Implications of Alternative Economic Growth Scenarios for Long-term Trends in Immigration and the Autochthon-allochthon Mix of the Population[*]

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Recent long-term labour force projections (Burniaux et al. 2003, Feld 2005, Carone 2005 and Bijak et al. 2008) show that Western Europe is heading towards a decline in labour supply. For most of these countries, the labour force is projected to continue to increase up to a date. After peaking, a decline is projected to set in, persisting as a rule through the end of the projection period, normally the year 2050 or thereabout. According to Carone (2005), all but two EU15 nations will see their labour force reaching a maximum, typically during the next decade, then falling; Sweden and the small Luxembourg will not experience a decline before 2050. Eleven of the other 13 nations are projected to reach the lowest level at mid-century. Among these are the four largest economies, including Germany and Italy that are set, according to this study, to lose close to one-fifth of the peak-level labour force by the mid-century. France and the UK may lose only 3 per cent and 6 per cent, respectively. In sum, the decline is projected for many, however, its magnitude varies a lot.

The decline is charted in spite of the fact that the labour force participation rates underpinning the projections are assumed – where this is still feasible – to rise over time towards high levels, thereafter remaining fixed. Moreover, the population projections behind the labour force projections rest on assumptions of positive net migration. This is the case irrespective of the source of the population projections used – Eurostat, the United Nations or other. For example, a variant of the Eurostat 2004 projections used in Carone (2005) rests on the assumptions that Germany and Italy will experience net migration until 2050 of over 10 millions and more than 7 millions, respectively. The labour force decline is driven by the projected contraction of the working-age population, which, due to the assumed increase in the participation rates typically sets in earlier than the onset of the labour force fall.

The authors of the projections are cautious about drawing the conclusion that the labour supply contraction will spell labour shortages and fuel immigration. Thus, Feld (2005), who considers only the first quarter of the present century, appear to be of the opinion that comprehensive mobilisation of unused labour reserves will help avert labour shortages. As regards foreign labour, "[l]ocally and selectively, migratory flows can make a contribution to this mobilisation by providing labour market flexibility, particularly in sectors where foreign labour and native labour to a great extent complement each other". The point that "migrant workers flows are, generally speaking, only very marginal to the receiving countries' labour force as a whole" appears to miss

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the very fact that, in the case of countries such as Germany, very large population gains due to migration are built into the labour force projections. For Carone (2005), prospective labour shortages are a mute point. This study, which also projects employment, concludes that employment like the labour force will contract and that economic growth will slow down.

McDonald and Kippen (2001) take a different tack. Their labour force scenarios for 16 OECD countries through the middle of the century led them to question the benign nature of the projected labour supply contraction. "While virtues of a slowdown in economic activity are often praised, the more likely outcome is that countries with falling labour supplies will not fare well", compared to the US which will continue to growth due to its more favourable future labour supply situation. As regards some large European economies – France, Great Britain, Germany and the Netherlands – "significant growth could only be achieved through levels of immigration that are well beyond the present experience of these countries". It appears that the authors tilt towards the position that long-term economic slowdown or decline may be too high a price to pay and that the way out would be immigration levels sufficient to avoid them.

Carone (2005) shows that the contraction of the working-age population is part of an overall demographic decline that is charted to spread through Western Europe approximately as of 2020. The population decline is anticipated to occur alongside the continued gains due to international migration. Lost to the population projection exercises alluded to here is the implicit conclusion that as Western Europe approaches a demographic decline, it is beginning to witness a sustained long-term replacement of its native peoples by foreigners. The extent of the replacement will vary a great deal. Countries that receive large numbers of foreigners and experience a rapid decline of the natives will see the swiftest shift in what we call in this paper the autochthon-allochthon mix of the population.[1]

After having reviewed a set of population projections, Colman (2006) recently concluded that the replacement of natives by foreigners might well be Europe's future. The projections made for seven West European countries – Austria, Denmark, Germany, Great Britain, Netherlands, Norway and Sweden – along with the US, distinguish foreign-origin populations of those countries. The key conclusion of the review is that "the countries … can expect the proportion of the future total population of foreign origin to grow to a much higher level than today". Moreover, "[w]ithin that total, the proportion of Western origin diminishes over time, as higher projected rates of immigration and fertility shift the balance in favour of non-European populations."

According to a similar position, immigration to Europe will probably remain high and that process, in combination with depopulation "… would entail a fundamental transformation in the ethnic composition of the population …" (Demeny 2003).

[1] We use the terms, autochthon and allochthon following Cliquet (1993), who wrote that "[i]n Webster's dictionary autochthon is defined as original inhabitants of a region, whereas allochthon refers to people of foreign origin".

This paper addresses the twin issue of immigration driven by the need for foreign labour and its consequences for the change in the autochthon-allochthon mix. Its approach differs from the one usually employed in making population and labour force projections. In the approach used here, immigration is not one of the projection inputs. Rather, it is an outcome of assumed economic changes, as is, by implication, the proportion allochthon, a measure of the mix. We do not model non-European immigration separately. Consequently, its effect on the "cultural patrimony" (Demeny 2003) or "ancestry" (Coleman 2006) of the immigration countries is not part of the analysis.

The paper rests on the following premises. Economy expands at a set rate. Labour shortages cannot slow it down, as any potential shortage is readily eased. The labour shortfall, the size of which party dependents on an exogenously fixed productivity change is averted by means of immigration. In brief, underpinning the changes in immigration and indirectly, the proportion allochthon are, inter alia, assumptions on the future growth of GDP and average labour productivity. We take these premises as a point of departure in spite of their contentious nature. They permit us to explore economic growth implications for immigration and the change in the autochthon-allochthon mix. This is not at variance with the fact that future economic growth – its pace and features – may need to adapt to the native labour force change, if mass immigration proves untenable.

The paper provides answers to the following two key questions. First, how large immigration flows would be required to offset future labour shortages if economic growth were sustained. Second, how significant would be increases in the proportion allochthon resulting from those flows? Note that while addressing the questions, we allow for different patterns of sustained growth, resulting in different rates of employment expansion. The paper also responds to two subsidiary questions. First, does the employment participation of allochthons, which is on a par with, rather than inferior to the employment participation of autochthons moderate immigration and the rise in the proportion allochthon? Second, can a fertility recovery have a moderating impact on these two outcome variables?

The answers derive from simulation results obtained by means of a model run over a 50-year interval using French, German and Swiss data.[2] Therefore, the results in part reflect fertility and employment conditions that existed until about the year 2000 in the three countries. The results show that the magnitude of future immigration and the associated increase in the proportion allochthon are considerably influenced not only by the pace and nature of economic growth but also by those initial conditions, in particular fertility levels.

In view of the simplicity of the model and data limitations, we take the simulation results with a measure of caution. We do not view them as long-term predictions for the three countries.

[2] For France, the initial year of the interval is 1999. For Germany and Switzerland, it is 2002.

