant and mediator over the past four decades.

Keywords Labour Relations, automation, employment, unemployment, precarity, automated crane

Part 1. Automation Analysis in Seaports

1. INTRODUCTION

We considered port terminals operated manually were automation process can be introduced in the future. We did not considered automated terminals build from scratch since we are concerned with possible unemployment generated by the process of automation.

We divided the ports in six categories of operational efficiency, 20%, 40%, 60%, 80%, 90%, and 100%, meaning that a terminal operating at 100% is working at full capacity, 24hour per day seven days per week.

For an overview and glossary of port operation terminology see [2] We divided the possible automation costs in two main components: a) ship-to-shore cranes and stacking cranes, b) internal transport of containers (not considered in this work). We did not compute changes in the architecture of the ports, due the high cost of full changes in the terminals, namely numbers in the order of 1G euros for a full refurbishment of a port with 100 ship-to-shore cranes plus equivalent systems of stacking cranes and automated trailer system and gates. That refurbishment will never be profitable for the operator of a port operating actually, as we will see in the sequence of this article. We did not consider the introduction of new automated trailer system in manual operated terminals, since this implies a change in the full architecture of the port. In future works that can be considered, since there are possible new automated vehicles working without driver that can be introduced in to an existing port [6].

We considered the average cost of replacing a manual crane for a number of automated cranes, the main hypothesis is that the operational capacity of the port does not reduce. We considered the model of wages: full shifts with marginal extra time payment which is mathematically equivalent to a system of basic timetable in daily hours and week days with extra payment for after hours and weekends, complemented with eventual work.

We considered also five classes of wages, from highly paid dockers, more than 50 Euros/hour without extra hours, to 10 Euros/hour, since automation is not profitable at all for this last value we did not consider lower wages, knowing that in third world countries the wages can be lower than 10 Euros/hour. We estimated a reduction of labour time per crane due to automation in the order of 45-50%, as predicted by ABB in its advertising or in its "technical papers" [3].

The conclusions are quite clear: the automation process is not profitable for the port operators if they want to maintain the same level of efficiency of the manual operated terminals, except in the case of very high wages with cheap automation!

In Countries with low labour costs the automation is not profitable at all. Ports operating old and small ships will have great difficulties and automation does not seem possible due to technical reasons in ship-to-shore cranes. In terminals operating only Panamax and Feeders, the automation is not even a hypothesis to consider in ship to shore cranes, due to the non standardized nature of the ships,

the existence of hindrances like ship cranes, bulkheads and barriers, frequent jams in the locking mechanisms, small scale and other factors.

We considered briefly the loss in revenue to the country when there are rents involved and the unemployment raises as a consequence of automation.

Finally we analyzed briefly the loss in GDP of a country when automation is introduced. That is a major issue not usually considered in automation studies but worth to mention for political reasons.

2. WORK PLAN OF THE MATHEMATICAL STUDY

The analysis of the automation involves three separate studies.

The first analysis is on the direct financial impact on the operator of the port.

We refer to [1] for technical data, including labour cost and different types of technology involved although we do not particularize technicalities to keep this work the most general as possible.

The analysis is very simple, the direct cost of the automation process is the sum of projects, automated cranes, constructions, maintenance, communication systems, computer hardware and software, licenses, financial costs like interests, control rooms. The time span of these costs is the operational time of each automated crane, we considered 10 years.

One very important fact to account is the number of automated cranes that can replace a human operated crane. Our numbers point, and are very conservative, are 1.33 automated cranes (AC) per human operated crane (HC). Our main goal is to obtain a normalized measure of automation gain (or loss) at constant container flux, i.e., the yearly gross number of TEU operated by each terminal does not reduce.

Other important fact to consider is the growing needs of each port. If the port is in steady state, it is very easy to compute. If the port increases its flux at constant rate, the computation is not so easy; it depends if the expansion capacity was inserted ad initio or if new capacity is added along the time span of the automation process. Finally, it is very hard to compute this number if the ports have a large fluctuation of fluxes. In this last case, a forecast can be estimated, but the flexible nature of human handling allows a better response.

The analysis of the savings is easy to compute, we have to deduct the wages of dockers replaced by the process of automation, multiplied by the time span of the operational cost of the cranes.

This first approach gives the direct cost of the automation. Automation is not beneficial for the operators if they want to keep or increase the same flux (yearly flow rate trough the terminal) of containers before the process of automation, and/or the efficiency of the container terminal. Efficiency here is a measure of the number of containers moved per hour and per human crane before the process of automation, the port efficiency after the automation process is the new number of containers moved per original HC.

We simulated for five generic ports and five levels of wages, the first simulation is at constant rate of containers, the second one is at constant rate of container and constant efficiency. The particular cases can be interpolated from the ones present here. Further study is needed for each particular port and terminal but the computer programs are ready for application to particular cases. We used Wolfram Mathematica 11 to perform our simulations.

Direct costs to the State when automation processes are introduced.

This analysis counts the benefits against disadvantages for the government whenever the automation process done. If the state collects a rent, fixed or per container, at some port and this rent does not change after the automation process, the State will lose income from that particular port.

If a number of dockers become unemployed, there will be a liquid reduction of work taxation as well a reduction of contributions to the social security network, on one hand and an increase of social security expenditures to the families of the unemployed workers. These numbers can grow significantly and the actual rent collected by the state can become negative during the time span of each automation process.

This analysis is harder, due to the different taxation and social security systems in the world.

Impact in the GNP and social impacts

The third analysis is on the global impact of the automation process in the GNP of each country. There is one main producer of automated cranes and the control systems, ABB, with headquarters in Zurich, Switzerland. Great part of the labor costs, after automation, are transferred from the local country to this company, and others nonlocal companies, reducing greatly the local GNP. On the other hand, the labor income will disappear from the local GNP. The reduction of profits of local companies and the reduction of taxation will impoverish the countries where each port is located (Switzerland has no ports).

Finally, the social impact of unemployment is not easy to measure. It increases the sensation of unfairness in the society [5], promotes inequality. Its impact is lasting. Produces urban conflict and reduces the chances of education for the families of each new unemployed. Its social cumulative effects are persistent in the society.

This effect is the most difficult to estimate in the global process of port automation, but, in our opinion it will be the most nefarious in time.

3. DIRECT ANALYSIS OF COST AND BENEFITS OF AUTOMATION OF CRANES

To simplify the analysis without losing insight and keeping the error low, we made some realistic assumption. In this section we do not count productivity or profit rate. Our analysis relates only costs.

Our assumptions are:

The ports under consideration are man operated. The operation is conducted entirely by dockers. At time t_0 the operator of the port decides to automate the tasks of loading and unloading the ships using automated cranes.

The internal movement of containers can be automated. This can be done by automated diesel trailers or by electric trains. We do not compute the savings of this type of automation since this involves a generalized change in the architecture of the terminal and the costs are very high.

The loading of external lorries and trains can be also automated. This process is not analyzed in this work, since is much complex since involves external operators and very expensive to introduce in existence man operated ports.

We consider six levels of use of the installed capacity of each possible port. When the port operates at full capacity it means that it uses all the available resources 24hours/7days per week the entire year. Speed is paramount to provide comfort and delivery of goods. We consider 100%, 90%, 80%, 60%, 40% and 20% capacities, 20% is not excessively low for some ports, namely some small terminals in Lisbon operating feeders. We notice that usual working hours are about 50 to 60 each week, which means operating at 29% to 35% of installed capacity without extra time labour cost. The value of 40% can be considered a little over the installed capacity of a small scale terminal. Big terminals must operate at 80% to 90%, working 24hours per day to save operational costs at exchange of some increase of extra time labour hours. Operation at 100% is a theoretical option but not a practical one due to weather conditions, technical failures, overload of the equipment, ship replacement in the available berths and stochastic effects.

TABLE 1. Automation results, nominal labour cost 10 Euros, Cost of automation 1 Million Euros per device including maintenance during 10 years.

LCm	LCa	Ca/Y	Var	Sav	Disc	sm	sa	Epm	Epa	Esm	Esa
10	10	118	336	33.3	50	20	26.7	40	30	26.5	20.3
10.6	12	111	149	25	50	40	53.3	40	30	20	14.4
12.4	13.8	95	73	26.1	50	60	80	40	30	15.6	15
13.8	15	85	44	27.3	47	80	100	40	32	18	21.3
14.8	15	85	37	31	40	90	100	40	36	20	24
15	15	85	32	33.3	33.3	100	100	40	40	26.7	26.7

m: manual, a: automated, LC: Effective labour cost per hour, Ca/Y: global increase of cost due to automation in thousand euros per year, Var: percentage increase of costs relative to the labour cost before automation, Sav: percentage of labour cost reduction, Disc: effective percentage of dockers discharged, s: port use in percentage, Ep: efficiency of the port, Es: efficiency of the ship, text in red: automation beneficial to operators.

TABLE 2. Automation results, nominal labour cost 20 Euros, Cost of automation 1 Million Euros per device including maintenance during 10 years.

LCm	LCa	Ca/Y	Var	Sav	Disc	sm	sa	Epm	Epa	Esm	Esa
20	20	106	151	33.3	50	20	26.7	40	30	26.5	23.4
21.3	24	92	62	25	50	40	53.3	40	30	20	14.4
25	28	61	23	26.1	50	60	80	40	30	15.6	15
27.5	30	33	8.5	27.3	47	80	100	40	32	18	21.3
29	30	15	3	31	40	90	100	40	36	20	24
30	30	-3	-0.5	33.3	33.3	100	100	40	40	26.7	26.7

m: manual, a: automated, LC: Effective labour cost per hour, Ca/Y: global increase of cost due to automation in thousand euros per year, Var: percentage increase of costs relative to the labour cost before automation, Sav: percentage of labour cost reduction, Disc: effective percentage of dockers discharged, s: port use in percentage, Ep: efficiency of the port, Es: efficiency of the ship, text in red: automation beneficial to operators.

TABLE 3. Automation results, nominal labour cost 30 Euros, Cost of automation 1 Million Euros per device including maintenance during 10 years.

LCm	LCa	Ca/Y	Var	Sav	Disc	sm	sa	Epm	Epa	Esm	Esa
30	30	94	90	33.3	50	20	26.7	40	30	26.5	23.4
32	36	74	33	25	50	40	53.3	40	30	20	14.4
37	41	27	7	26.1	50	60	80	40	30	15.6	15
41	45	-20	-3.5	27.3	47	80	100	40	32	18	21.3
43	45	-55	-8	31	40	90	100	40	36	20	24
45	45	-90	-11	33.3	33.3	100	100	40	40	26.7	26.7

m: manual, a: automated, LC: Effective labour cost per hour, Ca/Y: global increase of cost due to automation in thousand euros per year, Var: percentage increase of costs relative to the labour cost before automation, Sav: percentage of labour cost reduction, Disc: effective percentage of dockers discharged, s: port use in percentage, Ep: efficiency of the port, Es: efficiency of the ship, text in red: automation beneficial to operators.

TABLE 4. Automation results, nominal labour cost 40 Euros, Cost of automation 1 Million Euros per device including maintenance during 10 years.

LCm	LCa	Ca/Y	Var	Sav	Disc	sm	sa	Epm	Epa	Esm	Esa
40	40	83	59	33.3	50	20	26.7	40	30	26.5	23.4
43	48	74	55	25	50	40	53.3	40	30	20	14.4
50	55	-7	-1.3	26.1	50	60	80	40	30	15.6	15
55	60	-72	-9.4	27.3	47	80	100	40	32	18	21.3
58	60	-125	-14	31	40	90	100	40	36	20	24
60	60	-178	-17	33.3	33.3	100	100	40	40	26.7	26.7

m: manual, a: automated, LC: Effective labour cost per hour, Ca/Y: global increase of cost due to automation in thousand euros per year, Var: percentage increase of costs relative to the labour cost before automation, Sav: percentage of labour cost reduction, Disc: effective percentage of dockers discharged, s: port use in percentage, Ep: efficiency of the port, Es: efficiency of the ship, text in red: automation beneficial to operators.

