Economically Sustainable Demography: Reversing Decline in Portuguese Peripheral Regions

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Abstract

This paper proposes an integrated demographic and economic model to forecast population change up to 2030 in depressed Portuguese Peripheral Regions (PPR), corresponding to 14 NUTS III regions, where population is declining and ageing. The ultimate goal of our study is to uncover policy strategies to revert these areas demographic decline.

The projections for PPR population changes depend both on population´s natural increase and net migration. The key idea of this modeling framework is the hypothesis that net migration (for population under 65 years) depends on employment, assuring the integration of the demographic and economic components of the model. Accordingly, we use regional IO models, considering a SAM-type frame (with two kinds of households: over and below 65 years) to project – under scenarios analysis – employment's progress in PPR. For this, our first (and perhaps major) task involves building the SAMs for these small PPR, as such data are not available in Portuguese official statistics. Then, the population below 65 final consumption is considered as endogenous to the SAMs. Finally, (what if) scenarios on future economic activity up to 2030 are implemented. This will be done through an iterative process where the employment flows generated in the SAM model are made consistent with the migrations estimated within the demographic model component.

Keywords: Input-Output, Small Regions, Inter-regional migrations, SAM, Demography.

Topic: 9_Applications of input-output tables.

1. Introduction

Demography has major implications on the economic course of nations or regions. On the one hand, the share of the working-age population on total population fixes the supply of disposable labor in the economies, and therefore, as far as this factor is not wastefully used, it also determines the national or regional products' level, e.g. their GDP. On the demand side of the economies, different population ageing structures imply different final demand composition, either regarding private consumption, or goods and services publicly provided, which in a significant part are a specific elderly people benefit. Of course, broadly speaking, both private preferences and public needs, at the national or regional level, depend on the population age.

Therefore, currently demographic trends are a major concern for social scientists and policy-makers. However, there are important differences in the way demography restraints the economy, at regional or national levels. It is true, for both levels, that, everything else being equal, a larger share of no-working aged population corresponds to a lower value of GDP *per capita*. However, the link between people's welfare and the GDP level is much weaker at the regional level. This happens because GDP equals income generation, but income redistribution, beyond production, is much more intense among regions, within the same country, than among countries in the international arena. As a result, the regions income *per capita* may be remarkably discrepant from their GDP *per capita*.

Retirement benefits render this argument a concrete form. For a country, ageing is a problem because young generations have to bear the retirement pensions benefiting elderly people, through taxes, that in some point of time they may not be willing to pay. For regions the problem is different - as social security systems are nation-wide, regions do not bear the cost of their own older generations. Thus, one region may afford the gains of an aged population if the other country regions are younger. Elder regions are transfers recipients, in the form of social benefits, proceeding from younger regions. These received transfers feed local demand, and may have positive indirect and induced effects on their economic activity.

Though demography does affect economy, the other way round is equally important. Population dynamics depends on natural change, that means on the birth and death rates, but migrations, having a crucial effect as well, are the principal element through which economy influences demography.

At the international level the relationship between the economy and the migration flows is mitigated by several factors. Migrations to other countries, even when legally allowed, are very often hazard choices. As a rule, international migrants have to deal with a different language, sometimes with deep cultural gaps, and maybe with the discomfort of unfriendly or even hostile hosts. On the other hand, national economies have their own effective policy tools – the exchange rate is an example – to deal with (transitory or permanent) economic shocks, which might undermine their competitiveness.

On the contrary, interregional migrations are much more benign and may there reach a disproportionate extent. Adaptation costs are much lower (language and culture should be similar), although some frictions may still last. Housing market inefficiencies, for instance, may remain as binding barriers. On the whole, however, mobility is expected to be significantly larger.

Furthermore, given the absence of an exchange rate device, regional migrations are actually the main adjustment mechanisms that regional economies dispose, when hit by economic shocks. Several models of the so-called "new economic geography" assign them this role, at least in the medium/long run (see, e.g., Overman et al., 2010). In the short run, government transfers (unemployment benefits, investment grants), private solidarity networks, and even interregional pro-profit capital flows may smooth the impacts of those shocks, and postpone the population shifts among regions. But, in the end, migrations must be the outcome of a regional economy relative success or failure.

The main purpose of this paper is to develop an integrated demographic and economic model, mainly suitable to small regions, which will be used to estimate employment and population changes, up to 2030, in depressed Portuguese Peripheral Regions (*PPR*). These correspond to 14 NUTS III regions (almost half of the 30 Portuguese NUTS III regions, but representing less than one fifth of the Portuguese population), where population has been abruptly shrinking since the middle 20th century. Naturally, the economic decline has been accompanying this demographic contraction.

Models combining demography and economy have been the focus of an expanding area on regional affairs literature. Lisenkova *et al.* (2010) and Kim and Hewings (2010) are two recent uppermost examples, although both assume demography as exogenous. Indeed, they rely on official estimates for population paths, on Scotland and American Midwest states, respectively, and insert these projections on the economic models. These are computable general equilibrium (CGE) models, where, as a first impact, population decline leads to a real wage increasing process. In Lisenkova *et al.* (2010) this wage increase drives a competitiveness loss that implies, *ceteris paribus*, a decrease in GDP *per capita*. Kim and Hewings (2010) assume that the wage increase effect may be offset by a human capital accumulation process, but nevertheless they anticipate a slight growth trend for the Midwest states. Contrarily, Park and Hewings (2007) admit a double causal interaction process between demography and economy, where the ageing process has an impact on wages, and these, on its turn, are able to attract in-migrants. However, the model proposed is a regional macro-growth model, lacking the detail of a multi-product approach. The focus of Yoon and Hewings (2006) is instead on the demand composition change, induced by the ageing process, but the demographic trend is again taken as exogenous. In Portugal, the opposite procedure, which makes demographic dynamics endogenous to economic growth, had already been adopted by Gaspar *et al.* (1989) in their pioneer forecast of the country evolution in the turn of the century.