Model and data

Sharing the view that it takes a simple model to produce intelligible results (Ruttan 2002), we formulate and use an uncomplicated model. The simplicity comes at a price, however, but we consider it acceptable. In addition, faced with data limitations, we chose to live with them rather than give up the analysis. Gains from the analysis, in our view offset deficiencies deriving from the data limitations. The consequences of the deficiencies for the results are discussed.

Model

The model generates simulations for a 50-year period by sequentially performing calculations for dates spaced five years apart. Rather than presenting the model formally, we suggest how results are arrived at the end of the first quinquennium, to which we will hereafter refer to as the period. Note that in what follows the inputs into the simulations are italicised when they are referred to for the first time.

Given the *beginning-of-period GDP level* and the *beginning-of-period average labour productivity level*, the GDP and average productivity levels at the end of the period are computed using the *period-specific average annual GDP growth rate* and the *period-specific average annual growth rate of average labour productivity*. The resultant end-of-period GDP and average productivity levels are used, in turn, to calculate a level of employment consistent with them. Let us call this level the number of required workers.

The national population consists of the autochthons and allochthons, which are calculated using the cohort component method. The procedure rests on the assumption that the members of the two groups do not have common offspring, which significantly simplifies the calculations. The age-sex distribution of the autochthons at the end of the period is derived using the *beginning-of-period age-sex distribution of the autochthons* and the *period-specific assumptions on autochthon fertility and mortality*. International migration does not enter the calculations, as the autochthons are assumed to be unaffected by it.

Then, the age-sex distribution of the allochthons at the end of the period is derived from the *beginning-of-period age-sex distribution of the allochthons* and the *period-specific assumptions on allochthon mortality and fertility*.[3] Subsequently, the allochthons may gain numbers due to immigration. Irrespective of whether this happens, the assumption is that they do not leave the country, i.e. lose numbers due to emigration. Note that the mortality assumptions for the allochthons are identical to those for the autochthons, while the fertility assumptions for the two groups are different. This is in line with the similarity of mortality conditions and the differences of fertility conditions for the two groups shown by recent data.

[3] Mortality assumptions are specified in terms of life expectancies at birth by sex. Fertility assumptions are spelled out in terms of the total fertility rate and the mean age of childbearing. The requisite proportionate fertility schedule by age is derived from this mean age using the United Nations fertility model.

The age-sex distributions of the two groups are used along with the assumptions on employment rates for the two groups pertaining to the end of the period to calculate a level of employment. We call this level the number of available workers at that date. The *end-of-period assumptions* pertain to the *overall employment rate* (persons aged 15-64), the *female employment rate* (women aged 15-64) and the *employment rate for the young old* (persons aged 55-64). Note that these are the employment rates for which the Lisbon and Stockholm European Councils (European Commission 2000 and European Commission 2001) set the targets for the year 2010. Two additional, less important assumptions are also made in order to allow for the fact that there are people aged 65 or older who work.

If the number of required workers is smaller than the number of available workers, the calculations are performed for the next five-year period, i.e. the second one in this description. Before this is done, however, it is necessary to force equality between the numbers of required and available workers. This could be done by means of a downward adjustment in the employment rates. Another possible adjustment would entail a reduction in the number of allochthons through repatriation, something that would be out of line with the assumption that the allochthons do not emigrate. Neither of the adjustments is made, as this would be cumbersome. Instead, the level of productivity is reduced.[4]

If the number of required workers exceeds the number of available workers, the calculations are taken forward, initially resulting in the number of immigrants at the end of the period. The number of foreigners admitted in this simplified world of simulations depends in part on the three employment rates assumed for the allochthons and the *end-of-period assumptions* regarding the *sex ratio of immigrants* and the *proportionate age distributions of immigrants by sex*. These assumptions make use of the age-sex patterns of immigration used by United Nations (2000). The patterns stay fixed over time and across simulations.

The allochthon employment rates assumed for the end of the period apply to the newly arriving foreigners. The number of foreigners admitted is just sufficient to have the excess of the number of required workers over the number of available workers eliminated. The immigrants who do not join the employed become their dependents. The immigrants are added to the end-of-period allochthons arrived at earlier. The numbers of autochthons and the augmented numbers of allochthons are added up to produce the national population. This completes the cycle of calculations for the given period, which is followed by a cycle for the next period.

The terms autochthons and allochthons are inherently vague. In order to avoid a misunderstanding, we indicate next what they stand for in this analysis. Allochthons

[4] Only rarely the simulation results showed noticeable downward adjustments in the productivity levels and the productivity growth rates derived from the adjusted levels. Almost exclusively, the adjustments were made early in the 50-year simulation periods, especially when the employment rates were assumed to rise rapidly.

include immigrants and their descendants who have spread through the three countries during the post-war era, a process likely to accelerate in the future. Because of the no-common-offspring assumption, the lineage of the descendants solely derives from the immigrants. It does not matter whether their ancestors are persons of one or more foreign nationalities. Autochthons are the people who inhabited these countries early during the post-war era and their descendants. Due to the no-common-offspring assumption, their lineage is traced only to those inhabitants.

This assumption and the definitions of the two groups are restrictive, a consequence of the simplicity we opted for. They rule out the existence of persons of mixed ancestry and a related challenge of setting a rule for distributing these persons between the autochthones and allochthons. The restrictiveness has implications for the use of data to initialize the model and, indirectly, for certain aspects of the analysis.

Data

Statistics on people of foreign origin – immigrants and their descendants – are generally limited. They are by far the best in the Nordic countries, which have a relatively long history of population registers. There, the keeping of the registers in an electronic format since the 1960s makes it possible to establish relatively easily the ancestry of foreign-origin persons of particular interest to these countries. Those persons include immigrants who came to the Nordic countries from the other parts of Europe and the developing world during the post-war years, plus their descendents borne there. As regards the descendents, it is possible to establish their ancestry, no matter whether foreign or mixed.

In many European countries, only imperfect information on foreign-origin people is available. The information comes from sources that collect information on the country of birth, which permits the identification of foreign-borne persons, i.e. immigrants. Population censuses almost routinely collect such information, as does the European Labour Force Survey (LFS).[5] The problem is that the information on the foreign-origin people based on the country of birth information excludes the descendants of the immigrants borne in the country of immigration. In well-established foreign-origin communities, the descendents make a relatively sizeable share of the membership of the communities. As a result, the statistics on foreign-borne can substantially understate the numbers of foreign-origin people.

The imperfect information also comes from sources gathering data on citizenship or those entirely focusing on foreign-nationality residents. The sources include censuses, the LFS and the registers of foreigners, such as the one maintained in Switzerland. The sources permit the identification of both immigrants and their descendants, but not all of them. The problem is that these sources do not account for the immigrants and the descendants who have been naturalised. Where naturalisation is relatively rare – this has been the case in Germany and Switzerland until recently – the statistics on foreigners

[5] The LFS data that Germany collects, however, do not comprise information on the country of birth. In Italy, this information is gathered, but the government does not allow its use (Münz 2004).

approximate foreign-origin persons better than the data on foreign-borne do. Where naturalisation is comparatively frequent, as in France, this is not the case.