TABLE 5. Automation results, nominal labour cost 40 Euros, Cost of automation 2 Million Euros per device including maintenance during 10 years.

LCm	LCa	Ca/Y	Var	sm	sa
40	40	212	151	20	26.7
43	48	185	62	40	53.3
50	55	123	23	60	80
55	60	65	8	80	100
58	60	30	3	90	100
60	60	-6	-0.5	100	100

m: manual, a: automated, LC: Effective labour cost per hour, Ca/Y: global increase of cost due to automation in thousand euros per year, Var: percentage increase of costs relative to the labour cost before automation, s: port use in percentage, text in red: automation beneficial to operators.

TABLE 6. Automation results, nominal labour cost 40 Euros, Cost of automation 2.5 Million Euros per device including maintenance during 10 years.

LCm	LCa	Ca/Y	Var	sm	sa
40	40	277	198	20	26.7
43	48	249	84	40	53.3
50	55	187	36	60	80
55	60	134	17	80	100
58	60	107	12	90	100
60	60	80	8	100	100

m: manual, a: automated, LC: Effective labour cost per hour, Ca/Y: global increase of cost due to automation in thousand euros per year, Var: percentage increase of costs relative to the labour cost before automation, s: port use in percentage, text in red: automation beneficial to operators.

TABLE 7. Automation results, nominal labour cost 50 Euros, Cost of automation 3.0 Million Euros per device including maintenance during 10 years.

LCm	LCa	Ca/Y	Var	sm	sa
50	50	330	188	20	26.7
53	60	295	79	40	53.3
62	69	218	33	60	80
69	75	151	16	80	100
72	75	115	10	90	100
75	75	79	6	100	100

m: manual, a: automated, LC: Effective labour cost per hour, Ca/Y: global increase of cost due to automation in thousand euros per year, Var: percentage increase of costs relative to the labour cost before automation, s: port use in percentage, text in red: automation beneficial to operators.

TABLE 8. Automation results, nominal labour cost 60 Euros, Cost of automation 3.5 Million Euros per device including maintenance during 10 years.

LCm	LCa	Ca/Y	Var	sm	sa
60	60	382	182	20	26.7
64	72	342	76	40	53.3
75	83	249	32	60	80
83	90	167	14	80	100
87	90	122	9	90	100
90	90	78	5	100	100

m: manual, a: automated, LC: Effective labour cost per hour, Ca/Y: global increase of cost due to automation in thousand euros per year, Var: percentage increase of costs relative to the labour cost before automation, s: port use in percentage, text in red: automation beneficial to operators.

TABLE 9. Automation results, nominal labour cost 10 Euros, Cost of automation 1 Million Euros per device including maintenance during 10 years, static analysis, efficiency before automation is equal to efficiency after automation, the new number of cranes compensates the individual loss of speed.

LC	Ca/Y	Var	Sav	s	Ep	Es
10	161	459	33	20	40	26
11	148	198	33	40	40	20
12	129	99	33	60	40	16
14	108	56	33	80	40	18
14	97	42	33	90	40	20
15	85	32	33	100	40	27

LC: Effective labour cost per hour, Ca/Y: global increase of cost due to automation in thousand euros per year, Var: percentage increase of costs relative to the labour cost before automation, Sav: labour saving and workers discharged in percentage, s: port use in percentage, Ep: efficiency of the port in containers moved per hour, Es: efficiency of the ship in containers moved per hour spent at port; text in red: automation beneficial to operators.

TABLE 10. Automation results, nominal labour cost 20 Euros, Cost of automation 1 Million Euros per device including maintenance during 10 years, static analysis, efficiency before automation is equal to efficiency after automation, the new number of cranes compensates the individual loss of speed.

LC	Ca/Y	Var	Sav	s	Ep	Es
20	149	149	33	20	40	26
21.3	123	82	33	40	40	20
25	86	33	33	60	40	16
28	44	11	33	80	40	18
29	20	5	33	90	40	20
30	-3	-0.5	33	100	40	27

LC: Effective labour cost per hour, Ca/Y: global increase of cost due to automation in thousand euros per year, Var: percentage increase of costs relative to the labour cost before automation, Sav: labour saving and workers discharged in percentage, s: port use in percentage, Ep: efficiency of the port in containers moved per hour, Es: efficiency of the ship in containers moved per hour spent at port; text in red: automation beneficial to operators.

TABLE 11. Automation results, nominal labour cost 30 Euros, Cost of automation 1 Million Euros per device including maintenance during 10 years, static analysis, efficiency before automation is equal to efficiency after automation, the new number of cranes compensates the individual loss of speed. Near saturation the results are similar to Table 3, when the port operates at low capacity the losses are much greater.

LC	Ca/Y	Var	s
30	138	131	20
32	98	44	40
37	42	10	60
41	-20	-3.5	80
43	-55	-8	90
45	-90	-11	100

LC: Effective labour cost per hour, Ca/Y: global increase of cost due to automation in thousand euros per year, Var: percentage increase of costs relative to the labour cost before automation, Sav: labour saving and workers discharged in percentage, s: port use in percentage, Ep: efficiency of the port in containers moved per hour, Es: efficiency of the ship in containers moved per hour spent at port; text in red: automation beneficial to operators.

We consider the cost of automation of a crane something between 1.0 million euros, i.e., 1.0×10^6 Euros or 1.11×10^6 USD and 3.5×10^6 Euros or 3.9×10^6 USD, depending on the possibility of modifying an existing small crane till the acquisition of a brand new high capacity crane. The ship to shore cranes and stacking cranes are included in these numbers since we do not focus on different types of cranes. We are interested only in prices. Thus, we used a price spanning covering all the possibilities.

We included financial costs of cranes with 5% interest. This includes loans, if operators do not have access to available capital, or losses in other investments if the

TABLE 12. Automation results, nominal labour cost 40 Euros, Cost of automation 1 Million Euros per device including maintenance during 10 years, static analysis, efficiency before automation is equal to efficiency after automation, the new number of cranes compensates the individual loss of speed. Near saturation the results are similar to Table 4, when the port operates at low capacity the losses are much greater.

LC	Ca/Y	Var	s
40	126	90	20
43	73	25	40
49	-2	-0.3	60
55	-85	-11	80
58	-132	-14	90
60	-178	-17	100

LC: Effective labour cost per hour, Ca/Y: global increase of cost due to automation in thousand euros per year, Var: percentage increase of costs relative to the labour cost before automation, Sav: labour saving and workers discharged in percentage, s: port use in percentage, Ep: efficiency of the port in containers moved per hour, Es: efficiency of the ship in containers moved per hour spent at port; text in red: automation beneficial to operators.

TABLE 13. Automation results, nominal labour cost 40 Euros, Cost of automation 2 Million Euros per device including maintenance during 10 years, static analysis, efficiency before automation is equal to efficiency after automation, the new number of cranes compensates the individual loss of speed. Near saturation the results are similar to Table 5, when the port operates at low capacity the losses are much greater.

LC	Ca/Y	Var	s
40	299	213	20
43	246	82	40
49	171	33	60
55	88	11	80
58	41	5	90
60	-6	-0.5	100

LC: Effective labour cost per hour, Ca/Y: global increase of cost due to automation in thousand euros per year, Var: percentage increase of costs relative to the labour cost before automation, Sav: labour saving and workers discharged in percentage, s: port use in percentage, Ep: efficiency of the port in containers moved per hour, Es: efficiency of the ship in containers moved per hour spent at port; text in red: automation beneficial to operators.

capital is available. This value is an average, similar studies are usually considering interests in the order of 6% [3]. We are more conservative.

There is an important coefficient, not used until now in the literature, i.e., the number of workers effectively replaced by the automation process, this number is a function of the port capacity use and changes very much with the level of use of each port. Since an automated crane can operate 24/7 it replaces more workers when the port operates at some optimal rate, even with loss of the number of containers operated per unit of time. When the port operates at full capacity the number of

TABLE 14. Automation results, nominal labour cost 40 Euros, Cost of automation 2.5 Million Euros per device including maintenance during 10 years, static analysis, efficiency before automation is equal to efficiency after automation, the new number of cranes compensates the individual loss of speed. Near saturation the results are similar to Table 6, when the port operates at low capacity the losses are much greater.

LC	Ca/Y	Var	s
40	385	275	20
43	332	111	40
49	257	49	60
55	174	23	80
58	127	514	90
60	81	8	100

LC: Effective labour cost per hour, Ca/Y: global increase of cost due to automation in thousand euros per year, Var: percentage increase of costs relative to the labour cost before automation, Sav: labour saving and workers discharged in percentage, s: port use in percentage, Ep: efficiency of the port in containers moved per hour, Es: efficiency of the ship in containers moved per hour spent at port; text in red: automation beneficial to operators.

TABLE 15. Automation results, nominal labour cost 50 Euros, Cost of automation 3.0 Million Euros per device including maintenance during 10 years, static analysis, efficiency before automation is equal to efficiency after automation, the new number of cranes compensates the individual loss of speed. Near saturation the results are similar to Table 7, when the port operates at low capacity the losses are much greater.

LC	Ca/Y	Var	s
50	460	262	20
58	383	95	40
65	289	42	60
73	179	18	80
76	120	10	90
78	62	5	100

LC: Effective labour cost per hour, Ca/Y: global increase of cost due to automation in thousand euros per year, Var: percentage increase of costs relative to the labour cost before automation, Sav: labour saving and workers discharged in percentage, s: port use in percentage, Ep: efficiency of the port in containers moved per hour, Es: efficiency of the ship in containers moved per hour spent at port; text in red: automation beneficial to operators.

automated cranes must be greater to preserve efficiency, as we will see in the next discussion. In some ports it is possible to introduce a surplus of cranes but in most existing ports, working at saturated levels, this is not possible, since there is no more space in the jammed structures of the port to introduce extra cranes.

One important factor here is the number of TEU's moved by each human crane operator. If that number exceeds 30 per hour, the introduction of automation in cranes in very active ports, will reduce the efficiency of the port, the delivery of goods to external clients and the waiting time of ships, lowering drastically

TABLE 16. Automation results, nominal labour cost 60 Euros, Cost of automation 3.5 Million Euros per device including maintenance during 10 years, static analysis, efficiency before automation is equal to efficiency after automation, the new number of cranes compensates the individual loss of speed. Near saturation the results are similar to Table 8, when the port operates at low capacity the losses are much greater.

LC	Ca/Y	Var	s
60	534	254	20
64	455	102	40
75	343	44	60
83	218	19	80
87	148	11	90
90	78	5	100

LC: Effective labour cost per hour, Ca/Y: global increase of cost due to automation in thousand euros per year, Var: percentage increase of costs relative to the labour cost before automation, Sav: labour saving and workers discharged in percentage, s: port use in percentage, Ep: efficiency of the port in containers moved per hour, Es: efficiency of the ship in containers moved per hour spent at port; text in red: automation beneficial to operators.

the competitiveness of the particular port. The tendency is to construct big new automated terminals to take care of the extra traffic leaving the manual terminals still in operation. If the traffic will decrease in the future the older terminals will be shutdown, creating unemployment, but that concern is not realistic, since the traffic has been increasing steadily even with financial crises [7], and super heavy container ships with more than 20.000 TEU are been commissioned although maintaining the other classes in operation.

The number of operators of each crane was fixed in 2 per a shift of eight hours. If this number is lowered, as in the US, the automation cost will be prohibitive in all the cases.