Regarding the integrated model we propose, the goal is not chiefly the estimation of economic impacts of demographic changes or vice-versa, but the analysis of the co-evolution of production and population in PPR. It is worth mentioning that this paper is part of a wider project, titled DEMOSPIN[1], whose ultimate purpose is to uncover policy strategies to revert demographic decline in PPR. The model considers the assumption of “small open regional economies”, implying that PPR are price-takers

[1] DEMOSPIN is a research project funded by the Portuguese Foundation for Science and Technology (FCT PTDC/CS-DEM/100530/2008).

concerning their wage level. We assume instead a quantity effect running from employment to working-age population, which makes migrations endogenous. Moreover, our models are not CGE, but we confine our scope to input-output models with a social accounting matrix (SAM)-type frame. After a short description of the peculiar demographic behavior of PPR given in section 2, section 3 sets the main features of the DEMOSPIN models. They are described as two blocks integrated models where demography and economy interact, according to different scenarios on PPR future paths up to 2030. These scenarios are drawn contemplating demography and the region’s economic side. In section 4 some preliminary results are presented. Firstly considering the zero migrations assumption, for all age groups, from 2005 onward; then, considering several prospects for the demand addressed to the PPR. The employment consequences of these plots are analyzed, under the assumption that employment changes mean, at the regional level, migration incentives. Section 5 presents our main conclusions.

2. The demography of depressed *Portuguese Peripheral Regions*

This class of regions, that we named PPR, comprises 14 Portuguese NUTS III regions (Minho-Lima, Douro, Alto Trás-os-Montes, Pinhal Interior Norte, Dão-Lafões, Pinhal Interior Sul, Serra da Estrela, Beira Interior Norte, Beira Interior Sul, Cova da Beira, Alentejo Litoral, Alto Alentejo, Alentejo Central and Baixo Alentejo), that since the 1950s have been presenting a remarkably contrasting demographic behavior in relation to the rest of the country. These are mainly in-locked regions (located between the border with Spain and the most developed Portuguese regions of the coastal zone); however two coastal regions (Minho-Lima and Alentejo Litoral) were also considered as depressed PPR, because their demographic profiles present strong similarities with the ones of the interior regions. Figure 1 shows the mismatch extent, since 1950 to nowadays, of the demographic evolution for the two groups of regions: the peripheral regions (PPR) and the *Rest of Portugal*.

Figure 1 - PPR and Rest of Portugal Population (1950-2005)

In this period, although Portuguese population increased by 24.4%, PPR population shrunk, with a 30.8% decline in their number of inhabitants. Migration was the reason for this noticeable discrepancy. Indeed, in a massive move which started in the 1950s and accelerated in the 1960s, people from the PPR left their homes towards the coastal regions (where the industrial, business and political powers are concentrated), and to a large extent (mainly in the 1960s) they also migrated abroad. Actually, in this period, migration to other countries was predominantly illegal, although in fact largely tolerated. The resulting demographic plunge had indeed a double effect: on the one hand, the PPR population simply decreased, but on the other it aged sharply, as migrations were concentrated on the younger tiers of the Portuguese population.

In the 1970s, after the first oil shock and the Portuguese democratic revolution, migrations (at least the international ones) suddenly waned, but as oddly as it may seem, the population decline at the PPR stayed at the same pace. Natural decrease has become the main reason for this, because the population ageing process depressed birth rates and simultaneously increased death rates. Moreover, this process continued in the following years. According to Jacinto and Ramos (2010), which used the component equation method to estimate the migration flows in the inter-census period 1991-2001, although the PPR[2] population decreased 3.5%, there was a tiny but positive 0.7% *in*-migration rate, in these regions as a whole. The most recent official demographic estimations implicitly extend this trend (however only later this year, when the 2011-Census results will be made available, the trend may be confirmed).

Figure 2, also based on Jacinto and Ramos (2010) work, shows the PPR age profile regarding net migrations, in the last known inter-census period (1991-2001).

Figure 2 - Net Migrations from/to PPR, by gender and age groups

It is remarkable that PPR were still subject to wide *out*-migration flows regarding young people (mainly the groups between 20 and 34 years old), though

[2] It is important to note that Jacinto and Ramos (2010) focused only on the 12 inland NUTS III regions, therefore excluding Minho-Lima and Alentejo Litoral (i.e. the two coastal regions that we also classified as PPR in this paper).

compensated by the *in*-migration of older people (over 35 years old). Although, in Portugal, we still lack sound studies on this matter, the likely reason for this profile may consist, in a significant part, of former migrants' return. Moreover, it is worth to remark that part of these migrants may still be returning during their working-age life. This might be interpreted as a possible sign of migration failures, but we may also embrace a more stimulating view. In fact, De la Roca and Puga (2010), in a study for Spanish urban zones, argue that the agglomeration economies private premium, grasped by the workers, may be partially mobile, and therefore it can be kept, to some extent, when people move out from the dense cities, or return, as in the Portuguese case, to their original towns. The migration age profile, observed for the PPR, also brings out important shortcomings regarding their demographic prospects. Truly, though *in*-migration carry on in these regions, the ageing process is still enduring, and therefore the natural imbalance is likely to magnify, implying the ongoing natural population drainage. On the other hand, as the peak of PPR *out*-migration occurred in the 1960s, the future sustainability of the *in*-migration process of elderly people might be questioned, as this partially derives of former *out*-migrants return. In fact, we must recognize that the phenomenon may have already ceased after the 2001 Census, although this is still not reflected in official extrapolations.