Problems with statistics on natives are a mirror image of those pertaining to the persons of foreign origin. These people may be approximated as persons borne in the country. The approximation is problematic as it includes the descendants of immigrants borne in the country. Alternatively, the natives can be approximated as nationals or citizens of the country. The problem in this instance is that the nationals include foreign-origin persons – immigrants and descendants – who have been naturalised. If naturalisation is uncommon, the statistics on nationals provide a better approximation of the numbers of natives than the statistics on native-borne persons.

France, Germany and Switzerland lack population registers of the Nordic variety. Consequently, we faced the limitations that imperfect data pose. Under the circumstances, we opted to use the data on the nationals and foreigners to arrive at the initial-year values of the input variables for the autochthons and allochthons. In particular, the age-sex distributions of the citizens and foreigners for the initial years of the 50-year simulation periods chosen for the three countries were imputed to the autochthons and allochthons. The same had been done with the fertility and employment rates, which provided the basis for formulating fertility and employment-rate assumptions. Some of the information used came from Eurostat, the other from the national statistical offices.

Among the initial-year values of the input variable were those pertaining to the GDP and productivity levels. These came directly from the Eurostat database.

Before moving to the next topic – simulation inputs – let us consider implications of the imputations. There are reasons to believe that the implications, which we can only evaluate in qualitative terms, differ across the input variables and countries. One of the implications is a likely understatement of the numbers of allochthons and an overstatement of the numbers of autochthones, more for France than for Germany and Switzerland. This is due to the nature of the respective naturalisation policies of the three countries and the restrictiveness of our assumptions of the autochthons and allochthons.

For a long time France had a liberal naturalisation policy. Until 2000, Germany had a highly restrictive policy, when it substantially liberalised its naturalisation law. The German policy, however, remains more restrictive than the French one. In a recent review of the citizenship policies in the EU15 countries (Howard 2005), on a 0-6 scale, the French policy scores 6 points as one of the most liberal. The German policy, described as a moderate, scores 3 points. The German score for the 1980s, i.e. the years before the law change is 0.

The Swiss policy, which was not included in the review, appears to remain rather restrictive. Unlike in France and Germany, children borne in Switzerland do not automatically receive citizenship. In Switzerland, foreigners can apply for the citizenship after 12 years of residence. In France, the residency requirement is five years, in

Germany 8 years (15 years before 2000).[6] All the three countries allow for dual citizenship, however, in Germany, the current rule is that persons borne to foreigners many hold dual citizenship until the age of 23, when they must choose between the German and another citizenship.[7] Haug (2005) characterises the Swiss policy as substantially selective.

Naturalisation poses one problem, the restrictive definitions another. Even if we have had perfect ancestry data, it would have been impossible to subdivide the national populations into two groups as we defined them. The reason is that, contrary to reality, the definitions rule out mixed ancestry. Persons of such ancestry would not be included in either group. Approximating the numbers and characteristics of the autochthons and allochthons using the data on the nationals and foreigners necessarily had to sidestep this problem arising from the definitions.

In view of the above, we suspect that in all three countries the use of the data on the nationals and foreigners led to overstatements of the autochthons and understatements of allochthons. We also guess that the overstatements and understatements have been larger for France than for Germany and Switzerland, where these were probably relatively small. The allochthons are understated because the statistics on foreigners do not include naturalised immigrants and their descendants of foreign ancestry. The autochthones are overstated as the statistics of nationals include these two categories of persons, plus, very likely, the majority of the mixed-ancestry persons.

The understatements of the allochthons and, in particular, the proportion allochthons – our measure of the autochthon-allochthon mix – are a problem. However, the problem is not as great as one may think, particularly not in Germany and Switzerland. As we will see below, much of the analysis pertaining to the proportion allochthon concerns increments in this proportion over the simulation interval. These increments are free of the initial-year understatements, except for indirect effects of the understatement of the allochthons and the overstatement of autochthons operating through early value of the fertility and employment-rate inputs. In view of their likely limited importance, these second order effects are not worth being considered here.

Inputs

We now turn to the simulation inputs. The discussion will concern the sets of values we have chosen for the input variables as well as the empirical and policy background of the choices made. We shall first discuss in some detail the inputs for four basic scenario simulations. Subsequently, we shall describe how some of these inputs were modified in order to arrive at the inputs for three scenario simulations associated with each basic scenario simulation. Henceforth, we shall refer to each basic and the three related scenario simulations as a group. In addition, keeping in mind that behind each

[6] In Switzerland, however, the years lived in the country between the 10th and the 20th birthday are counted double.

[7] The information referred to here is from Howard (2005) and the Swiss Federal Office for Migration, http://www.bfm.admin.ch/bfm/en/home.html .

simulation there is a scenario, we shall refer to scenario simulations simply as simulations.

Basic simulation inputs

GDP and productivity growth rates. The Lisbon strategy (European Commission 2000), an EU job creation and growth blueprint for the current decade identifies economic growth as an overriding goal of the Union. It responds in part to the challenge that the EU's economic competitors, the US and Japan, and, more recently, China and India pose to Europe. In addition, it reflects the ambition to continue raising living standards of the citizenry of the EU countries. There are no indications yet as to whether or how the EU strategy will change past 2010, the end year of the Lisbon decade. In view of the foreign and domestic considerations, irrespective of how it may evolve, Europe is very likely to retain growth as a paramount objective, and this in spite of the anticipated labour constraint. Can it do otherwise?

If economic growth is Europe's long-term future, then a rise in the numbers of foreign workers and their dependents will occur as a matter of course, more in some countries than in others. A prop up of native labour through efforts at raising fertility, although considered (Vignon 2004 and European Commission 2004a) seems not to be a particularly promising response. One problem is that transforming babies into workers takes considerable time. Perhaps more importantly, there is no agreement in Europe that this could be a right response. A five-year review of the Lisbon strategy implementation (European Commission 2004b) chose not mention pronatalist efforts as an option. This adds to the salience of the questions on the implications of economic growth for immigration and the autochthon-allochthon mix.

In order to address the questions, we assume that future GDP growth will occur at two or three percent per annum. (Note that the Lisbon strategy (European Commission 2000) chose a GDP growth rate of 3 per cent per annum as a target for EU15 for the current decade.) We further assume that the output growth at either rate is associated with the rise of average labour productivity growth of one or two per cent. These four pairs of the output and productivity growth rates underlie the four basic simulations and are the cornerstones of the four groups of simulations. The employment growth rates associated with the four pairs vary between zero and two per cent per annum.

Basic simulation No.	Growth rate		
	GDP	Productivity	Employment
1	3	1	2
2	3	2	1
3	2	1	1
4	2	2	0

The recent geographical pattern of output, productivity and employment growth sheds light on the choice of the four pairs (Figure 1). The plot shows the average annual percentage employment and productivity growth rates for 20 OECD member states for

the period 1970-2005, a group of countries for which the relevant long time series data are available at OECD.StatExtracts[8]. Associated with each point in the scatter is a GDP growth rate that equals the sum of the productivity and employment rates; the GDP growth rate is not shown, however. The figure reveals a range of past long-term patterns of growth across the industrialised world. Also shown in the figure are the combinations of the productivity and employment growth rates that are part of the four basic simulations.