The efficiency χ_A , of each automated crane is fixed in 30 containers moved per hour, i.e.,

$$\chi_A = 30,$$

this value as been pointed as the objective of automation in every study about this question and in the advertising of major companies [3] and is consensual inside the community.

The ideal efficiency χ_M , of each manual crane can change from 40 containers moved per hour, i.e.,

$$\chi_M = 40,$$

meaning that the operation speed of man can exceed in 30% the automated speed. This is obtained due to the fact that trajectories can be better interpolated by human operators, and full operational speed of the crane engines can be achieved with man operated cranes. Moreover, jams and failures can be prevented and solved quickly by human operators.

We consider the ship efficiency per container, the average number of TEU carried in ships and moved at a particular port divided by the sum of average waiting time after arrival \bar{T}_w at the port and the effective average time of operation \bar{T}_o

$$\sigma_M = \frac{\overline{\#TEU}}{\bar{T}_w + \bar{T}_o},$$

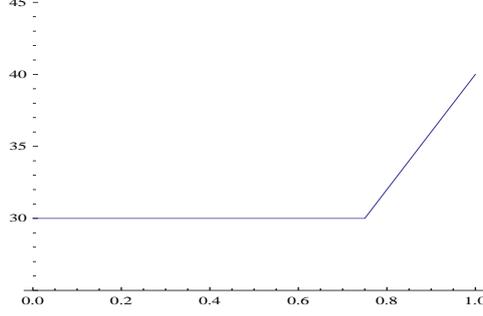


FIGURE 1. Efficiency of the port before automation is higher, near 40. After automation the port must operate more hours per day to maintain the same number of TEU. When the equipment saturates, the number of automated cranes must be increased to maintain the operation.

where $\overline{\#TEU}$ is the average number of *TEU* moved per ship at the terminal, we can say that

$$T_0 = \frac{\overline{\#TEU}}{\chi \# \overline{cr}}$$

where χ is the moving efficiency (manual or automated) and $\# \overline{cr}$ is the average number of cranes operating the ship. Therefore

$$\sigma_M = \frac{\overline{\#TEU}}{\overline{T_w} + \frac{\overline{\#TEU}}{\chi \# \overline{cr}}}.$$

Obviously, the yearly port working capacity s is the key variable, and all the other factors depend on s .

The waiting time $\overline{T_w}$ is very difficult to estimate, it depends on the size of the ships and the deviance of that size, it depends on the time of arrival of the ship in ports with lower capacity and it depends on the level of activity of the port and the number of available berths and cranes. We used queue theory and probabilities of finding available slots at a particular time and integrated over time to obtain a plausible estimate. The probability of finding an available berth at a particular time reduces with s , and the waiting time increases with s . On the other hand when s is low, the port tends to operate at working hours and not at extra time, and the overnight wait will increase drastically the waiting time of each ship at bay. The conjugation of this factors gives the average waiting time as a function of s . In Figures 1 and 2 we can see the two types of efficiency, a low ship efficiency reduces drastically the competitiveness of the port.

The main factor to decide if the automation will be profitable is the isolated analysis of cost/benefit of automation. ABB and other companies advertises a labour saving in the order of 45% to 50% in time per crane substituted [3, 9]. This can be achieved globally at manual terminals operating at lower capacity s , but not in manual terminals using almost all its installed capacity since the operator, to keep the same yearly flux of TEU, must increase the number of cranes to compensate the loss of speed of each crane. We can show that the percentage reduction of the number of labour hours is 33% after automation, when human efficiency is ideal and the port is operating at full capacity, with no increase of effective cost of labour hour. Therefore, the labour cost saving can be 33% and not the 45-50% advertised by ABB. At lower activity ports the labour cost savings can achieve 50% but the low flux of TEU will not pay the costs of the automation.

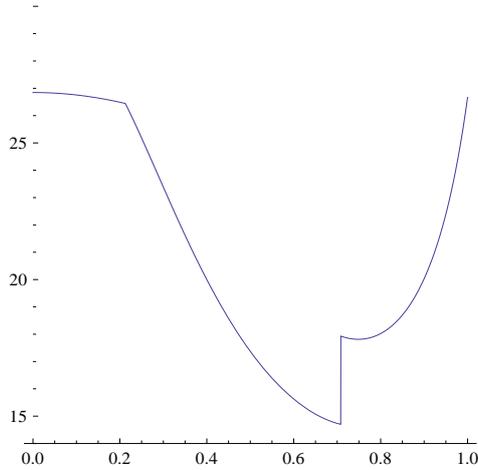


FIGURE 2. Efficiency viewed by ships, the discontinuity is near 0.7, value were the terminal is forced to operate 24hours over 24 hours, reducing the overnight waiting time.

The results of our simulations are presented in the tables 1 to 16 and in Figures 1 and 2. The cost of automation of existing or new devices, stacking cranes or ship-to-shore cranes plus maintenance and financial cost, is divided in classes, from 1 million Euros, to 3.5M Euros with an amortization period of ten years. Naturally, 1 million Euros with maintenance is a very low price, which can be accomplished only with smaller equipments, operating in low scale terminals, usually near $s = 30\%$. The results presented in Tables 1 to 4 show clearly that with nominal labor cost of 30Euros, i.e., nominal regular hour cost, automation is not profitable, even in the case of terminal use of 60%.

In tables 1 to 4 we discuss a device price of 1 million euros and four levels of nominal wages, from 10 euros to 40 euros. The actual wages are higher and can be seen also in the tables since there is extra time work involved. The efficiency is measured in containers moved per hour. As mentioned above, there are two efficiencies, the port efficiency, measuring the exact number of TEU moved per hour and the ship efficiency, which is the number of TEU moved per ship per hour at port, this last efficiency measures also the waiting time. Since the velocity of automated cranes is lower, the efficiency viewed by ships is reduced which reduces also the rate of delivery of containers to external clients of the port. Only when the number of automated cranes replacing the manual ones compensates the loss of velocity of automated equipment the efficiencies compare to the manual operated terminals. One interesting fact is when a port is forced to operate 24hours per day, i.e., when the normal daily hours are not enough to deal with the traffic. In this last case, the efficiency viewed by ships and clients increases suddenly, due to the elimination of overnight waiting of ships at bay, this can be seen in tables 1 to 4. The data on efficiency and port use is always the same, it depends only on the port use before automation sm . Therefore we do not repeat redundant columns in tables 5-12.

In tables 13 to 16 we present the results of simulations when the port authorities do not allow reduction of the efficiency. The cost of automation in that case is higher, since the reduction of speed of the cranes is not compensated by more working time of automated cranes but by adding more cranes, the timetable of the port remains the same with only the cost of greater need of coordination, a cost

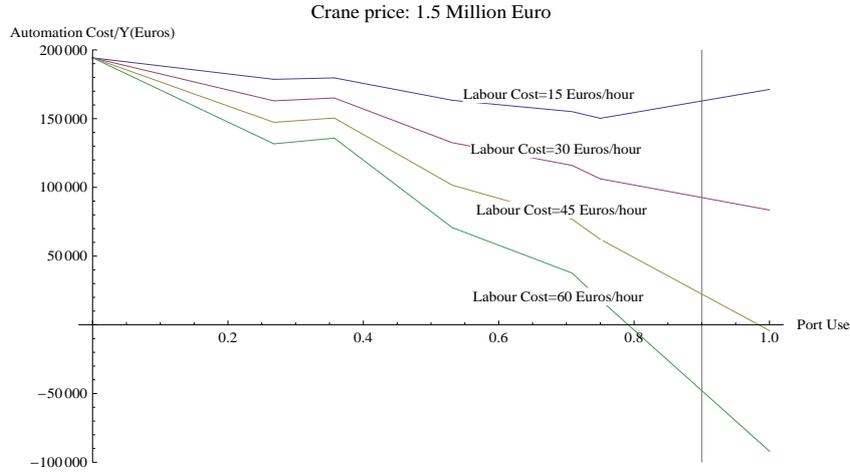


FIGURE 3. Graphic of effective cost of automation for an initial price of 1.5 Million Euros per device (including maintenance) for 4 different effective labour costs. Automation makes sense when the curves cross the horizontal axis to negative values. Only when the hour labour cost exceeds 60 euros with port use rate above 80% automation makes sense. Above the vertical line of 90% the port use is unusable. The devices are maned by two dockers per shift (double cranes have four dockers). One extraordinary fact is that when the labor cost is low, the increase of traffic in the port raises the costs of automated ports, as we see in the upper curve.

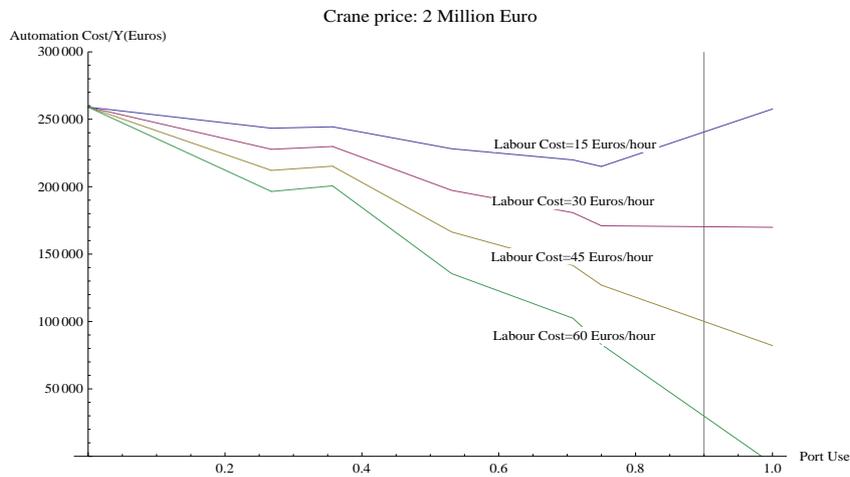


FIGURE 4. Graphic of effective cost of automation for an initial price of 2.0 Million Euros per device (including maintenance) for 4 different effective labour costs, automation never makes sense. Above the vertical line of 90% the port use is unusable. The devices are maned by two dockers per shift (double cranes have four dockers). Again whenever labour cost is low, the increase of traffic in the port raises the costs of automated ports, as we see in the upper curve.

we did not compute in this study. All the efficiencies and port uses are the same before and after automation. Evidently, the cost of automation is very high at low port usage, since the traffic does not pay the high number of cranes acquired to maintain efficiencies at constant rate. This is evident in tables 13-16, when the cost of automation becomes prohibitive at low port usage, with huge over cost of 534% in table 16, compared with 382% seen in table 8, where the efficiency was reduced about 25%. This observation justifies our approach of introducing the least possible number of automated cranes accordingly to port usage and gradually increasing the number of cranes when port usage reaches high levels. This approach reduces the costs ad initio sacrificing competitiveness. We did not investigate the loss of traffic associated with loss of competitiveness. That analysis, which deals with stochastic factor, local factors of each port, psychological and comfort factors for the clients of the port, will be detrimental to the arguments of automation but very difficult and imprecise in general to measure. Nevertheless, it can be done for each particular port.

At 60% use, the real cost of labour hour increases to 41 Euros, due to non regular work hours and the need to use weekends. This value is relatively high in European terms. In U.K. this value is near 35 Euros, in U.S. is at most 35 USD, being the average 25USD. In Norway, this value increases to 60Euros. In this country automation could be profitable, at least at first sight. As we will see, if other effects are considered not even in Norway, or countries with similar wages, automation will make sense for manual operated terminals.

In USA the automation is viewed with suspicion by the operators [8] due the risk involved and the high costs of the automation process with relatively smooth relationship between employers and workers.

In third world countries where the labor cost is lower, automation is not profitable. It can be justified only by ideology, not from sound strategic management.