The detailed analysis of the observed migration patterns in PPR and the construction of models linking such patterns with the future evolution of productive capacity are the main objectives of DEMOSPIN project and will be addressed in the following section.

3. The DEMOSPIN proposed models: main features

The DEMOSPIN proposal consists of different kinds of models that are in fact different ways of combining two main building blocks: the demographic and the economic blocks.

Model 1, which is, so far, more advanced in our work, starts with exogenous demand growth scenarios and exogenous migrations of elderly population, over 65 years old (which generate a demand change as well). These assumptions on future exogenous demand are then inserted in regional SAM-type models, in such a way that they determine the evolution of production and employment. The population necessary to generate such employment is an endogenous result which, in turn, when compared with the demographic forecast assuming zero migrations, gives the migration flows of working age population.

Model 1 main idea, as for the nexus between the demographic and economic components, is to rely on a dynamic overlapping generations model. This means that when a disturbance occurs in a region *r* in period *t*, there is an effect on regional production and employment, which may induce net *in* or *out*-migration of population less than 65 years old. Population over 65 is contemporaneously exogenous. However, as population below 65 changes in period *t*, this therefore induces changes in the estimates for population over 65, for periods *t+1*, *t+2*, up to 2030, provided by the model demographic component. These new forecasts feed, of course, our economic predictions for those last periods.

Model 2 assumes that regional dynamics are driven by population growth and thus starts with demographic forecasts, according to different scenarios, which in turn determine the amount of production necessary to generate the employment which fits the job needs of working age population. In other words, the model, reversing the typical causal links of input-output models, calculates the implicit external and internal demand which is necessary to generate the volume of employment required by demographic dynamics.

A realistic growth model is certainly somewhere between the extreme economic and demographic driven models. However, we think that the analysis of the future states of the world generated by the two above models can provide a rich set of information, necessary to inform PPR development policies, and are an essential pre-requisite to the development of a model where growth is simultaneously driven by demographic and economic dynamics which mutually interact.

After this overall description of the DEMOSPIN models it is now time for a short presentation of the two building blocks and then of the results obtained so far.

3.1 The Demographic Block

The main element of this block is population estimation, for each PPR, under the assumption of zero migrations (closed population estimates). This was done using a cohort survival methodology and starting with the population given by 2001 Census, separated by 5 years age groups and gender. Up to 2009 the method uses the births and deaths by age groups and gender, provided yearly by the National Statistics Institute while, from 2009 up to 2030, death and birth rates estimates were used.

To closed population estimates different net migration values are added, according to several scenarios. When the demand driven model is used, such scenarios correspond to different hypotheses concerning the evolution of demand and productivity. Such hypotheses determine different employment figures and then different values of migration necessary to balance working age population with available jobs. This balance and the corresponding results of economic dynamics are calculated every five years, starting in 2005.

Given the total amount of net migration, generated by employment dynamics, it is necessary to distribute it among the different age groups of population in working age (5 years groups, by gender, between 20 and 65 years). For this, we estimate the following regression model, using net migration flows for the period 1991 to 2001, calculated by the method explained in section 2:

$$M_{ni}^{5} = A + a_1 P_{ni}^{5} + a_2 GDP_i + a_3 DP_i + a_4 M_i + \varepsilon_i \qquad \textbf{(1)}$$

where, for each region *i*:

M_{ni}^{5} is the net migration of population of the age group between *n* and *n+5* years, expressed as a fraction of the region total population in 1991;

GDP_i is the *per capita* GDP;

DP_i is the demographic potential $DP_i = \sum \frac{P_j}{d_{ij}}$ where P_j is the population of region *j* (the potential of each region *i* was calculated in relation to all Portuguese NUTS III regions) and d_{ij} is the distance between regions *i* and *j*;

M_i is the total net migration of population between 20 and 65 years, expressed as a fraction of the region total population in 1991;

ε_i is the error term.

GDP and *DP* are expressed as a fraction of the Portuguese average figures. Moreover, the set of equations must be estimated simultaneously under the condition: $\sum M_{ni}^{5} = M_i$.

The net migration of population under 20 years old is then calculated as a function of the net migration of their parents, while net migration of population over 65 is exogenously given, by different scenarios.

As for model 2 population growth is taken as exogenous. Therefore, various scenarios can be analyzed, in particular that of a demographic sustainable population. This means a population with a steady state growth and a demographic pyramid with a constant shape. For instance, a population with a steady state zero growth has a fertility rate of about 2.1 children per woman and a demographic pyramid which tends to a cylinder shape. The demographic pyramids of PPR are quite different, because they lack a substantial amount of younger and middle age population. Therefore, in order to reach a sustainable situation before the time horizon of 2030, PPR need to absorb a significant number of *in*-migrates, which can be calculated along with the amount of employment needed to attract such migrations.

3.2 The Economic Block

The economic block consists of social accounting matrixes (SAMs), one for each of the 14 depressed PPR where our analysis focuses on. We must emphasize that such kind of data is not available in Portuguese official statistics. Thus, a major task of the DEMOSPIN project, underlying the results depicted in this paper, was to derive these SAMs for the 14 PPR, taking as a starting point the Portuguese national input-output table, for the year 2005. However, the discussion of the methodology adopted in the regionalization of the Portuguese national input-output table is beyond the scope of this paper. A draft description of the principles and methods adopted with such purpose may be seen in Ramos *et al.* (2010).