(Figure 1 about here)

Distinguished in the figure are three groups of countries. To the left are the majority of the West European countries and Japan with some of the fastest productivity increases and generally slow employment growth over the three and a half decades. Their output growth rates are among the lowest among the twenty countries. To the right are the four countries of European settlement – the traditional countries of immigration – combining the slowest productivity rise and generally rapid employment increase. Their output growth rates are the highest among the twenty countries. In-between is a smaller group of West European countries having intermediate employment growth rates and a range of productivity growth rates; the productivity increase among the two-thirds of these is, however, on par with that of the other West European countries. Their output growth is roughly intermediate.

In terms of growth patterns, the four basic simulations span a range of these experiences. The growth pattern of the Basic 1 simulation is close to the Canadian pattern, where the output growth of some three per cent has been driven in large part by a rapid employment growth, nearly double the productivity increase. At the other end of the spectrum, the growth pattern of the Basic 4 simulation is an extreme version of the pattern found in the West European countries where moderate output increase is a consequence of a fast productivity growth and a generally slow employment increase. In this basic simulation, with employment constant, the moderate output growth is entirely driven by productivity increase. The growth patterns of the Basic 2 and Basic 3 simulations capture the experience of the minority of the West European countries, which partly due to the outlier – Switzerland – combine varying paces of productivity rise with moderate employment growth.

The values of the output and productivity growth rates assumed for each of the basic simulations are not reached overnight. Rather, starting from the initial-year country-specific values the rates approach the assumed basic simulation values over a period of five or 10 years. Thereafter the rates remain constant through the end of the 50-year simulation interval and are identical for the three countries. Thus, as part of each basic simulation, output and productivity for each of the three economies grows at identical rates as of five or 10 year past the initial year. By implication, employment grows at a constant, identical rate equal to the difference between the output and productivity growth rates.

[8] http://stats.oecd.org/wbos/default.aspx

Employment rates. There is a range of industrialised economies, including France and Germany where labour reserves persist among overlapping groups, in particular the young, women and the young old. The groups also include the unemployed, people with low skills, immigrants and persons with disabilities (OECD 2003). There are, however, countries, among which is Switzerland, where the reserves are nearly nonexistent. Therefore, the employment strategy of the industrialised word – the OECD 1994 Jobs Strategy (OECD 2006), which after focusing on the unemployed increasingly promotes greater employment participation of the other underrepresented groups. The EU Lisbon strategy shares this orientation.

The strategy set the targets for the overall and female employment rates for 2010 for the EU15 as a whole at 70 and 60 per cent (European Commission 2000). Subsequently, the Stockholm European Council set the target for the employment rate of the young old – persons aged 55-64 – at 55 per cent (European Commission 2001). The target for women appears to be within reach. Those for the young old and, by implication, for all are likely to be missed by a number of countries. This is what Eurostat information for 2007 shows.[9]

Against this backdrop, Vignon (2005) shows that even if the EU15 overall employment rate were to reach the target in 2010 and remain flat thereafter, the result would be a decline in employment for the EU15 starting a few years past this date. He also shows that employment growth could continue past 2010 but reach a plateau 10 years later and begin contracting as of 2025. This would require, however, an increase in the working-age population in line with the Eurostat high demographic scenario, rather than the commonly used baseline scenario. In addition, a further increase in the overall employment rate to 75 per cent in 2020 would be required. Thus, it appears that the Lisbon employment rate targets, in spite of the likely partial short-term setback will have to be revised upwards.

The employment rate assumptions used here are based on the premise, inspired by the Lisbon strategy that a rapid rise in employment rates, where this is still possible is the way of furthering employment growth. Similar to the Vignon exercise, key assumptions place the employment rates beyond the Lisbon strategy targets. Moreover, in view of the fact that the LFS data document almost systematically higher employment rates for the nationals than foreigners (Macura et al. 2004 and Münz 2004) the assumptions are made separately for the autochthons and allochthons.

The assumptions underlying the basic simulations – for the time being we are discussing only the basic simulation inputs – set employment rates for the autochthons at the levels that are by up to 10 percentage points higher than those for the allochthons. In particular, for France and Germany the three rates for the autochthons are set at 75 per

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9 http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1996,45323734&_dad=portal&_schema=PORTAL&screen=welcomeref&open=/C/C4/C41&language=en&product=Yearlies_new_population&root=Yearlies_new_population&scrollto=90

cent, 65 per cent and 55 per cent. Assuming that allochthons will trail autochthons, the corresponding allochthon rates equal 65, 55 and 45. As in the case of the output and productivity growth rates, the employment rates rise form the country-specific initial-year values and reach these values within five or 10 years, remaining constant thereafter.

The Swiss initial-year employment rates, for the nationals and foreigners alike are higher than the rates assumed for the French and German autochthons, not to speak of the EU targets. In view of this, the overall, female and young-old rates for the Swiss autochthons are set at 80, 75 and 70, a bit higher than the corresponding initial-year values. The rates for the allochthons are handled in the same manner, except for the young-old rate, which is a slightly lower than its initial-year counterpart; these rates equal 78, 68 and 60. These various rates are also attained within five to 10 years.

In sum, the allochthon employment rates are lower than the autochthon ones, not only initially but throughout. As part of some of the related simulations, this assumption is relaxed.

Mortality and fertility measures. The life expectancies at birth by sex for the three countries do not reveal any systematic nationals-foreigners differences. In view of this, the autochthons and allochthons are subject over time to the same mortality change. The life expectancies at birth by sex are assumed to increase from the initial-year values until maxima reached at specific dates. These mortality inputs are nearly identical to the mortality assumptions underlying the Eurostat population projections for the three countries. They do not vary across the simulations.

The fertility of the foreigners is higher than that of the nationals in the three countries. These differentials necessitated different fertility assumptions for the autochthons and allochthons. Total fertility rates for the autochthons are assumed to remain constant throughout the simulation period at the initial-year values. For France and Switzerland, where the differentials are large, the rates for the allochthons move from the initial-year values toward the autochthon values but do not converge with them. Rather, from a point in time on, the differential is fixed. For Germany, where the initial-year differential is relatively small, the allochthon fertility is roughly constant as of the initial year. The result is an approximately fixed autochthon-allochthon fertility differential throughout.

The autochthon fertility is constant as there is no ground on which to base an assumption of a fertility decline or a fertility recovery. We consider it reasonable to assume that allochthon fertility will fall where it is still relatively high. In the past, foreigners have displayed a tendency to adapt their reproductive behaviour to that of the nationals, although not necessarily fully. In addition, foreigners increasingly come from countries where the trend toward lower fertility is under way, if not completed.

As we shall presently see, we modify the fertility assumptions as part of some of the related simulations.

Related simulation inputs

One of the purposes of the related simulations is to explore effects of a disappearance of the autochthon-allochthon employment rate differentials. The rationale for this is as follows. West European countries that have had post-war "guest worker" and similar labour recruitment programmes unwittingly saddled themselves with low skilled, poorly educated migrant workers and their dependents from the non-European Mediterranean countries and beyond. The social and economic costs of their maladaptation overshadow the short-term economic gains the West European countries reaped from the immigration. It appears that the lesson has been learned, but not everywhere, as the South European countries recently testified.