Finally in Figures 3 and 4, we can see the curves of the extra cost of automation for two crane prices, 1.5 and 2.0 million Euros, with maintenance in a 10 year span for different effective labour cost. We do not consider port usage above 90% by reasons exposed above. In this case we considered reduction of efficacy, to minimize the costs of the process of automation. Even with this reduction in efficiency, and consequently reduction of competitiveness of the port it is clear that automation is not profitable for the operator when the price of the devices supersedes 1.5 million Euros and effective labour cost is less than 60 euros. Only in the marginal case of port use of 80%, near the limiting operational use of 90%, automation can be profitable, if we do not count jams due to the greater number of cranes when port usage reaches values near 90%.

In almost every country, when a worker is discharged, the former employer must pay a compensation, this compensation varies from country to country. In some countries this comes partially from a retirement fund, in other countries it must be paid directly by the former employer. The cost of this compensation must be added to the price of the automation. When we consider a price of 1.5 million euros per crane, this value includes the compensation paid to the discharged dockers. In a full operating port that can be a full salary times n (varies from country to country) compensation for 3 or 4 workers. In Australia, Brisbane, this is more than one year of salary for each worker which means the addition of 300.000 to 400.000 euros to the price of the crane plus financial costs. The mentioned value of 1.5 million Euros is very conservative for the automation of a device.

Finally we mention that is very strange the idea that automation is profitable and unavoidable in ports [8, 4]. The discussion in [4] is very interesting but completely meaningless in quantitative terms, since only opinions without number support are

argued. It seems only profitable for banks, financing the operations, and corporations supplying the technology. It is not profitable for workers as a whole, not profitable for the operators and reduces integrated efficiency. It seems to work only if the operators are also involved in the share structure of the corporation supplying automation technology. This false idea that automation is unavoidable is also fruit of the piles of money invested by big corporations, like ABB, in marketing. It would be interesting to study the actual feeling of the port community about automation in all its variants, partial, complete, in multiple crane options, in vehicular transportation, in gates, brand new from scratch or introduced in old ports formerly operated manually. A lot of work can be done on this subject, and many PhD and master thesis can be done on this huge and fertile subject. We suggest the reading of [10], who reflects on the human and philosophical perspectives of automation.

4. ANALYSIS OF LOST INCOME FROM THE STATES

In most states the Operators of the ports pay rents. For instance, in Brisbane, the rent is about 6 million Euros or 9 million Australian Dollars. The port authorities, normally public services, collect also other taxes.

The state before the automation would receive port rents plus labour income taxes. Usually automation will not increase profits for the port operators. Automation only serves to get rid of the human factor, simply because operators want to avoid possible social unrest and confrontation. A risk that the operators are not prepared to face by historic and ideologic reasons, explained in the second part of this work. Naturally, there is no increase of taxation on capital profits. On the other hand, there is no taxation costs associated with the automation, due to free trade agreements. This reasoning proves that automation will produce a net decrease on income to the governmental budgets of each country were automation has been introduced.

In the rest of this section we will perform a very simple case study, contrary to the direct estimation of cost/benefits analysis of crane automation, is very difficult to perform a similar analysis due to the particular nature of taxation laws of each country.

We consider a case, similar to Australia, that when dockers are discharged, they cease to pay income tax, social taxes, and start to receive unemployment compensations. Those are state funded in most cases.

Whenever a docker is discharged an average of 30% of his salary ceases to be paid to the state and an average of 100% of his salary starts to be paid by the state, in a temporary basis.

We consider ports operating at 60%, 80% and 90%, ports where makes sense to introduce automation. With lesser port use is spurious to ever think about automation. We consider nominal labour cost of 10, 20, 30 and 40 Euros.

For nominal labour costs (at normal daily work hours) of 10 Euros, the reduction of taxation varies from 14 to 24 thousand euros per crane depending on port utilization and from 60 to 104 thousand Euros in temporary loses. This means that if in a country with this average nominal wage of 10 euros, like Portugal, the state loses 128 thousand euros per manual crane automated. In a port with 100 cranes, this represents a loss of 12.8 million Euros of state losses per year in the first years, and a loss of 2.4 million Euros for the rest of the lease, with a real net decrease in the actual rent. If the rent is in the order of 6 millions Euros, the state is actually paying the private operators to automate their systems.

The situation is worst when the nominal labour cost is 20, 30 or 40 Euros per hour. In that case the loss of the state is linear with the nominal wage. That

represents a loss of 51.2 million Euros in the years after automation introduction and a permanent yearly loss of something like 9.6 million Euros forever.

In Norway, for instance, even if the wages favors automation, the state losses would be very large.

The analysis can and must be fine tuned for each particular country.

The conclusion is very clear: The unions must press the governments and public opinion to consider the losses of all the community will suffer if automation is carried on without further compensations to the discharged workers and the country as a whole.

5. ANALYSIS OF GNB REDUCTION

In this last section we mention very briefly that automation is in general a severe loss in Gross National Product. Being the automation companies outside the countries with active ports the value paid in the process of automation is exported and the dockers discharged cease to contribute with their labour income to the National Product of the local country. This is a two way effect, in ports with 100 cranes when automation is carried on, with nominal labour cost of 40 Euros per hour there is a yearly net loss of about 41.6 million euros in labour income where at the same time there is a loss of 100 million Euros, at least, for a period of ten years. This situation represents a net loss of the GNP in the order of 140 millions per year, during 10 years, for countries with nominal labour cost of 40 euros per hour. In countries with 10 Euros of nominal labour cost, the loss in the GNP is about 110 million Euros per year. For low wages countries like Portugal, this represents a huge loss in the GNP and on the state national budget.

6. CONCLUSION OF PART 1

The mathematical analysis of the automation has a clear conclusion. The automation process is not profitable for the operators, nor the state, and it is catastrophic for each local country as a whole. Automation is very profitable for the corporations producing the automated systems and detrimental for all the other agents. Only when there are hidden factors related to labour restructuring viewed globally, discussed in second part, the process of automation makes some sense for the capital owners. Namely, when the share holders of automation providers are the same of port operators.

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Part 2. State Policies Towards Precarious Work: Employment and Unemployment Restructuring labour Markets

1. INTRODUCTION

This article offers an analysis of the historical evolution of labour relations, focusing on labour precarity and unemployment in recent 3 decades, and on the role of the state in dealing with it. We will argue that more often than not the phenomenon of unemployment is cyclical, implying that precarity and unemployment are two sides of the same coin in the current mode of production, and lead directly to a decrease in wage bills (direct income) and indirectly to a reduction in social costs (the welfare state). Among the multiple variables open to scrutiny (including education, training, taxation, direct creation of public sector jobs, and legislation), we will focus especially on how workers' social security and welfare state funds were put to use in this period, to mitigate in political as well as social terms the social regression condoned when employment rights were curtailed and labour conditions worsened. We will use the example of Portugal. The Ministry of Labour and Social Security and its Institute of Employment and Training were responsible, along with legislative changes approved by Portugal's parliament and EU regulations, for managing the workforce in that direction. There were legislative changes in 1976 which introduced short-term contracts, which had been illegal in 1974-1975; wholesale redundancies were facilitated in 1987 and early retirement in 1991. Further changes came in 2003, 2009, and 2012, which did not take into consideration piecework wages in calculating income and reduced the value of redundancy payments by more than half.

Portugal once had a policy of universal welfare with no obligation to prove poverty or unemployment to gain access to benefits – maintained by progressive taxation – for things such as health, education, and social provisions, including subsidized canteens for workers. However during the 1990's, the policy has moved towards focused assistance, meaning it is now necessary to prove poverty to gain access to free healthcare, subsidized canteens or transport, and cheap electricity.¹ The new welfare policy might indeed have been intended to address social inequalities and promote reintegration into the labour market,² but our contention is that, first, the increase in compensatory and targeted social measures was actually conducive to increased job insecurity and was closely related to the deregulation of employment; second, the compensatory social programmes were created simultaneously with the abolition of free access to health and education in the 1990s. The new policy simply endorsed the principle of “the user pays”. Most remarkable among the legal measures dealing with labour flexibility since 1985-1987 were the facilitation of collective dismissal and the use of the social security fund to compensate for redundancy. Then, especially with further legislative changes in 2003 and 2009,

¹Cleusa Santos, “Rendimento de facto Mínimo? Estado, Assistência e Questão Social”, in Raquel Varela (ed.), *A Segurança Social é Sustentável. Trabalho, Estado e Segurança Social em Portugal* (Lisbon, 2013), pp. 321-323.

²AAVV, *Pareceres sobre o Rendimento Mínimo Garantido* (Lisbon, 1997), pp. 1-84.

it became easier to dismiss individuals. One of the social outcomes of the changes can be seen in the Gini index, which fell from 0.316 in 1974 to 0.174 in 1978, when it reached its lowest level due to the “employment for all” policy of the 1974-1975 revolution. However, with inequality growing thereafter, the index rose to 0.210 in 1983.³ Since then it has risen to a figure of 0.338 today, one of the highest in the EU, but caused by the “competitiveness of low wages” according to an analysis by the Bank of Portugal.⁴ Over the same period, exports increased exponentially from a total of twenty billion euros in 1995 to sixty billion in 2014. The report by the Governor of the Bank of Portugal declared that the transformation in growth was export-driven.⁵

This article begins with a discussion of the notion of labour precarity, adducing several definitions of what is a controversial concept that until recently had remained outside the scope of formal studies. The concept of precarity has been subjected to different definitions within the framework of labour relations studies and projects. Inasmuch as it displays each country’s distinct reality, the Global Collaboratory on the History of Labour Relations is likely to make a decisive contribution to the debate on the concept and its history. We will also discuss the concept of real versus official unemployment, and relevant data will be compared with those from the Global Collaboratory on the History of Labour Relations.

Later, we will examine the historical background to the changes in labour relations that have taken place in the past five decades, highlighting the occasions when change was abrupt (1974-1975, 1986-1989, and 2012-2014), but also the gradual transformations that occurred throughout the 1990s and the first decade of the present century. Recognizing gradual change is equally important to understanding the historical development of the state’s role as far as precarity and unemployment are concerned. Furthermore, we will point out that, in this specific instance, the state acted upon the link between protected, precarious, and retired workers, making use of social and welfare state funds (net social income) to do so. In defining those changes affecting the role of the state, reference will be made to the relevance of Portugal’s position, both regionally and in the context of globalization (as well as to that of the completion of a global labour market) — namely its joining the European Economic Community (now the European Union) in 1986.

Finally, we will compare developments with those in Sweden in order to highlight the similarities in both processes, albeit at different stages, both in terms of economic development and the social conditions and distinctive features of the workforce.

2. PRECARIETY AND UNEMPLOYMENT

Throughout the past two decades labour market researchers in southern Europe and Latin America have discussed the concept of labour precarity in the light of the exponential increase in the number of workers facing labour precarity since the end of the 1980s. Similarly, the concept of unemployment has aroused academic

³Manuela Silva, “A repartição do rendimento em Portugal no pós 25 de Abril 74”, *Revista Crítica de Ciências Sociais*, 15-17 (1985), pp. 269-279, 272.

⁴Carlos da Silva Costa, “Competitividade da economia portuguesa: desafios futuros”, available at https://www.bportugal.pt/pt-PT/OBancoeoEurosistema/IntervencoesPublicas/Lists/FolderDeListaComLinks/Attachments/257/App_APGEL10072014.pdf, slide 26, last accessed 11 March 2016.

⁵Idem, “O desafio da absorção do desemprego estrutural em Portugal”, available at <https://www.bportugal.pt/pt-PT/OBancoeoEurosistema/IntervencoesPublicas/Lists/FolderDeListaComLinks/Attachments/242/intervpub20140125.pdf>, last accessed 5 May 2016.

controversy, so we will underline the major debates related to agreeing definitions of the two social phenomena and examine the data available for both.