An important feature of the derived regional SAMs is the consideration of two households groups: those headed by a person with more than 65 years old, and the other by somebody less than 65 years old. We have used detailed information from an official source (the Household Budget Survey, carried out by the Portuguese National Statistical Institute) to 2005-2006, in order to split the private consumption vector (comprising 59 groups of different products) into two sub-vectors for the two households groups. Accordingly, this model addresses the issue of consumption composition change, following the ageing process.

The integrated model's economic block set apart different assumptions to estimate, for each household group, the corresponding (implicit) size, as well as its path over time. A key idea of this modeling framework is that there is a close connection between employment shifts, which depend on the economic structure mutation, and the (net) migrations for population under 65 years. Whether economic growth drive migrations or demographic dynamics drive economy depends on each of the two models we are developing. In any case, elderly people migrations are assumed to be exogenous to the economy, and then the number of households belonging to that group is settled out of the model's economic block. Indeed, throughout this paper we do not consider any scenario where this elderly people group migrations were incorporated .

In the particular case of the demand-driven model where demography is endogenous (model 1), the private consumption estimation procedure for both households groups is based on the following consistent hypotheses. First, the private consumption of households below 65 is supposed to be endogenous, as it depends on regional employment and therefore on households' earnings (labor compensations and mixed income) that result from the local production process. Of course, this group's private consumption depends on the economic activity and simultaneously determines the regional economic variables, including the regional production level. Second, *per capita* consumption of households over 65 is settled exogenously, as part of the different scenarios designed (to be explained ahead) for the future economic activity. With regard to the group weight, this depends on the demographic block output (rather than on the level of economic activity).

In the model were demography is exogenous (model 2), the key element is the determination of the total output and of the vector of final demand which gives an amount of employment consistent with the working age population. It is possible to split demand in internal and external components and thus to derive conclusions about the necessary *in* or *out*-migration of firms in different sectors in order to satisfy such demands.

Another important hypothesis endorsed in the model's economic block is the so-called "small open regional economy" assumption. This hypothesis fits well with our PPR, as the larger among them reaches 287 thousands inhabitants, meaning only 2.7% of the Portuguese population. The "small open regional economy" principle means that our regional economies may be hit, either by internal or external shocks, but the local impact of these shocks is relatively narrow, as a significant part of the stimuli leak to the rest of the national economy (or even to abroad), mainly to the coastal regions, where the core of the Portuguese economy is placed. It is also relevant to note that, although a regional shock in a small open economy may have a residual effect on the rest of the country, we neglect any feedback effect of that impact on the region where the shock originally happened.

4. Some preliminary results

This section presents some preliminary results, that however, in what concerns model 1, have not yet been produced through the dynamic procedure previously described, as some critical procedures such as the split of net migrations by gender and age groups is still going on, preventing, at this stage, the dynamic overlapping generations model closure. Actually the results we have produced are the outcome of a static approach where:

- On the one hand, the population from 2005 on, until 2030, is extrapolated under the "zero migrations" hypothesis, and the economic impact of that population's decline is broadly traced (model 2 type approach);
- On the other hand, several (*what if*) scenarios on future final demand addressed to PPR are considered, with the purpose of estimating these regions likely levels of demand-driven employment (and population) up to 2030 (model 1 type

approach). These estimates were based on an assumption of perfectly elastic labor supply, or, in other words, we assume frictionless movements of population below 65, insofar that the requested levels of employment are accomplished in every region.

4.1. Demographic projections and economic prospects up to 2030

Table 1 depicts our estimates regarding the population variation rate, up to 2030, at the 14 PPR and at the *Rest of Portugal*, under the assumption of zero migrations in every age group. We also present the estimates for the following three critical age groups: less than 20 years old, between 20 and 64 (conventionally assumed as the working-age population), and over 65. Our estimations for GDP annual average growth rates, up to 2030, implied by these demographic trends, are also shown in Table 1.

It is important to note that these estimates on GDP growth were obtained assuming:

- That employment declining rate equals, in each region, the 20-64 years old population decrease.
- That this decline in employment is distributed, by the regional economies branches, according with an inverse proportion rule with the productivity growth (e. g., the decline is sharper where the productivity growth is steeper).
- The same standard hypotheses on productivity growth that will underlie the scenarios to be considered in sub-section 4.2, namely: a 2% annual increase in the Primary sector, in the Power Sector and in the Industry's productivity; a mild increase in Services' productivity, specifically 0.53% (this is, in fact, the historic trend of this sector, for the national economy as a whole, for the 1995-2005 period), and the same productivity growth for Construction[3].

[3] The rational for these hypotheses is as follows: productivity in the primary sector (including agriculture) stagnated in the period 1995-2005, but we rejected any extrapolation of this occurrence, as it points against the long run trend of agriculture's productivity in Portugal, which beginning in 1953 recorded a faster growth than the average. On the other hand, industry productivity grew almost 3% in the 1995-2005 period (and the power supply industry more than 5%), but we decided again not to support these trends onward, opting rather by a standard 2% productivity growth for all these sectors. Conversely, construction's productivity growth was slightly negative in this period, but we decided again not to prop this trend, opting instead by the same productivity growth than in services.