In the case of two out of the three related simulations within each group, we assume that the allochthon employment rates rapidly rise from the initial-year levels. They reach the values postulated for the autochthon rates at the time when these rates reach their maxima. From then on, the autochthon-allochthon employment rate differentials do not exist, i.e. the participation in employment of the allochthons is as high as that of the autochthons. The legacy of the past is being wiped out within five to 10 years. This assumption is premised on an effort made early on to fully integrate the allochthons in the labour market.

As regards the continuing recruitment of foreign labour, it is assumed that it will take place through an efficient selection mechanism. Selection criteria stress the possession of requisite education and skills; as a result, the allochthons are readily employable. Men and women are selected in roughly equal proportions. Where required, preference is given to couples. This keeps in check immigration of spouses on family reunification or family formation grounds who lack requisite education and skills. As a result, the employment rates of the immigrants are as high as those of the already established allochthons. The simulations using these inputs shed light on the extent to which a full labour market integration of the allochthons can help moderate immigration and its impact on the autochthon-allochthon mix.

The related simulations are also employed in order to explore effects of a rise in fertility. A few years ago, the European Commission took steps designed to bring about a high-level political endorsement of a fertility stimulating policy. Early in 2004, Vignon (2005) argued that an "[a]ctive immigration policies can only moderate and postpone" … "a significant drop in the labour force and subsequently in the EU's economic growth potential". "Therefore, public opinion and policy makers will be faced with the need to reconsider public policies in relation to fertility and families." He went on to suggest a policy package that, in his opinion would be required to overcome "barriers to choice and preference in relation to childbearing".

Subsequently, a high-level group on social policy (European Commission, 2004a) suggested that the Lisbon strategy be completed in order to increase the working-age population. The aims were "a comprehensive and voluntary immigration policy" and a policy that would "allow European couples to have the number of children they desire,

with a potential benefit on the labour force in the longer term." Soon, another high-level group completed its work, a mid-term review of the implementation of the Lisbon strategy. Its report (European Commission 2004b), which was endorsed by the Brussels European Council (European Commission 2004c) acknowledged the need for selective immigration but ignored the challenge of increasing the domestic working-age population by helping "couples to have the number of children they desire".

In spite of the fact that the pronatalist policy initiative failed, our simulations look into effects that a fertility rise could have. We assume that, instead of remaining constant at the initial-year level the autochthon TFR will rise within the first 15 years to a level, at which it stays constantan thereafter. This level depends on the initial-year level, being the highest in France – 2.1, where the initial-year TFR is the highest. In Germany and Switzerland, the maximum autochthon TFR is 50 per cent higher than the initial-year value, i.e. 2 and 1.8. In the case of the two countries, we felt that setting the maximum equal to the French 2.1 would be overly ambitious.

Allochthon fertility is assumed to reach the autochthon maxima at the time when autochthon fertility attains them. Thereafter, allochthon fertility remains constant and equal to autochthon fertility. We use these assumptions in order to explore the extent to which higher fertility tempers immigration and its impact on the autochthon-allochthon mix.

The three simulations related to any basic simulation use, as shown below different combinations of allochthon employment assumptions and the autochthon-allochthon fertility assumptions. The meaning of the terms used below is as follows. 'Low allochthon employment' and 'low fertility' stand for the allochthon employment and fertility assumptions described above when discussing the basic simulation inputs. 'High allochthon employment' stands for the allochthon employment-rate assumptions that ensure equality between autochthon and allochthon employment rates five or 10 years after the initial year. 'High fertility' signifies the assumptions allowing autochthon fertility increase and a convergence of allochthon fertility toward it.

Simulation	Allochthon employment	Fertility
Basic	Low	Low
Related 1	High	Low
Related 2	Low	High
Related 3	High	High

Given any particular Basic simulation, each Related 1 simulation associated with it isolates the impact of high allochthon employment, while every Related 2 simulation looks into the impact of high fertility. Each Related 3 simulation considers implications of high allochthon employment and high fertility. As the above discussion suggests, we did not vary across the simulations the employment rates for the autochthons and the life expectancies at birth by sex.

Altogether, there are 16 simulations, belonging to four groups. Each group consists of a basic simulation and a related triplet. Table 1 summarises information on the

inputs for the 16 simulations. The values of the inputs themselves are presented in the Annex.

(Table 1 about here)

Results

At the root of the anticipated labour shortages and the likely labour immigration is the inadequate growth of the native working-age population, labour force and employment. In some instances, such as France, the problem will be far less acute than in others, Germany and Switzerland included. Figure 2 illustrates the point for the three countries. Shown in it are the changes in the autochthon working-age population and autochthon employment; these were generated in the course of the basic simulations over the five decades. Note that the way the assumptions for the autochthons were formulated leads to the identical basic simulation results.

(Figure 2 about here)

As regards the working-age population, its size in France shrinks by close to 15 per cent during the five decades. In both Germany and Switzerland, it contracts three times as much, approaching a drop of 45 per cent. In all three, given the assumed rise in employment rates before these stabilize at high levels, the decline in employment levels is not as pronounced. In fact, in France, the level rises by a modest 10 per cent. In Germany and Switzerland, it drops substantially, however, less than the size of working-age population does. Clearly, these trends, especially those for Germany and Switzerland, are grossly at variance with employment trends that any sustained economic growth at a moderate or rapid pace would entail.

Basic simulation results

As we shell presently see, growth patterns consistent with different historical experiences of the industrialised world would all require more workers than the allochthons could provide. The Basic 1 growth pattern is particularly labour reliant, requiring arrival of large numbers of immigrants over the half century (Table 2). Cumulated immigration over the 50-year simulation interval equals 64.4 millions for France, 112.4 millions for Germany and 10.2 millions for Switzerland. In each instance, it exceeds the initial-year national population size by a considerable margin. The relative excess is smaller for France (10 per cent) than for Germany (38 per cent) and Switzerland (38 per cent).

(Table 2 about here)

The large-scale immigration drives a rapid population increase. The national population of France and Switzerland each increases by close to 150 per cent and that of Germany by a bit less. The other consequence of the massive immigration is a vast shift in the autochthon-allochthon mix of the population. Within the half century, the proportion allochthon reaches close to two-thirds in France, three-fourths in Germany and four-fifths in Switzerland (Table 2 and Figure 3, Panel I). Switzerland is at the top of the list in spite of the fact that the increment in the Swiss proportion over the half century is

noticeably smaller than that in the German proportion (Figure 3, Panel II). The reason is that the Swiss initial-year proportion is substantially higher than that of France or Germany – 20.8 versus 5.6 and 8.7.

(Figure 3 about here)

In sum, a growth pattern similar to the Canadian experience since the 1970 would occasion an enormous demographic growth and a fundamental transformation of the autochthon-allochthon mix of the three countries. As regards the mix, had we allowed the Basic 1 simulations to continue beyond the 50-year horizon, it would have been only a matter of time before the results would signal a near complete replacement of the autochthons by allochthons. This would have happened earlier in Germany and Switzerland than in France.