In recent decades many authors, including Callaghan and Hartmann,⁶ Farber,⁷ Hodson,⁸ and van der Linden,⁹ have worked with the idea of precarity. A feature recurring in most of their work is a tendency to conflate precarious labour relations, distinct national legal system features, and workforce mobility.

As defined by Charles and Chris Tilly, “work” includes any human effort adding use value to goods and services.¹⁰ Ricardo Antunes, the Brazilian sociologist who coined the concept of a new morphology of the working class as the class-that-works-for-a-living, points out that in western countries the main dynamic of the labour market has seen decreased regulation of work and increased precarity, which are inextricably linked to subcontracting within a flexible business model.¹¹

At the height of the outbreak of the most recent global crisis, that model became broader and induced even greater erosion of contracted and regulated labour of the type that had been most common throughout the twentieth century, namely Taylorist/Fordist labour.¹² Such relatively more formalized work has been replaced by several different kinds of informality and precarization – outsourced work in all its wide diversity, including “cooperativism”, “entrepreneurship”, and “voluntary work”.

Antunes has emphasized that the class-that-works-for-a-living is irretrievably interconnected, regardless of type of employment: “[...] by then, the two most noticeable and relevant focal points of the Portuguese working class were surfacing: those who had been forced into precarization and the working class that had inherited the welfare state and Fordism”.¹³

The close link between flexible modes of production and precarity, as well as its impact in terms of wrecking the whole workforce, has been pointed out by Castillo,¹⁴ Huws¹⁵ — who applied it to the “cyber proletariat” — and Mészáros,¹⁶ among others. According to Felstead and Jewson, in the USA more than half of net employment growth was related to precarious labour.¹⁷

Graça Druck has devised a typology of precarization: (i) procedures aimed at commodifying the workforce, resulting in a heterogeneous and segmented labour market, characterized by structural vulnerability and precarious modes of integration, with contracts depriving workers of any social protection whatsoever; (ii) labour planning and management standards that have brought about extremely

⁶Polly Callaghan and Heidi Hartmann, *Contingent Work: A Chart Book on Part-Time and Temporary Employment* (Washington, 1991).

⁷Henry S. Farber, “Alternative and Part-Time Employment Arrangements as a Response to Job Loss”, *Journal of Labor Economics*, 17:4 (1999), pp. 142-169.

⁸Randy Hodson (ed.), *Marginal Employment, Research in the Sociology of Work* (Stamford, CT, 2000).

⁹Marcel van der Linden, “San Precario: A New Inspiration for Labor Historians”, *Labor: Studies in Working-Class History of the Americas*, 11:1 (2014), pp. 9-21.

¹⁰Charles Tilly and Chris Tilly, *Work under Capitalism* (Boulder, CO, 1998), p. 22.

¹¹Ricardo Antunes, *Os Sentidos do Trabalho. Ensaio sobre a Afirmação e a Negação do Trabalho* (São Paulo, 2009), pp. 16-21.

¹²J. Breman and M. van der Linden, “Informalizing the Economy: The Return of the Social Question at a Global Level”, *Development and Change*, 45:5 (2014), pp. 920-940.

¹³Antunes, *Os Sentidos do Trabalho*.

¹⁴Juan J. Castillo, *Sociología del trabajo* (Madrid, 1996).

¹⁵Ursula Huws, *The Making of a Cybertariat: Virtual Work in a Real World* (New York and London, 2003).

¹⁶István Mészáros, *Para além do capital* (São Paulo, 2002).

¹⁷A. Felstead and N. Jewson (eds), *Global Trends in Flexible Labour* (London, 1999).

precarious conditions through increased workloads (setting impossible targets, extending working hours, flexibility, etc.); (iii) labour not legally protected, and unfavourable health and safety conditions — the outcome of management standards that despise vital training, information on hazards, collective preventive measures, etc; (iv) unemployed status and the constant threat of losing one’s job; (v) weakened trade unions, methods of resistance, and workers’ representation, because of competition, heterogeneity, and splits, against a background of union obliteration caused chiefly by outsourcing practices.¹⁸

Several researchers have argued that precarity, or casualization, is a new phenomenon — in Portugal it has been around for about thirty years — involving a historically circumscribed definition: absence of the right to work in the post-revolutionary period 1982-2014, in contrast to 1974-1975, when the right to have a job was legally protected by the Constitution. We argue in this paper that the absence of the right to work, here understood in three ways (no right to work, lack of protection from dismissal, and no compensation for dismissal) is not a new phenomenon in Portuguese capitalist development. Historically, since the mid-nineteenth century, it has been the rule rather than the exception.

In our work¹⁹ we suggest a definition of precarity which differentiates precarization from contingent employment. Contingency, or switching between unprotected work and unemployment, is not the sole qualitative variable distinguishing twenty-first-century from nineteenth-century casual work. The concept of precarity is different today from the forms of lack of employment rights prevailing in the nineteenth and twentieth centuries. Precarity in Portugal is a concept that encapsulates other features besides the lack of any right to work and became very widespread during the period of the social pact (1974-1986). It includes the prospect of social regression (and not only of social immobility), and its management as a social phenomenon is heavily dependent on the workers’ savings fund (social security) and the family wage. Today it assumes multiple forms, including false self-employment (“green invoices”, the popular term for the invoices sent by autonomous workers on piece rates), small businesses, cooperatives, outsourcing, and piecework.

Thus, the concept of precarity is defined based on its opposite, protected work, *de facto* or *de jure*. What is involved is an analysis of employment security, which may derive from legal protection or skills training rather than from the conditions under which the work is performed — for instance, working in a mine can be physically precarious, because it is dangerous — but is not necessarily contingent with regard to protection against redundancy. That being so, precarity does not depend on any lack of good hygienic conditions, physical safety, or mental health but is purely a matter of the mobility of a workforce perpetually facing either precarity or unemployment. There is a direct link between precarity and unemployment. However, structural precarization of employment and unemployment are two sides of the same coin, since the same worker is caught in a cycle of precarious employment for part of the year followed by unemployment the rest of the year. For unions and state policy it is essential to understand this point.

¹⁸Graça Druck, “Precarização social do trabalho”, in Anete B.L. Ivo (ed.), *Dicionário Temático Desenvolvimento e Questão Social – 81 problemáticas contemporâneas* (São Paulo, 2012), pp. 373-380.

¹⁹Raquel Varela, “Eugenização da Força de Trabalho em Portugal”, in *idem*, *A Segurança Social é Sustentável*, pp. 23-85; *idem et al.*, “Relações Laborais em Portugal 1930-2011”, *Revista O Social em Questão*, 18:34 (2015).

In Portugal after the 1974 Carnation Revolution, to work became an absolute right, so that whoever is deprived of that right becomes precarious. It was enshrined in Article 58 of the 1976 Constitution²⁰ (the social pact), but its actual implementation relied in fact upon employers' concessions and workers' resistance, as well as on how the social pact was operated under the democratic-representative system.²¹ The right to work in Portugal was introduced legally and socially as a universal human right (the right to survival) unfolding around three concepts: everyone has the right to work, everyone is entitled to protection from dismissal, and finally everyone is entitled to protection if they are involuntarily unemployed.²²

Precarious workers include therefore a wide range of labour relations, quite distinct in their legal outlook but sharing the ease by which workers can be dismissed. The category of precarious workers comprises 1) workers on fixed-term contracts, 2) most workers paid on a piecework basis (freelancer "green invoices", self-employed), 3) those on student grants, interns, and first-job contracts (all funded by the state for a fixed term, assuming the workers are being trained, even though they are actually carrying out paid work); 4) public-sector workers whose contracts are protected, albeit legally subjected to special mobility status (they can be relocated from different cities or jobs within the public sector) or possible dismissal; and 5) workers with permanent contracts whose redundancy pay (compensation for dismissal) was reduced, exposing them to easier dismissal. We have extended the concept of precarity here to include a specific class of small-scale entrepreneurs: in our opinion, in Portugal some precarious workers are labelled self-employed entrepreneurs although they are in essence normally employed workers. Besides "green invoice" workers, those on student grants, and interns, there are more controversial instances such as small business owners who are in fact workers. They might technically own a "business", usually founded after a larger company had been dismembered and begun employing its original workers as outsourced labour. The result is, of course, that workers actually remain employed by and are dependent on the same larger companies while themselves bearing all the costs their former employers are no longer obliged to meet: social security, production stoppages, etc. Capital flows through these small companies but does not accumulate in them, so that their income is "barely enough to make ends meet" — often meaning just barely enough to cover running costs. Some might indeed be true small business proprietors genuinely in competition with others, but a good number are ordinary workers who are really precarious despite being officially labelled as operators of small businesses. Ultimately, the models applied by the Instituto Nacional de Estatística (INE, National Statistical Office) do not go beyond the scope of formal and legal frameworks to

²⁰Constitution of the Portuguese Republic, Seventh Revision [2005], available at <http://www.tribunalconstitucional.pt/tc/conteudo/files/constituicaoingles.pdf>, last accessed 5 May 2016. Article 58 reads: "(Right to work), 1. Everyone has the right to work. 2. In order to ensure the right to work, the state is charged with promoting: a) The implementation of full-employment policies; b) Equal opportunities in the choice of profession or type of work, and the conditions needed to avoid the gender-based preclusion or limitation of access to any position, work or professional category; c) The cultural and technical training and occupational development of workers." Article 59 reads: "(Workers' rights) 1. Regardless of age, sex, race, citizenship, place of origin, religion and political and ideological convictions, every worker has the right: a) To the remuneration of his work in accordance with its volume, nature and quality, with respect for the principle of equal pay for equal work and in such a way as to guarantee a proper living; b) That work be organised under conditions of social dignity and in such a way as to provide personal fulfilment and to make it possible to reconcile work and family life [...]"

²¹Raquel Varela, "A persistência do conflito industrial organizado. Greves em Portugal entre 1960 e 2008", *Mundos do Trabalho*, 3:6 (2011), pp. 151-175.

²²For an analysis of the configuration and evolution of the right to work in Portugal, see Manuel Branco, *Economia Política dos Direitos Humanos* (Lisbon, 2012).

allow us to see who really is in labour relationships equivalent to employer and employee, as far as small businesses are concerned. Finally, some contracts, whether fixed-term or even for piecework, imply a workforce that could not easily be replaced — doctors, for instance — and therefore were not precarious because for them neither mobility nor intensification would lead to unemployment. So it is true that not all mobility is precarious, although there are certain legally protected labour relations, including those of some business holders, that embody precarious work.

Discussing such concepts is paramount to assessing their reality throughout history, as well as their current prevalence, and we shall pinpoint below how deeply methodology affects the data on the general workforce.

If we look at the whole population of Portugal broken down by broad age groups for our period, we notice a substantial variation both in young people and the elderly. The proportion of young people fell steadily, from 29.2% in 1960 to 14.9% in 2011, while the proportion of elderly rose, also steadily, from 8% in 1960 to 19% in 2011. Nevertheless, the age group of people fit for work (aged twelve to sixty-four in 1991 and fifteen to sixty-five in 2001 and 2011) remained noticeably stable. The lowest figure was 61.9% in 1970, with a peak of 67.7% in 2001. Such figures are likely to trigger social repercussions. For instance, from the point of view of social security, spending on younger groups would be replaced by spending on the elderly, but the figures illustrate something else that is rather important. The population available for work has risen from 1960 until today, for the most part because of the number of women joining the labour market. Another change must be stressed, that in education: in 1970 there were about 30,000 university graduates, in 2012 there were 1.3 million.