Table 1 - PPR and the Rest of Portugal projected population and average GDP growth rates: 2005-2030

The most striking point of these estimates is that PPR population is going to continue decreasing, even considering that migrations cease at all. This will happen, as well, in the remaining regions (*Rest of Portugal*), but at a more moderate pace. The decreasing population is certainly the outcome of the regions ageing profile, which in PPR leads to a serious natural imbalance, with very low birth rates and high death rates.

At the same time that their populations decrease, the PPR will continue to age as well pulling in a clear vicious circle. The decline in the population group below 20 years is expected to be severe, in fact much harsher than in the remaining regions. Regarding population over 65, the increase will go on, in such a way that we expect an 18.5% decline in the *PPR* working-age population (beyond their 16% decay in total population).

Figure 3 compares *PPR* and the *Rest of Portugal* population ageing structure foreseen, in 2005 and in 2030.

Figure 3 - PPR and the Rest of Portugal Age Population Structure, 2005 and 2030

It is patent that the working-age population reduces, in relative terms, in both regions, thought it remains lower in the *PPR* group.

As a result of the deeper decline in working-age population in comparison with the one for total population in the *PPR*, these regions' GDP *per capita* must decrease, unless this gap is filled by appropriate growth in productivity. On the contrary, assuming an upward move in productivity (as it is our case) an average growth is expected for all the regions except Alentejo Litoral (as the last column in Table 1 discloses), although at a very low pace. Nevertheless, as population declines GDP *per capita* growth looks more sensible.

There is another worrying and unexpected fact depicted in Table 1: although we estimate that population over 65 will grow in the *PPR*, as a whole, this growth rate is now going to be much slower than in the remaining regions. Indeed, some of these regions (7 out of 14) will probably experience a population loss, even in this group of elderly people. This happens because todays' middle-age population (let us say between 40 and 65) was already very scarce even in 2005.

Paradoxically, this may be a problem for some of these regions, as their economies are very dependent on their elderly people expenditure. Table 2 provides some interesting information on this matter.

Table 2 - How important are elderly people for PPR economies?
Weight and estimated impacts of their consumption, in 2005

The elderly people impacts depicted in Table 2 refer to 2005 and have been estimated through our SAM-type models, which make up the economic blocks of our integrated regional models. It is interesting to note that the impacts on local Gross Values Added (GVA) are relatively moderate, comparing with the weight of this age group private consumption in the aggregate. The very reason for these mild impacts is our "small open regional economy" assumption, allowing for a significant part of that old people private consumption to be imported from other regions of the country, or even from abroad. Total impacts include, beyond direct impacts, what in the jargon is known by indirect and induced effects. This means that inter-industry relationships and the effects on income and consumption of the employed people (below 65) are taken into account. Actually, the impacts of consumption related to the elderly people (over 65) only reach a significant magnitude when publicly provided goods and services are added[4]. This happens because, except for residual cases, all these products have to be locally produced. Thus, as seen in Table 2 last column, when private and public consumptions are mingled, these expenditures all together account for more than a quarter of local GVA in several *PPR*.

[4] As we were not able to find an obvious criterion for allocating this expenditure by the two household groups (over and below 65), we have used simply the population weights.

4.2. Demand-driven employment reduction: scenarios analysis to 2030

The following results proceed from a different approach of the one devised in the previous sub-section. Indeed, in 4.1, we estimated the *PPR* population under the zero migrations hypothesis and we looked at the seeming economic outcome of their population slide. In this section, our purpose is to foresee the economy, assuming several different scenarios, and then look at the employment prospects in those *PPR*. The employment course is actually considered to determine their population.

We have dealt with six different scenarios, as described ahead. The changes regarded in these scenarios are the only shifts considered for the *PPR* economies, all the rest being assumed the same – in real terms – than in 2005. It is important to stress that our aim is not to guess how the *PPR* future will be, but rather to estimate the potential impacts, mainly on employment, of a few trends that will likely govern those economies.

Scenario I focuses on the economic impact on *PPR* of the growth (or decrease) in the number of elderly headed households, whose consumption is assumed to be independent from the very course of the regional economies. This effect is taken alone is this scenario, in such a way that when the number of elderly households increases (or diminishes), private consumption and local production expand (contract).

Scenario II adds to scenario I the assumptions on the productivity paths for the different economic sectors, already referred above: an average annual productivity increase of 2% for the primary sector, as well as for the industry and power sectors; and a more modest annual productivity growth (0.53%) for services and for the construction sector. At the same time, we also introduced, as a counterweight, an assumption of 1% growth in the exogenous final demand addressed to the *PPR* economies. The exogenous final demand comprises international and inter-regional exports, investment, general government and non-profit institutions consumption expenditure, tourists' consumption, and yet the consumption of elderly households, whose heads exceed our 65 years threshold (in this latter case, only per capita consumption is supposed to increase 1%, as the total depends as well on the number of households, as in scenario I). As for other households' consumption, (with less than 65 years old) this is deemed to be endogenous, as we explained before, depending on the production founded income.

It is relevant to note that a critical issue in scenario II is the fact that we assume that productivity gains do not influence income distribution, whose relative shares (for employees, own account producers, and other non-labor factors) are made invariant. Then, scenario III is similar to scenario II, except for this last hypothesis. Indeed, in scenario III is assumed that employees cannot keep their gains on labor productivity (even when they are imputable to their contribution), but only succeed in keeping their average compensation constant in real terms. Instead, productivity gains spill over to their employers, which then become the great beneficiaries of this process. This a sensible hypothesis in regional analysis, because when the gains remain in employees' hands, then as a rule these are spent in the same region where they come forth, and so feed the local economy. Otherwise, when they accrue the employers' profits there is no reason for assuming that these will result into additional regional expenditure (and thus generate more local production).