The Basic 2 and Basic 3 growth patterns are half as labour dependent as the Basic 1 pattern. The underlying rate of employment growth equals one per cent, i.e. one-half the rate of the Basic 1 simulation. Given the identity of the employment growth rates, the Basic 2 and Basic 3 results are very similar. In view of this, there is no need to consider them separately. Therefore, in Table 2, Figure 3 and later on, simple means of the Basic 2 and Basic 3 results, referred to as Basic 2&3 results are shown.

In view of the lower employment growth rates, the Basic 2&3 cumulated immigration flow is smaller, roughly one half the inflow of the Basic 1 simulation in Germany and Switzerland and less than that in France. The relative population increase ranges between 55 per cent (Germany) and 69 per cent (France). Note that in spite of comparatively smaller immigration, the population of France grows more; this is a consequence of higher fertility in France. In each case, however, the relative increase amounts to considerably less than the Basic 1 increase. The Basic 2&3 relative additions to the population are smaller than one-half of the Basic 1 additions.

As one would expect, the Basic 2&3 proportions allochthon are lower than the Basic 1 proportions, however, not by much (Table 2 and Figure 3, Panel I). The reason for this is that the increments of the Basic 2&3 proportions are substantial (Figure 3, Panel II). The Basic 2&3 increment in the proportion allochthon for France amounts to 71 per cent of the Basic 1 increment. For Germany and Switzerland, it amounts to 79 and 82 per cent. Clearly, cutting the labour dependence of growth by half does not result in halving the additions to the proportions allochthon. Moreover, the "downward stickiness" of the increments appears greater for Germany and Switzerland than for France.

The Basic 4 growth pattern does not require employment increase, as the entire output growth is due to a labour productivity increase.[10] Nevertheless, maintaining employment at a fixed level requires immigration. The Basic 4 cumulated immigration stands at 12 per cent of the Basic 1 cumulated immigration in France and at 22 and 20 per cent in Germany and Switzerland. The ratio of cumulated immigration to the initial-year population is 13 per cent in France and more than twice that much in Germany (30 per

[10] The zero employment growth regime sets in as of year 10 in France and year 5 in Germany and Switzerland. Before that, employment grows, faster in France than in the other two countries.

cent) and Switzerland (28 per cent). Despite the smaller gain due to immigration over the half century, the population of France grows by 14 per cent, those of Germany and Switzerland by 5 and 9 per cent. It is the higher fertility that underpins the faster French demographic growth.

In each case, the proportion allochthon after the five decades is higher than the original proportion – 22 per cent in France, 45 in Germany and 53 in Switzerland. The increment in the proportion is the highest in Germany; note that this is so in the case of the other basic simulations as well. In sum, in Germany and Switzerland, where fertility is considerably lower than in France, the slower population growth goes hand in hand with a faster replacement of the autochthons by allochthons. Significantly, this happens under the condition of no change in employment.

Before moving on, let us bring some of the treads of this analysis together with the help of Figure 4. The figure shows how the relationship between the ratio of cumulated immigration to the initial-year population and the increment in the proportion allochthon shifts across the basic simulations. Note that, for the sake of brevity, we shall often refer to the ratio simply as cumulated immigration; as long as no confusion can arise, this should not be a problem, as the ratio's denominator is a constant. As regard the schedules shown in the figure, there are two points worth noting. Firstly, the French schedule lies to the left of the German and Swiss schedules. Secondly, the slope of the French schedule is steeper than that of the other two schedules, especially between the Basic 2&3 and Basic 4 points.

(Figure 4 about here)

In order to assess the significance of the positions and the shapes of the three schedules, let us start with the premise that the Basic 1 growth pattern is untenable. Its 3-per-cent output growth is underpinned by a 1-per-cent productivity increase. This combination requires too large a migration inflow and pushes the proportion allochthon too high. In view of this, the Basic 2 or Basic 3 pattern could be a reasonable fallback position. The question is how the three countries would fare if they were to move along their respective schedules from Basic 1 to Basic 2&3.

This move would be most advantageous for France. France's new cumulated immigration and new proportion allochthon increment would both be smaller than the German and Swiss ones. Note that the French position was not as favourable as this at Basic 1, where, the French and Swiss proportion allochthon increments were equally larger. At Basic 2&3, the Swiss proportion allochthon increment would be smaller than the German increment, making the Swiss position more favourable than the German one. In other words, Germany would see least benefits from the move.

Next, let us suppose that the Basic 2 or Basic 3 pattern is undesirable, as well. Either generates fewer immigrants and adds less to the initial proportion allochthon than the Basic 1 pattern, but the outcomes are still objectionable. In view of this, a new fallback position, where a final effort at growth is made is the Basic 4 pattern. Here, France stands out again, however, more prominently than before. Her position relative to

those of Germany and Switzerland, which grew closer to each other, is strikingly superior. The shift in the growth pattern towards the one entailing slower employment growth and eventually to the one requiring no employment growth moderates immigration and the proportion allochthon increase progressively more in France than in Germany and Switzerland.

The difference between the Basic 4 French and German positions is particularly large. For example, the German proportion allochthon increment is 20 percentage points larger than the French one. The German proportion allochthon (45 per cent) is twice as high as the French one (22 per cent), which is not much higher than the Swiss initial-year proportion (21 per cent).

Related simulation results

Could higher allochthon employment, on the one hand, and higher autochthon fertility combined with allochthon fertility that eventually matches it, on the other, make a difference? The results of the related simulations suggest an affirmative response. In all instances, the nature of the effects on cumulated immigration and the proportion allochthon increase is as expected – negative. The strength of the effects, however, varies across the countries and the groups of simulations.

Figure 5 shows the magnitude of the effects. Each panel shows three schedules for a particular country, schedules based on the related simulations belonging to Group 1, Group 2&3 and Group 4. Each schedule depicts the size of the effects on the two outcome variables associated with the three related simulations. For example, along the schedules corresponding to Group 1, point 1.1 depicts the impact of high allochthon employment given the underlying Basic 1 growth pattern. Point 1.2 portrays the impact of high fertility. Point 1.3 shows the joint impact of high allochthon employment and high fertility. Any given point indicates the extent to which cumulated immigration and the proportion allochthon increment obtained by the underlying related simulation are smaller than the values of the two outcome variables obtained by the corresponding basic simulation.

(Figure 5 about here)

The Group 2&3 and Group 4 schedules exhibit shapes that slope downward and to the left. The Swiss Group 1 schedule reveals the same shape, but not the French Group 1 and German Group 1 schedules. The “irregularity” of the two latter schedules is certainly curious, however, we do not wish to dwell on them. The Basic 1 simulations, as demonstrated above, are of no practical interest and, therefore, we will mainly focus on the effects revealed by the Group 2&3 and Group 4 related simulations. Note also that with the exception of one point of the French Group 1 schedule, the Group 1 schedules lie to the left of the Group 2&3 schedules. These, in turn, are positioned to the left of the Group 4 schedules.