By 1970, market wage earners represented 14.51% of all labour relations, a figure that had risen to 14.70% by 1981. Those employed outside the market (that is, working for the state, NGOs, the church, or the armed forces, bearing in mind that state and market are of course related spheres) made up only 12.87% of the whole population in 1971. By 1981, however, they accounted for 15.26%, with the nationalizations carried out throughout the revolutionary years of 1974 and 1975 as well as the expansion of state agencies as a result of urbanization being the primary factors behind that rise. In 1981, nationalized sector personnel represented 13% of those employed (salaried) in companies, and about 96% in the electricity-, gas-, and water-supply industries, 69% in communications and transport, and 57% in banking and insurance. By 1982, “state-owned enterprises” accounted for over 20% of the whole national economy, the highest figure among all OECD members.²³

As far as economic activity is concerned, the INE divides the population into two large groups, the working and non-working populations. The “active population” comprises those both employed and unemployed who were older than twelve at the time of the 1991 census or older than fifteen in 2001 and 2011. Everyone else is classed as “inactive”, so those younger than twelve or fifteen, depending on the census, domestic workers, students, retired people and pensioners, those incapacitated for work, and others, including anyone available for work regardless of having been out of the workforce for a long time. Nonetheless, it must be stressed that when it comes to those unemployed the concept of active and inactive populations in the census is strictly linked to their status, or lack of it, as effective or potential market producers. The taxonomy of the Global Collaboratory on the History of Labour Relations includes both market and non-market producers as active populations, as long as they effectively produce or perform services. The

²³Maria João Rodrigues, “O mercado de trabalho nos Anos 70: das tensões aos metabolismos”, *Análise Social*, XXI:87-89 (1985), pp. 679-733.

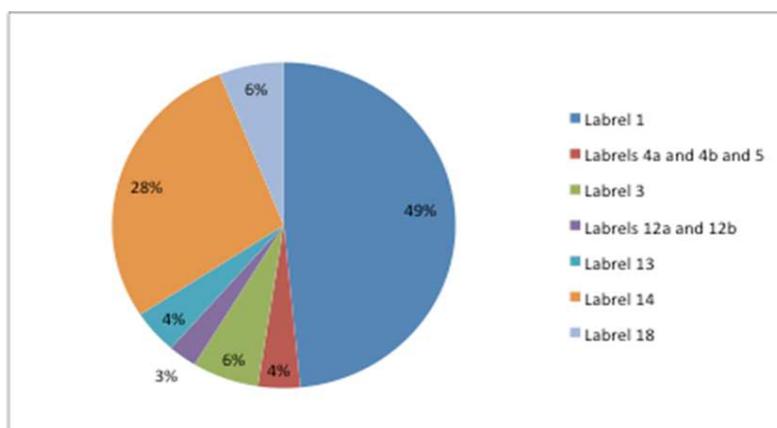


FIGURE 5. Labour relations, Portugal 2011, according to the taxonomy of the Collaboratory, Source: Ana Rajado, Cátia Teixeira, and Joana Alcântara, “Taxonomia das Relações Laborais em Portugal, 1930–2011”, *O Social em Questão*, XVIII:4 (2015), pp. 41–58, pp. 56–57, available at http://osocialemquestao.ser.puc-rio.br/media/OSQ_34_2_Rajado_Teixeira_Alcantara_Varela.pdf, last accessed 12 April 2016.

rest are then labelled inactive. There are then two considerable differences in the methodologies employed by the census and the taxonomy in that the taxonomy regards the unemployed as inactive, whereas domestic workers are labelled active.

Both the INE and EU member states follow the ILO (International Labour Organization) in defining an unemployed person as anyone old but not undertaking paid (or unpaid) work of any kind despite being available and actively seeking employment. The notion of “actively seeking employment” consists of a set of procedures that, according to the INE’s employment survey, includes being registered at a job centre, applying to employers, and attending job interviews. If a potential worker fails to fulfil such requirements, they will automatically be labelled available but inactive, or despondent. Economist Eugénio Rosa challenges the definition of “available but inactive” and includes it instead as part of the “unemployed” category, to which he adds those visibly under-employed, that is, “the number of individuals aged at least fifteen who, during the reference period, had a job comprising less working time than would be expected for their assigned operating position and declare themselves willing to work longer hours”.²⁴ The gap between inactive and unemployed people led to a clear discrepancy in 2014 between figures on official unemployment (13%) and real unemployment (23.7%). As we have explained, the Global Collaboratory uses a different definition of unemployment (labour relation 3), according to which unemployment was 6% in 2011 (see Figure 5).

According to Eurostat, in the fourth quarter of 2012 the proportion of fixed-term workers among employed persons was higher in Portugal (20.3%) than in

²⁴Eugénio Rosa, “Dados do Desemprego em Portugal” [Unemployment in Portugal: Data] 2011, available at <https://www.eugeniorosa.com/Sites/eugeniorosa.com/Documentos/2011/27-2011-Ataque-Estado-social-em-Portugal.pdf>, last accessed 11 March 2016.

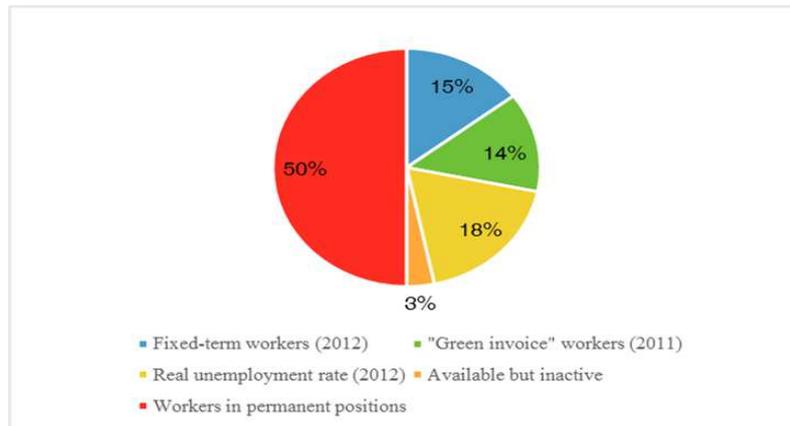


FIGURE 6. Precarious work in Portugal, 2011 and 2012.

almost any other country. In absolute terms, this amounted to 900,000 fixed-term workers. In order better to assess the amount of precarious work in Portugal, we should have to include the proportion of workers paid for piecework (“green invoices”). Although there are no such data available for the fourth quarter of 2012, we can estimate it from the 2011 census, which gives a figure of 827,000 precarious “green invoice” workers doing piecework. Those two types of fringe employment covered over 1.5 million precarious workers out of an “active population” of 5.658 million workers. That figure comprises an active population according to the INE of 5.455 million, employed and unemployed, plus 203,000 considered available but inactive, and contrasts with a real unemployment rate of 19.9% (1,126,000) in the fourth quarter of 2012. Thus, in 2012 half the workforce faced either precarity or unemployment (see Figure 6) – precarity having threatened less than half the workforce in previous decades, when unemployment was never higher than 7%. In addition, on average, workers on permanent contracts earned 16% more than those on fixed-term contracts, while in a study published in 2008 Eugénio Rosa estimated that on average a precarious worker earned 37% less than one on an open-ended contract.²⁵ Furthermore, only 12% of fixed-term contracts were subsequently converted into permanent contracts.²⁶

Figure 7 gives official unemployment figures, illustrating the impact in times of economic crisis, and how unemployment has been counter cyclical since the 1980s. The figure for 2012 was unprecedented. It is worth mentioning that this figure, as well as all the others, relates solely to the active population;²⁷ still, it depicts clearly the impact of the unemployment cycle on the unemployed population, as well as the upward trend on which that cycle is superimposed. Plainly, in the last cycle, triggered by the 2008 crisis, unemployment figures were unprecedentedly high: 16.2% in 2012.

²⁵Eugénio Rosa, “Emprego a tempo parcial, a prazo e a recibos verdes”, available at: http://resistir.info/e_rosa/precariedade.html, last accessed 23 March 2013.

²⁶Costa, “O desafio da absorção do desemprego estrutural em Portugal”.

²⁷In INE statistics, unemployment is included as part of the active population and thus the active population differs from the employed population.

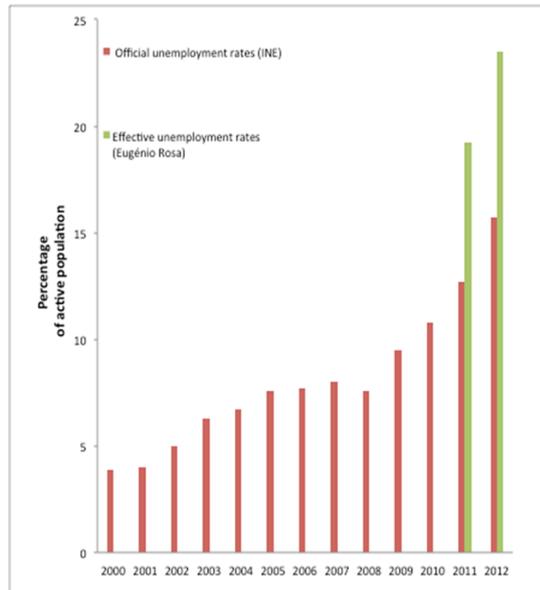


FIGURE 7. Unemployment rates in Portugal, 2000-2012.

3. THE ROLE OF THE STATE

Nowadays, either statistics nor the legal framework convey the full complexity of the kinds of state intervention that shape labour relations or employment conditions, both directly and indirectly. The Global Collaboratory on the History of Labour Relations is an ambitious attempt to categorize labour relations, which are becoming increasingly complex due to urbanization, education, and globalization. Here we shall focus mainly on the relationship between the state and the workforce. Understandably, this topic does not exhaust the whole multiplicity of variables binding the state to labour relations — for instance, in terms of preserving the health of the workforce (healthcare) or training it (education and vocational training); fiscal policy; public debt and public-sector budgets; public areas and amenities; or transport management. Our research into the management of labour precarity and unemployment and its relationship to the welfare state, especially with respect to social security, is an important part of a wide and complex network of relationships between state and workforce.

Currently prevailing explanations critical of neoliberalism have emphasized the fact that the period since the 1970s has been characterized by increased deregulation of the labour market, along with a decreased role for the state in the economy. In this article, we claim that labour precarity and unemployment amount to direct state intervention, and that it is increasing rather than being reduced. Close attention must be paid to changes in state intervention, instead of taking for granted any explanations presuming a steady decrease in that role.²⁸ Such changes might be seen in social dialogue mechanisms, including state, union federations, and employers' associations; targeted and non-universal social welfare policies to counterbalance

²⁸Mimi Abramovitz, "Theorising the Neoliberal Welfare State for Social Work", in Mel Gray, James A. Midgley, and Stephen Webb (eds), *The Sage Handbook of Social Work* (London, 2012), pp. 33-50.

the effects of rising unemployment and low wages; and changes in the legal framework regulating labour precarity. We should mention here our particular insistence that we see labour flexibility as being typified by a type of state regulation that promotes it. We look, too, at the close similarities between Portugal and Sweden, despite slight differences in the years of implementation, with Portugal joining the EU earlier (1986) than Sweden (1995), and the different figures for the cost of consumer goods and the different living standards enjoyed by workers in these two countries.