Scenario IV goes on with the same hypotheses than scenario III, but now assuming that contingently some of the products produced in *PPR* become obsoletes. The products for which such possibility is raised are: textiles and clothing; leather and other leather products; wood and cork products; fabricated metal products, except machinery and equipments; and furniture. In this scenario, obsolescence is deemed only to affect international competitiveness, so it materializes in an assumption of a negative annual growth rate of -0.5% in those products international exports, instead of the 1% increase that is regularly assumed for the final demand.

Scenario V extends the idea of scenario IV to inter-regional exports. Hence, besides the growth rate of -0.5% for international exports, it is assumed as well a nil growth (in real terms) in inter-regional exports for the same kind of (obsolete) products.

Finally, scenario VI considers that when population is declining in one region, the general government must comply with this decrease, restraining its consumption expenditure in such region. This means that the 1% average growth hypothesis for the exogenous final demand, regardless how sound it seems to remaining demand, may not be emulated by the government expenditure in *PPR*. In this scenario, we decided instead to postulate that general government freezes (in real terms) its expenditure in *PPR*, in response to population contractions that hit these regions. This hypothesis is cumulative with the ones included in scenario IV, but the constancy of inter-regional exports supposed in scenario V is discarded.

Table 3 shows the employment's change outcome of these sets of assumptions, gathered under the six scenarios. Results are displayed for the 14 *PPR* handled in this study.

Table 3 - What is the impact on employment of a foreseen demand contraction? Estimates under several scenarios up to 2030

Several conclusions may be put forward from these estimates:

- Scenario VI is the one that may actually hurt employment in *PPR*. This confirms these regions strong general government dependence. Really, if this sector, by budgetary or other reasons, 'retreat' from these regions, then *PPR* employment (and therefore their population) can be seriously hit.
- Income distribution may matter as well: the impact of productivity growth on employment is clearly distinct according with the assumption we held on regarding productivity gains distribution (as can be understood opposing the results for scenarios II and III).
- Some products' likely obsolescence, on the contrary, seems to have a mitigated effect on employment, particularly when such impact is confined to international exports; the reason is that these fragile economies are, even now, low dependent on exports; of course, this effect is magnified when it reaches inter-regional exports as well.

Finally, it is worth to note that an interesting, and somewhat surprising, result of this trial is that there is room for *in*-migration towards the depressed *PPR* (mainly located in the country's interior). Indeed, even under the most pessimistic scenarios on future demand, the resulting employment "destruction" seems to be markedly smoother than the reduction on working-age population that demographic trends foresee (on the zero migrations hypothesis).

5. Main conclusions

This essay main conclusion is that the demand-driven contraction in employment, in the *PPR*, is relatively gentle in comparison with the demographic prospects for these regions. Demography (and not the economy) seems to be the prime problem. Even if migrations cease at all from 2005 onwards, the working-age population in the *PPR* is likely to shrink, as a result of their adverse age profiles. In fact, we estimated an 18.5% contraction on total working-age population for the 14 *PPR* (see Table 2). Moreover, this shrinkage may outpace the estimated employment decline (even in the most pessimistic economic scenarios), which may not exceed 11.5% for the *PPR* as a whole (Table 3).

Thus, we are able to say that there is some room for *in*-migration in the depressed *PPR* we focused on. The point is, of course, how these regions can become attractive for the *in*-migrants. True, some *in*-migration has already taken place in the past, but we speculated that it refers, to a large extent, to former migrants' return, that is deemed not to go on. So, regarding new *in*-migrants, how can those regions become attractive? The first and the most prominent answer, is that jobs supply, itself, is the attraction factor. Actually, this is the very mechanism that underlies our integrated model in its demand-driven version. Jobs vacancies may still swell, in *PPR*, if the government keeps up with its support to these regions, allowing for a fair growth on its provision of public consumption goods and services (progressing in a close pace with the general economy). The promotion of a fair income distribution in the afterward of productivity increases is another way of enhancing jobs availability.

Other factors, however, may also play a significant role in *PPR* attractiveness. Amenities and the perceived quality of life are (beyond any doubt) among those factors. In particular, youth oriented quality of life has to be in a high priority, with the purpose of regenerating the *PPR* demographic age profile.

Acknowledgements

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Tables:

Table 1

	Popul. Total Growth Rate	Pop. < 20 Total Growth Rate	Pop. > 65 Total Growth Rate	Pop.20-64 Total Growth Rate	GDP Annual Average Growth Rate up to 2030
Minho-Lima	-13.3%	-38.2%	16.6%	-15.9%	0.42%
Douro	-14.7%	-42.4%	13.8%	-15.6%	0.50%
Alto T.-os-Montes	-18.6%	-42.9%	9.6%	-23.5%	0.16%
Pinhal Int. Norte	-17.2%	-38.0%	-1.9%	-16.8%	0.44%
Dão-Lafões	-9.7%	-38.9%	29.3%	-13.4%	0.62%
Pinhal Int. Sul	-25.9%	-37.6%	-24.3%	-23.0%	0.31%
Serra da Estrela	-22.4%	-42.6%	-6.8%	-23.0%	0.10%
Beira Int. Norte	-19.6%	-42.1%	-3.9%	-19.8%	0.35%
Beira Int. Sul	-22.3%	-34.3%	-12.6%	-23.7%	0.10%
Cova da Beira	-16.2%	-40.8%	17.0%	-21.5%	0.23%
Alentejo Litoral	-14.9%	-19.5%	12.5%	-24.7%	-0.26%
Alto Alentejo	-20.7%	-31.9%	-13.4%	-20.6%	0.01%
Alentejo. Central	-14.6%	-27.2%	1.4%	-17.0%	0.13%
Baixo Alentejo	-17.7%	-22.2%	-11.5%	-19.1%	0.05%
PPR	**-16.0%**	**-36.4%**	**5.9%**	**-18.5%**	**0.26%**
Rest of Portugal	**-5.4%**	**-25.7%**	**50.5%**	**-12.7%**	**0.26%**