In sum, the shift across the growth patterns from the first to the forth is associated with the weakening of the effects on cumulated immigration. This is to be expected, as

the shift occasions a reduction of the dependence of growth on foreign labour. In addition, most of the time, the shift brings about strengthening of the effects on the proportion allochthon increment. There are other points that the shapes and the positions of the schedules convey.

As one would expect, the strength of the high allochthon employment effects is considerably larger in France and Germany, where the initial labour reserves among the autochthons and particularly the allochthons are significantly larger than in Switzerland. The strength of the effects is larger when the underlying growth pattern is the one associated with Basic 2 or Basic 3 then with Basic 4. Overall, the effect on the proportion allochthon increment is, however, weak, amounting at most to -3. In sum, lifting the allochthon employment rates to the levels of the autochthon employment rates helps, however, not much.

The high fertility effects are powerful everywhere and much stronger than the high autochthon employment effects. The strength of the effect on the proportion allochthon increment is considerably greater when the underlying growth pattern is Basic 4 than when it is either Basic 2 or Basic 3. In the case of Germany, points 4.2 and 2&3.2 show that the effects on the proportion allochthon increment are respectively -11 and -7. The figures for France are -10 and -7 and for Switzerland -9 and -6.5. The strength of the effects on cumulated immigration is roughly the same irrespective of the underlying growth pattern.

Thus, the autochthon fertility recovery accompanied by a convergence of allochthon fertility towards it acts as a break on the rise in the outcome variables, particularly the proportion allochthon increment. The strength of the fertility recovery on this outcome variable in France is particularly impressive in view of the fact that the French autochthon TFR increases by a considerably smaller amount than the German and Swiss counterpart rates (see Annex).

The joint effects of high allochthon employment and high fertility are everywhere more powerful than the individual effects, particularly the high allochthon employment effects. A single exception aside, the joint effects on both outcome variables are the strongest in Germany and the weakest in Switzerland.

Basic and related simulation results

The focus remains on the Group 2 through Group 4 simulations as we bring together the results of the basic and related simulations. Opting for Basic 2 or Basic 3 growth pattern brings about relatively large immigration and large increments in the proportion allochthon. High allochthon employment and high fertility limit immigration and the proportion allochthon increment (Figure 6). High allochthon employment is considerably more beneficial to France and Germany than to Switzerland. High fertility has largely the same impact across the three countries. High allochthon employment and high fertility together would benefit Germany the most and Switzerland the least. Under this regime, France's ratio of cumulated immigration to the initial-year population and its

proportion allochthon increment are at least by some 10-percentage points lower than the Germany and Swiss ones.

(Figure 6 about here)

Opting for the Basic 4 growth pattern results in considerably less immigration and smaller increments in the proportion allochthon. High allochthon employment is now of limited help everywhere, while high fertility is very beneficial in all cases. Combined high allochthon employment and high fertility are most beneficial in Germany and least in Switzerland. In the French case, their consequences are a small cumulated immigration and a small increase in the proportion allochthon. The ratio of cumulated immigration to the initial-year population equals 5 per cent and the increment to 5 percentage points. In Germany and Switzerland, they result in values of the ratio and the increment that are a few-fold larger than the French values. This is particularly true in the case of the proportion allochthon increment. Consequently, the proportions allochthon for the two countries are 32 per cent for Germany and 43 for Switzerland.

Dilemma for some but not others

These results are in part influenced by the ceilings imposed on the rise in the German and Swiss autochthon TFRs and, by implication, on the eventual level of allochthon TFRs. The ceilings – 2 and 1.8 respectively – are lower than the French rate, 2.1. Had we allowed the German and Swiss TFRs to climb higher and match the French TFR, the German and Swiss values of the two outcome variables would have been closer to the French values. As mentioned earlier, we have imposed the ceilings for the two countries equal to the levels that are 50 per cent higher than the initial-year autochthon TFRs on the assumption that these levels themselves appeared rather ambitious.

In fact, the German and Swiss national fertility rates have been low during the last few decades, showing signs of occasional fluctuations along a slowly falling trend but no indications of an upturn. On the other hand, the French national fertility has recovered to two children per woman in 2006 from an already relatively high subreplacement level a few years earlier (Héran and Pison 2007). These trends may well mean that Germany and Switzerland are stuck in a low fertility trap, while France is well positioned to enjoy close to replacement fertility in the years to come. If indeed fertility were to remain low in Germany and Switzerland and to stay high in France, then we should not be comparing results of the same related simulations across the three countries.

If we were to confine ourselves to the Basic 4 growth pattern, we should compare, for example, the results of the French Related 4.3 simulation to the results of the German and Swiss Related 4.1 simulations. That comparison reveals situations that are way apart. The French results, as suggested above, show cumulated immigration that amounts to 5 per cent of the initial-year population and the increase in the proportion allochthon of 5 percentage points. The German and Swiss outcome variables take on much higher values. In each case, cumulated immigration amounts to more than a quarter of the initial-year population, while the proportion allochthon increment surpasses 30 percentage points.

This results in the proportion allochthon equal to 42 and 52 per cent, against the French albeit presumably more depressed proportion of 11 percent.

These results appear to convey the following message. In France, a moderate long-term growth need not depend on foreign labour in any significant degree. The relatively high French fertility during the post-1960 era will contribute to securing a nearly sufficient supply of autochthon labour. However, fertility will have to remain at the high levels observed during the last few years if the independence from foreign labour is to materialise. Assuming that France will pursue moderate growth, this near self-sufficiency will hinge on the country's ability to assure a rapid productivity increase. This may prove difficult in view of the recent French deceleration of the productivity growth, but not impossible. Note that there are countries, notably Finland and Sweden, which unlike many other West European countries experienced an acceleration of the productivity increase in recent years.

The German and Swiss future will, most likely, be different. Even if these countries were to secure the same rapid productivity rise, the realisation of a possible ambition to maintain a moderate economic growth will significantly depend on foreign labour. Their low fertility, past and future puts the two countries in a position of foreign labour dependence. However, this dependence is not necessarily their destiny, as they may abdicate the growth ambition, settling for growth deceleration and decline. Even if this happens, it will probably not occur before a repeated quest for a response to a troublesome dilemma whether or not to grow at the price of a substantial immigration and the shift in the autochthon-allochthon mix.

The other West European countries, some considerably less than others will face the same dilemma. Each of them individually will have to grapple with it. In this context, it will be interesting to watch how the EU responds to the challenge that this diversity across the block will bring about.