In the past four decades there has been no reduction in the state's role as a direct employer – in fact it has increased. In 1979 there were 383,000 civil servants in a total working population of nearly four million people. By 2014, there were 665,620 civil servants out of a total 4.5 million people employed.²⁹ It should be noted that the country's active population has risen significantly since the 1970s. It was 3.91 million in 1974, peaking at 5.534 million in 2008; in 2015 it was 5.225 million. Concomitantly, unemployment has risen. With 23.7% of the whole population unemployed, the figure for 2015 was the highest in the country's history.³⁰

Unemployment is a historical thing, and is derived from choices related to a certain means of accumulation and global competition based on reducing unit labour costs. In Europe the unemployment of the past four decades must be regarded as a complex phenomenon strictly linked to labour market restructuring and not to the “end of labour”.³¹ Authors in Portugal from the whole spectrum of economic thinking all agree that unemployment is nowadays the main cause of pressure on wages. We argue that, despite a minority of the workforce who tend to leave the labour market never to return, in most cases the data reveal that unemployment is cyclical and that there is a direct connection between unemployment and labour precarity: they are two sides of the same coin.

4. SOCIAL ASSISTANCE AND PRECARIETY

Organized mutual institutions or solidarity cooperatives have existed since the nineteenth century, but the Portuguese welfare state and the qualitative and quantitative generalization of social rights came late, thirty years after France and Britain in 1945 with the Beveridge Plan of 1942. But such institutions were born partly out of causes similar to those that gave rise to the welfare states in western and northern Europe, from the “concerns of the economic and political system with industrialization (including demographic explosion, social and political conflicts, economic crises)”, as pointed out by Luís Graça.³² Ângelo Ribeiro³³ noted that between 1926 and 1974 “human rights, taken as the civil liberties in their multiple aspects of civil, political, social, economic, and cultural rights that make a country a ‘state of law’, were practically non-existent in Portugal”. All researchers agree that the pension system during the Estado Novo (the forty-eight-year period of dictatorship under

²⁹Civil Service Employment: Central, Regional, Local, and Social Security Funds. Data sources: DGAEP/MEF – Civil Service Human Resources Survey (1979, 1983, 1986) | First and Second Civil Service Public Census (1996, 1999) | Civil Service Database (2005) | Information System on State Organization (SIOE) (from 2007 onwards). Source: Pordata. Last update: 26 June 2015, available at <http://www.pordata.pt/Portugal>, last accessed 16 January 2016.

³⁰Ibid.

³¹For a rebuttal of the “end of labour” thesis, see Antunes, *Os Sentidos do Trabalho*, and idem, *Adeus ao Trabalho? Ensaio sobre as Metamorfoses e a Centralidade do Mundo do Trabalho* (São Paulo, 2011).

³²Luís Graça, *Evolução do sistema hospitalar: Uma perspetiva sociológica* (Lisbon, 1996), pp. 1238-1242.

³³Ângelo Ribeiro, “Direitos Humanos”, in António Barreto and Maria Filomena Mónica (eds), *Dicionário de História de Portugal* (Oporto, 2000), p. 559.

Salazar and Caetano) was both restricted and offered little.³⁴ All other indicators of well-being – life expectancy, health, infant mortality, literacy and education, leisure – were equivalent to those in underdeveloped and backward countries. Total state spending in Portugal on social issues in 1973 was 4.4% of total GDP, while in Britain it was 13.9%, in Italy 10.6%, and 15.4% in Denmark.³⁵ Portugal was to undergo fundamental changes after the 1974-1975 revolution, which brought to an end the oldest dictatorship in Europe, under which a system of forced labour had persisted in its colonies. Unable to reform itself, the Portuguese regime collapsed on its backbone³⁶ in a coup d'état led by middle-ranking army officers but which was followed by social revolution. Then, one-third of the population (three million people) participated in workers' and residents' committees, with state expenditure at a correspondingly high level; today, expenditure on education, health and social security, the state's social functions, is equivalent to 18.1% of GDP.³⁷

In the aftermath of 25 April 1974 a huge demonstration forced the dissolution of the Ministry for Guilds and Social Welfare, which was renamed the Ministry for Labour and Social Security,³⁸ so that in 1974 welfare was replaced by security. Social security encompasses two main areas, namely pensions, funded by deductions from workers' wages or, for non-contributory pensions, by transfers from the national budget, and so-called social welfare policies, aimed at tackling poverty and involuntary unemployment. The former would not be feasible without the historical rise in wages, while the latter were implemented on a large scale only in the 1980s. Two interdependent ideas form the foundation of the universal social security system created in 1974 and 1975. First was the transfer of income from capital to labour. It was the most thorough instance of this in contemporary Portugal, and according to official data the proportion of income accounted for by labour grew from 49% before the revolution to 67% after, while the proportion of income from capital fell, from 52% to 33%.³⁹ The second was a public commitment to universal social protection and solidarity, which put an end to discriminatory and discretionary schemes and widened the scope of social protection. Universal protection was established, by means of education, healthcare, and pensions, to maintain and train the workforce, and support was given to such things as culture, sport, and general leisure. The average annual state pension rose more than fifty per cent between 1973 and 1975.⁴⁰

A look at the figures reveals that due in part to inflation real direct wages actually fell in 1974 and 1975. Nonetheless, for social wages, in other words the benefits provided by the welfare state and social security, the advantages were clear. It should be stressed that not only did wages rise, income disparities, too, were reduced, so that the gap between higher and lower incomes narrowed.⁴¹ We must emphasize this point in particular, that the greatest impact of the rise in incomes

³⁴Manuel de Lucena, "Previdência", in Barreto and Mónica, *Dicionário de História de Portugal*, p. 160.

³⁵Bernardete Maria Fonseca, "Ideologia ou Economia? Evolução da Protecção no Desemprego em Portugal" (MA thesis, Universidade de Aveiro, 2008), p. 78.

³⁶Fernando Rosas, *Pensamento e Ação Política. Portugal Século XX (1890-1976)* (Lisbon, 2004).

³⁷Eurostat. Social protection statistics, available at: http://ec.europa.eu/eurostat/statistics-explained/index.php/Social_protection_statistics_-_main_indicators, last accessed 12 August 2015.

³⁸Author's interview with Cruz Oliveira, 24 July 2012, Lisbon.

³⁹Silva, "A repartição do rendimento", pp. 269-279.

⁴⁰Pordata, "Pensões: total, da Segurança Social e da Caixa Geral de Aposentações – Portugal", available at: <http://www.pordata.pt/Portugal/Pens%C3%B5es+total++da+Seguran%C3%A7a+Social+e+da+Caixa+Geral+de+Aposenta%C3%A7%C3%B5es-851>, last accessed 16 March 2013.

⁴¹Silva, "A repartição do rendimento", p. 271.

in this period was not on direct wages but on social wages, that is to say on the welfare state. That being so, and social contributions aside, wages were therefore lower in 1983 than in 1973.⁴² There was precarity in the earlier period, too, but as unemployment remained residual – although still cyclical – between 1970 and 1990 (regardless of a peak following the 1982-1984 crisis), state measures for the management and support of unemployment were similarly residual until 1986.

In the 1980s, the end of the social pact initiated a period of social dialogue. The Conselho Económico Social (Social Economic Committee) was established in 1986, in a tripartite configuration of employees, employers, and the state, similar to the Swedish model. It was therefore a neo-corporative structure, switching company- or factory-based conflicts between employers and employees to a situation in which they were negotiated and prevented, as pointed out by Stoleroff⁴³ and Strath.⁴⁴ In Sweden, a very similar mechanism of “pre-negotiating” before official negotiations took place was established. Over the past twenty years the new policy has been steadily expanded and extended to include unemployment; this expansion has been financed by funds comprising contributions to retirement pensions. Marques argues that within the EEC (later EU) and the single market framework various measures were taken, such as “unemployment benefits, early retirement due to unemployment, explicit support for restructuring, active labour market policies, and professional training”.⁴⁵ As mentioned by Hespanha et al., the setting up of the Fundo de Estabilização Financeira (Financial Stabilization Fund) and the amalgamation of the social security and the unemployment funds were measures simply heralding the relationship between “unemployment problems and the need to maximize collected contributions”.⁴⁶

In Portugal, such changes took place only because there was a specific historical juncture (the economic crises of 1981-1984) characterized by the following near simultaneous developments. First, there was widespread social conflict involving some minor trade unions, in steelworking and heavy industry, who were opposed to the social dialogue. Their defeat in the 1984-1986 strikes had a symbolic effect that spread to other sectors, and Strath⁴⁷ notes that a similar effect was felt in Britain, Germany, and Scandinavia. Second, trade unions committed themselves strongly to negotiations instead of to conflict. Unlike during the revolution, they no longer saw the state as an opponent, but – rather than companies – as an arbiter to whom proposals should be addressed.⁴⁸ Moreover, the working and middle classes gained wider access to consumer goods as Portuguese markets were opened up to Asian businesses and pressure was applied to wages on a worldwide scale. A fourth factor, and in our opinion pivotal, was the deployment of the social security fund to manage precarity and unemployment, providing a social cushion. This move complied with the World Bank research guidelines on assistance, inflation,

⁴²Ibid., p. 270.

⁴³Alan Stoleroff, “All’s Fair in Love and (Class) War”, 26 October 2012, available at: http://www.snesup.pt/htmls/_dllds/All_is_fair_in_love_and_class_war_Stoleroff.pdf, last accessed 15 March 2013.

⁴⁴Bo Strath, *The Politics of De-Industrialization: The Contraction of the West European Shipbuilding Industry* (London [etc.], 1987).

⁴⁵F. Marques, *Evolução e Problemas da Segurança Social em Portugal no Após 25 de Abril* (Lisbon, 1997), cited in Fonseca, “Ideologia ou Economia?”, pp. 78, 79.

⁴⁶Pedro Hespanha et al., *Entre o Estado e o Mercado. As Fragilidades das Instituições de Proteção Social em Portugal* (Coimbra, 2000), cited in Fonseca, “Ideologia ou Economia?”, p. 78.

⁴⁷Strath, *The Politics of De-Industrialization*.

⁴⁸Marínus Pires de Lima, “Transformações das Relações de Trabalho e Ação Operária nas Indústrias Navais (1974-1984)”, *Revista Crítica de Ciências Sociais*, 18-20 (1986), p. 541.

and unemployment⁴⁹ aimed at preventing extreme poverty, inequality, and social decline. The deployment was negotiated case by case by way of early retirement and was mostly accepted by the unions⁵⁰. The process affected millions of workers throughout Europe, from Britain to Portugal, and Sweden to Spain. In return, “acquired rights” were left unaffected for those who already had them, while recently employed workers were suspended or made subject to precarity schemes. Finally, in southern Europe — and this was not a relevant element in Sweden nor in most developed European countries — young people began to join the labour market at a later stage. That naturally implied a decrease in most parents’ disposable income, because they had to support their children for longer. In Portugal nowadays, most unemployed people still rely first on their families for subsistence, with unemployment benefit coming second. All the same, in analysing the restructuring of the labour market since the 1980s we noted another important phenomenon, namely that although youth unemployment was high it was in the older segments of the working population that unemployment was more structural. There was a tendency for people over forty-five with fewer than six years of education to be permanently removed from the labour market, in an age/training selection process we call “workforce eugenics”.

One of the most relevant events in this interwoven relationship between the social security fund and the management of unemployment was the introduction of unemployment⁵¹ benefit (Decree-Law no. 20/85 of 17 January 1985). Most salaried workers had been entitled to unemployment benefit since 1975 (Decree-Law no. 169-D/75 of 31 March 1975) but in 1985 the EEC forced the establishment of a new benefit combining the social security and unemployment funds (leading to an integrated social security contribution, implemented in 1986) into a single fund for both pensions and unemployment benefits. Moreover, a legal framework for early retirement, also mandatory under EU law (Decree-Law no. 261/91 of 25 July 1991),⁵² was implemented, and permission was granted to exempt or reduce interest on social security debts owed by companies “in difficult economic situations or subject to special company rescue or creditor protection schemes” (since 1989, these schemes have taken on a variety of forms).