PPR and the Rest of Portugal projected population
and average GDP growth rates: 2005-2030

Source: Project DEMOSPIN

Table 2

	Weight of >65 private consumption on regional GVA	Direct impact of >65 private consumption on regional GVA	Total impact of >65 private consumption on regional GVA	Total impact of >65 related (private and public) consumption on regional GVA
Minho-Lima	13.00%	6.57%	9.63%	21.53%
Douro	11.26%	5.68%	8.10%	20.94%
Alto T-os-Montes	13.63%	6.84%	9.89%	26.36%
Pinhal I. Norte	12.21%	6.17%	8.89%	21.54%
Dão-Lafões	11.35%	5.95%	8.60%	18.83%
Pinhal I. Sul	12.28%	6.10%	8.38%	25.24%
Serra da Estrela	11.49%	5.71%	8.08%	23.14%
Beira I. Norte	14.56%	7.42%	10.50%	26.90%
Beira I. Sul	15.66%	8.11%	11.59%	28.18%
Cova da Beira	14.10%	7.29%	10.71%	23.67%
Alent. Litoral	8.75%	4.49%	6.29%	14.14%
Alto Alentejo	13.93%	7.23%	10.15%	26.43%
Alent. Central	13.89%	7.21%	10.29%	24.33%
Baixo Alentejo	12.51%	6.46%	9.22%	23.62%
PPR	**12.58%**	**6.44%**	**9.23%**	**22.51%**

How important are elderly people for PPR economies?
Weight and estimated impacts of their consumption, in 2005

Source: Project DEMOSPIN

Table 3

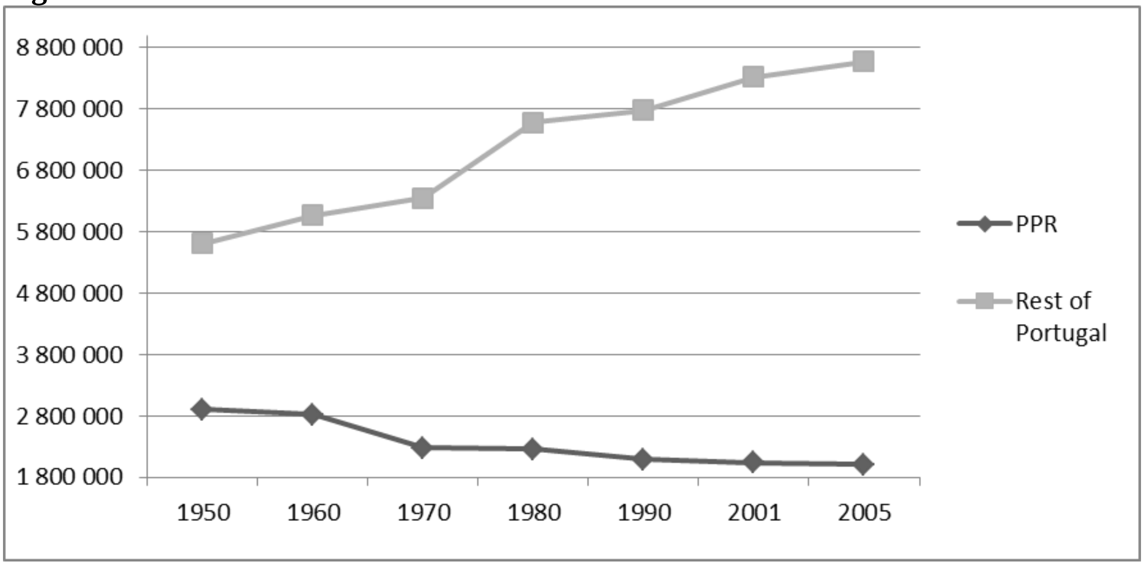
	Scenarios					
	S I	S II	S III	S IV	S V	S VI
Minho-Lima	0,68%	-2,01%	-5,13%	-6,30%	-7,19%	-11,20%
Douro	0,47%	-3,85%	-5,93%	-5,99%	-6,16%	-11,31%
Alto T-os-Montes	0,41%	-4,92%	-7,04%	-7,16%	-7,36%	-13,12%
Pinhal I. Norte	-0,14%	-4,31%	-7,00%	-7,94%	-10,13%	-13,33%
Dão-Lafões	0,93%	-3,71%	-6,12%	-7,45%	-7,93%	-11,56%
Pinhal I. Sul	-0,85%	-9,08%	-10,51%	-11,27%	-12,27%	-16,12%
Serra da Estrela	-0,27%	-3,44%	-5,86%	-6,60%	-9,01%	-12,99%
Beira I. Norte	-0,14%	-5,70%	-7,55%	-7,84%	-8,54%	-12,61%
Beira I. Sul	-0,60%	-4,79%	-6,94%	-7,59%	-7,99%	-13,07%
Cova da Beira	0,73%	-4,17%	-7,08%	-8,50%	-10,20%	-13,58%
Alent. Litoral	0,60%	4,44%	1,19%	1,16%	0,52%	-5,40%
Alto Alentejo	-0,76%	1,27%	-1,70%	-1,93%	-2,61%	-9,70%
Alent. Central	0,08%	3,37%	0,05%	-0,17%	-0,84%	-7,78%
Baixo Alentejo	-0,68%	2,14%	-0,99%	-1,04%	-1,27%	-9,65%
PPR	**0,24%**	**-2,61%**	**-5,17%**	**-5,80%**	**-6,52%**	**-11,43%**