One aspect of this state management was the setting up of pension funds. Further, under Decree-Law no. 415/91 of 17 October 1991, a minimum income was established by 1996, which was subsequently replaced in 2003 by the social integration income. In the spirit of Scandinavian “flexicurity” or the German Hartz IV welfare reforms, “targeted assistance programmes” are being implemented all over Europe aimed at creating a more politically stable workforce, to avoid political conflicts between capital and labour and to ensure social harmony. In his article on Sweden in the present volume, Max Koch reports a decrease in amounts allocated to individuals not returning to the labour market. Despite 47% being in poverty

⁴⁹Elisa Pereira Reis and Simon Schwartzman, *Pobreza e exclusão social: aspectos sócio políticos* (Rio de Janeiro, 2002).

⁵⁰On this topic, see Paulo Jorge Martins Fernandes, “As Relações Sociais de Trabalho na Lisnave, Crise ou Redefinição do Papel dos Sindicatos?” (MA thesis, Instituto Superior de Ciências do Trabalho e da Empresa, 1999).

⁵¹See Ministério da Solidariedade e Segurança Social, “Evolução do sistema de Segurança Social - conteúdo final”, available at: http://www.seg-social.pt/evolucao-do-sistema-de-seguranca-social?p_p.id=56_INSTANCE.R6s5&p_p.lifecycle=1&p_p.state=exclusive&p_p.mode=view&p_p.colId=column-1&p_p.col.count=1&_56_INSTANCE.R6s5_struts.action=%2Fjournal_content%2Fexport_article&_56_INSTANCE.R6s5_groupId=10152&_56_INSTANCE.R6s5_articleId=135838&_56_INSTANCE.R6s5_targetExtension=pdf, last accessed 4 January 2013.

⁵²See, for instance, Decree-Law no. 119/99 of 14 April 1999; Decree-Law no. 483/99 of 9 November 1999; Decree-Law no. 125/2005 of 3 August 2005. *Diários da República*, available at <https://dre.pt>.

in Portugal in 2014 (according to the UN definition), the number of social integration income beneficiaries fell from 526,382 in 2010 to 320,554 in 2014. Part of that state policy involves the Employment and Social Protection Programme (Decree-Law 84/2003 of 24 April 2003), which allows the period for claiming unemployment benefits to be shortened and gives access to early retirement resulting from unemployment, and access to social unemployment benefits. Another very important aspect of this intervention are the active labour market policies.⁵³ Since the end of the 1980s, mechanisms have been established whereby businesses can be exempted from making contributions. At first, companies could be granted exemptions that could be extended for a period of up to three years if a worker were employed permanently. Currently, the PAE (Active Labour Market Policies) programme allows a company to employ a worker for six months on a precarious contract, with wages paid by the social security system. Such an employee may be dismissed at the end of the sixth month.⁵⁴ This scheme, along with mini-jobs, is widespread in Austria and Germany. Companies may choose to pay a fraction of the salary, with the remainder paid by partial unemployment benefit. In Portugal there are currently 160,000 workers, including outsourced labour both in private and state employment, affected by policies under which the state, through the social security system, pays up to seventy per cent of their salaries.⁵⁵

Finally, if companies resort to laying-off employees, or in the event of total or partial production stoppages, workers receive social security for up to six months. In many cases they are required to attend official vocational training, which is partially paid for by social security. The number of companies declaring “fake” lay-offs, meaning they file for bankruptcy after six months, is unknown. It is also the responsibility of the social security body to guarantee outstanding remuneration, if certain conditions are met. In 2008 the figure involved was 26 million euros; by 2011 it had risen to nearly 75 million euros.⁵⁶ According to Guedes and Pereira’s study, by the end of 2011 vocational training and active labour market policies, combined, accounted for 1.4% of Portuguese GDP.⁵⁷

Social security, the densest component of the welfare state, has become a tangle of complex legislation affecting many sectors.⁵⁸ In general terms it includes retirement pensions (for workers who have contributed), minimum pensions, and allowances for disability, old age, and widowhood; assistance programmes to help the workforce in times of need, such as when they are sick; access to education; subsidized canteens; and a minimum income (which later became known as social integration income). Nevertheless, there has been a concurrent exponential rise in poverty, and today forty-seven per cent of the Portuguese are poor, before social transfers; despite these transfers, this figure is still as high as eighteen per cent.

⁵³Mónica Costa Dias and José Varejão, *Estudo da Avaliação das Políticas Ativas de Emprego* (Lisbon, 2012), available at:

<http://www.igfse.pt/upload/docs/2012/estudopoliticativasdeempregoRelFINAL.pdf>.

⁵⁴Ibid.

⁵⁵Ibid.

⁵⁶Pordata, “Indemnizações compensatórias da Segurança Social por salários em atraso” [Compensatory Allowances for Outstanding Wages], available at: <http://www.pordata.pt/Portugal/Indemniza%C3%A7%C3%B5es+compensat%C3%B3rias+da+Seguran%C3%A7a+Social+por+sal%C3%A1rios+em+atraso-114>, last accessed 15 September 2015.

⁵⁷Renato Guedes and Rui Viana Pereira, “Quem Paga o Estado Social em Portugal?”, in Raquel Varela (ed.), *Quem Paga o Estado Social em Portugal?* (Lisbon, 2012), p. 54.

⁵⁸For a detailed analysis of the different contributory schemes and the scope of measures covered by social security, see *Lei de Bases da Segurança Social* [Social Security Law], Law no. 4/2007 of 16 January 2007.

To recapitulate, in Portugal there are three parts to the social security system. The first is a contributory pension system based on a repartition system and on social contributions. The system has a surplus – it is the only budget in the overall national budget that has never been in deficit. The second is a non-contributory system designed after 1974-1975 mainly for peasants and domestic workers who had no social security benefits during the dictatorship. That fund had its origins in general taxation. The third is social protection, in principle intended to pay social benefits to impoverished and involuntarily unemployed workers. That fund, too, is financed from general taxation. Unemployment benefits are a statutory contribution, mandatory only for those on a permanent or fixed-term contract. However, some of the workers previously mentioned, including those on student grants, “green invoice” workers, and others, are trapped in forms of precarity and have no access to regular unemployment benefit. In April 2016 the official number of unemployed was 622,000, but just 250,000 received unemployment benefit.⁵⁹

The restructuring of employment, with increased precariousness, unemployment, and labour turnover took place at the same time as universal policies were replaced by targeted policies. After 1974, and during the 1980s, the welfare state was universal. The “unified education system” was free, from primary school to university, and the Portuguese national health service was entirely free for the entire population. Housing rents were “frozen”; by law, rents could not be increased for those tenancies that originated in the 1970s or 1980s. Moreover, such fixed-rent tenancies could be transferred to the tenants’ children. However, since the beginning of the 1990s there has been a major shift, with universal policies being replaced by focused ones. Free health care was now means tested, as was university education; and rents were liberalized after 2012-2013, with state subsidies only for those able to provide evidence of inability to pay. During the late 1980s and 1990s a range of unemployment assistance programmes were set up to supplement unemployment benefits. These included a minimum wage and “social unemployment benefit”. In theory, all of that should be covered by the tax system, but the contributory system, too, is having to pay for these programmes because the other funding systems are in permanent deficit. Furthermore, with the increase in precarity and unemployment the number of people in the contributory system and the level of their salaries are in dramatic decline. In 1988 the percentage of revenue accounted for by social security contributions was 88%; in 2000 it was 69.8%, and in 2012 35.1%.⁶⁰

Ana Elizabete Mota, a professor of social work, has ascertained that targeted assistance policies aimed at those affected by lower wages and unemployment tend to become more prevalent in the exact proportion to that by which the welfare state is curtailed, that is to say, they increase only where universal social solidarity is destroyed.⁶¹ Throughout the 1980s and 1990s the universal solidarity policies that assured the maintenance and training of the workforce were replaced by targeted policies that, while they ensured (biological) social reproduction, resulted in a subsequent fall in wages for all workers, contrary to initial intentions. Poverty and social inequality were the inevitable result. In the words of Pedro Hespanha, in this period the principle of “universality” was jeopardized.⁶² Figuratively speaking it amounts to “using parents’ wages to pay for their children’s unemployment”.

⁵⁹Diário de Notícias, 18 April 2016, available at: <http://www.dn.pt/dinheiro/interior/mais-de-372-mil-desempregados-sem-subsidio-em-marco-5131523.html>, last accessed 5 May 2016.

⁶⁰Pordata, “Contribuições no total das receitas da Segurança Social”, available at [http://www.pordata.pt/Portugal/Contribui%C3%A7%C3%B5es+no+total+das+receitas+da+Seguran%C3%A7a+Social+\(percentagem\)-765](http://www.pordata.pt/Portugal/Contribui%C3%A7%C3%B5es+no+total+das+receitas+da+Seguran%C3%A7a+Social+(percentagem)-765), last accessed 5 May 2016.

⁶¹Ana Elizabete Mota, *Cultura da Crise e Seguridade Social* (São Paulo, 1995).

⁶²Hespanha et al., *Entre o Estado e o Mercado*, cited in Fonseca, “Ideologia ou Economia?”, p. 80.

Van der Linden adds that “many of the social provisions adopted after the Second World War were not supported at the expense of capital. In 1950, the United Nations’ Economic Survey of Europe stated that ‘the whole of the social security system was funded by a huge redistribution of wealth within the working class.’”⁶³

5. CONCLUSION OF PART 2

Paradoxically, what had been a historical gain — universal social security won in the revolutionary biennium of 1974-1975 — became, from the end of the 1980s and for political reasons, a social cushion to fund unemployment and precarity. Beforehand, in order to shape these new labour relations, the family wage was legitimized and families took it upon themselves to support their children for longer periods. Then, social security resources, and pension funds in particular, were systematically put to use to follow up the regulation of labour market flexibility by providing support by means of unemployment benefits, subsidies to business, support for lay-offs, and assistance programmes.

Throughout the 1980s and 1990s, universal solidarity policies, which ensured the maintenance (health, social security, and housing) and training (education) of the workforce, were replaced by targeted policies in which only the working poor and unemployed had free access to the social welfare provided by the state.

The process might have left Portuguese society deeply wounded, inasmuch as it resulted in what we believe to be a case of “workforce eugenics”. Young people earning low wages see their social (and biological) reproduction being put in jeopardy while their experience of life as adult wage earners is delayed. Scenarios have been proposed centred on an increase in the average lifespan,⁶⁴ when in fact the pivotal question concerns labour relations. Portugal has an economically active population of roughly 5.5 million people, with 2.5 million pensioners, both contributory and non-contributory. However, because of the state of labour relations and employment conditions, that pyramid has been inverted and half the workforce — there are three million people unemployed or in precarious jobs — has become passive, making little or no material contribution to the economy. This labour market inversion has come about because the state has set up a social cushion, channelling social security funds in a multitude of ways, so that, on the one hand, business is supported while on the other unemployment and assistance-based programmes are enacted.

⁶³Marcel van der Linden, “Prefácio”, in Varela (ed.), *A Segurança Social é Sustentável*, p. 9.

⁶⁴The average life expectancy of those over sixty-five in Portugal is one of the lowest in Europe: seven or eight years less than in countries such as Denmark, Sweden, Ireland, and the United Kingdom. See Instituto Nacional de Estatística, “Esperança média de vida à nascença e esperança média de vida saudável à nascença”, available at: https://webcache.googleusercontent.com/search?q=cache:S4lXtL-7mcJ:https://www.ine.pt/ngt_server/attachfileu.jsp%3Flook_parentBoui=124268975%26att_display=n%26att_download=y+%&cd=2&hl=pt-PT&ct=clnk&gl=pt, last accessed on 12 February 2016.

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