What is the impact on employment of a foreseen demand contraction?
Estimates under several scenarios up to 2030

Source: Project DEMOSPIN

Figures:

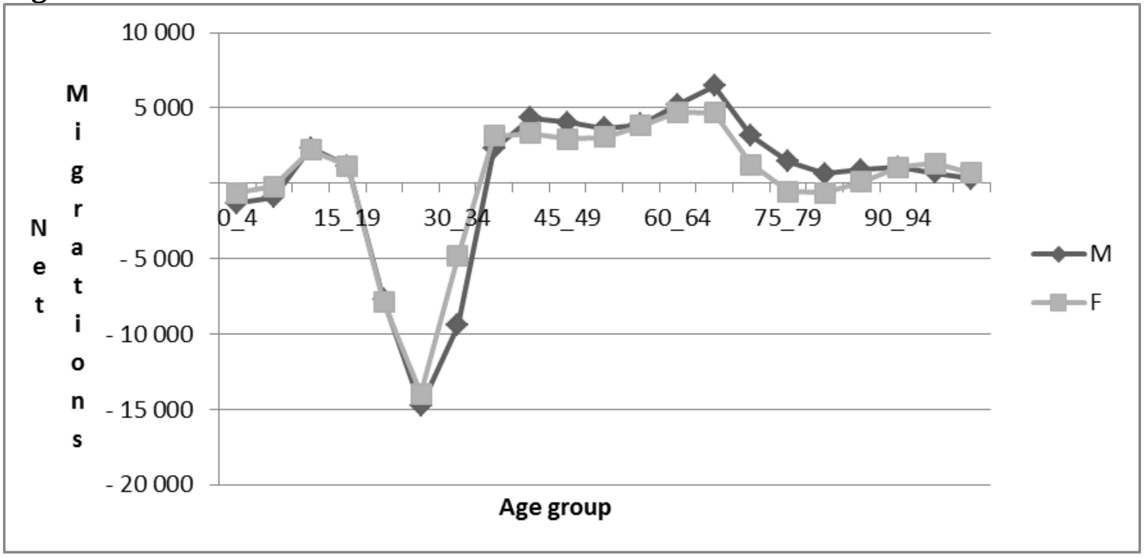
Figure 1



PPR and Rest of Portugal Population (1950-2005)

Source: Portuguese National Statistical Institute

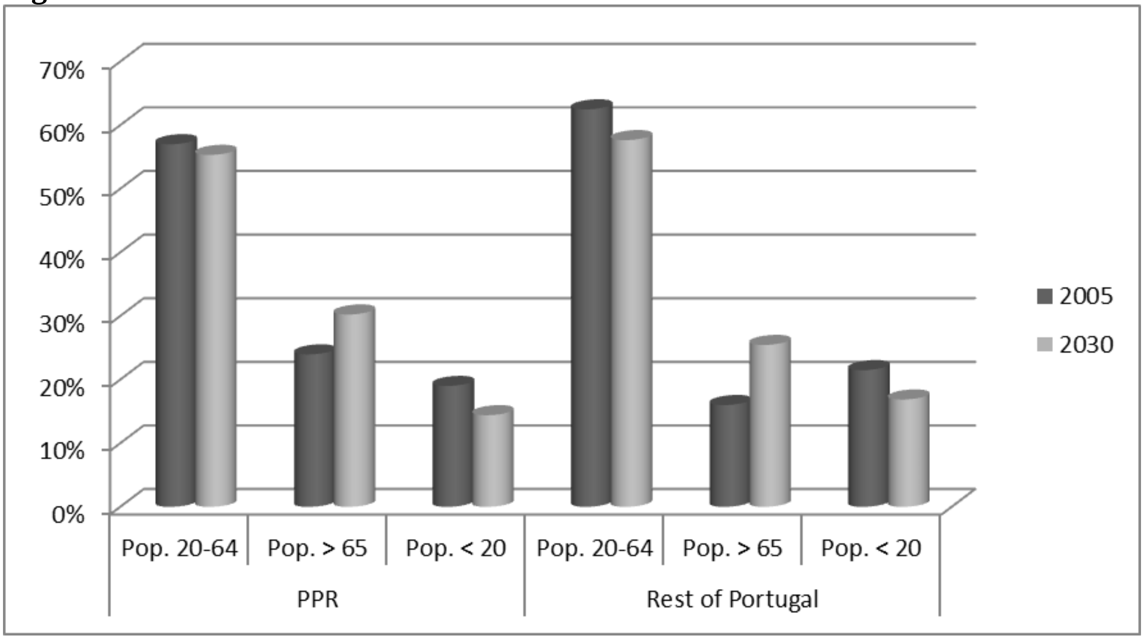
Figure 2



Net Migrations from/to PPR, by gender and age groups

Source: Jacinto and Ramos (2010)

Figure 3



PPR and the Rest of Portugal Age Population Structure, 2005 and 2030

Source: Project DEMOSPIN