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Table 1
Simulation inputs

Productivity growth rates	GDP growth rates: 3 per cent		GDP growth rates: 2 per cent	
1 per cent	Group 1		Group 3	
	Basic 1 Low fertility Low allochthon employment	Related 1.2 High fertility Low allochthon employment	Basic 3 Low fertility Low allochthon employment	Related 3.2 High fertility Low allochthon employment
	Related 1.1 Low fertility High allochthon employment	Related 1.3 High fertility High allochthon employment	Related 3.1 Low fertility High allochthon employment	Related 3.3 High fertility High allochthon employment
2 per cent	Group 2		Group 4	
	Basic 2 Low fertility Low allochthon employment	Related 2.2 High fertility Low allochthon employment	Basic 4 Low fertility Low allochthon employment	Related 4.2 High fertility Low allochthon employment
	Related 2.1 Low fertility High allochthon employment	Related 2.3 High fertility High allochthon employment	Related 4.1 Low fertility High allochthon employment	Related 4.3 High fertility High allochthon employment

Table 2
Selected results;
France, Germany and Switzerland

Country	Simulation	Cumulated immigration* (in thousands)	Population increase* (in per cent)	Proportion allochthon** (in per cent)
France	Basic 1	64,379	149	64
	Basic 2&3	29,885	69	47
	Basic 4	7,569	14	22
Germany	Basic 1	112,401	139	76
	Basic 2&3	56,900	55	62
	Basic 4	24,396	5	45
Switzerland	Basic 1	10,158	148	79
	Basic 2&3	5147	63	69
	Basic 4	2,037	9	53

Notes:

* During the simulation interval.

** At the end of the simulation interval.

Figure 1
Employment growth versus productivy growth in 20 OECD countries;
Average annual growth rates during 1970-2005
(in per cent)

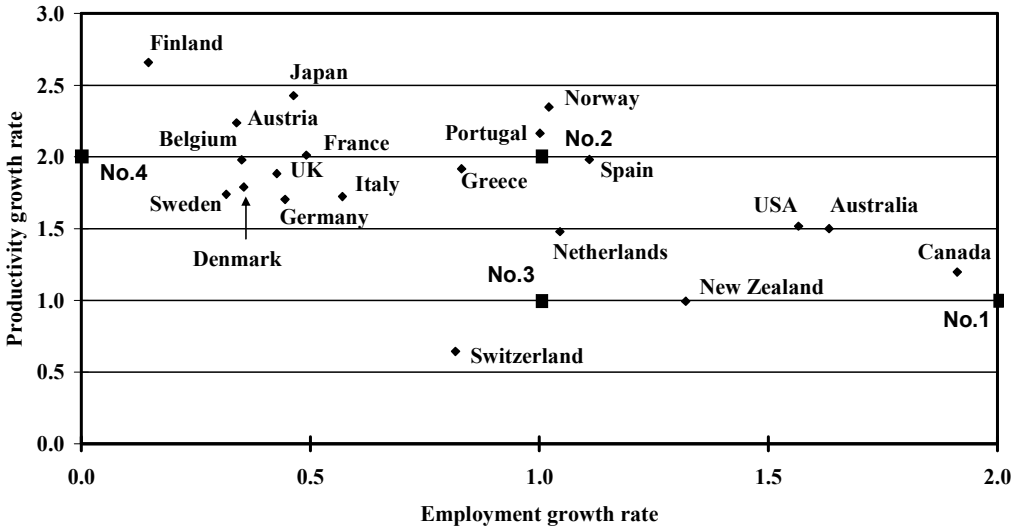


Figure 2
Working-age population change versus employment change in autochthon populations during the simulation interval; Basic simulation results; France, Germany and Switzerland (in per cent)

Figure 3, Panel I
Proportions allochthone at simulation end;
France, Germany and Switzerland
(in per cent)

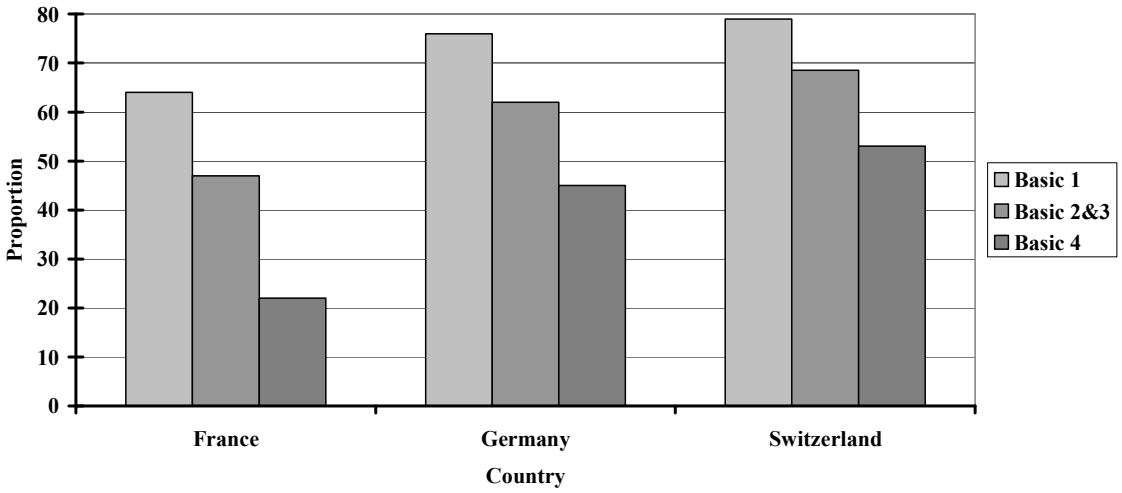


Figure 3, Panel II
Increments in the proportion allochthon during the simulation interval;
France, Germany and Switzerland
(in percentage points)

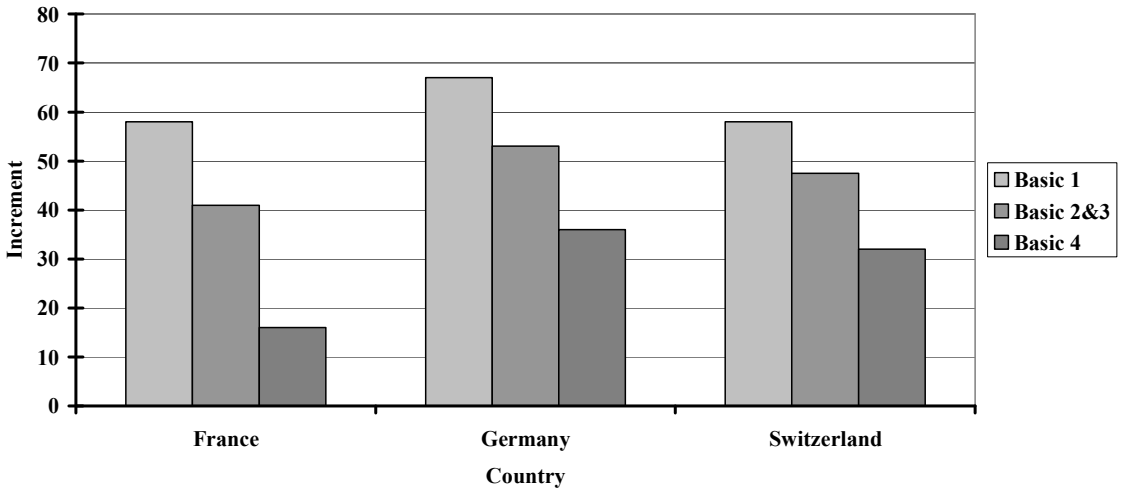


Figure 4
Ratio of cumulated immigration to initial population
verus proportion allochthon increment
(in per cent and percentage points)

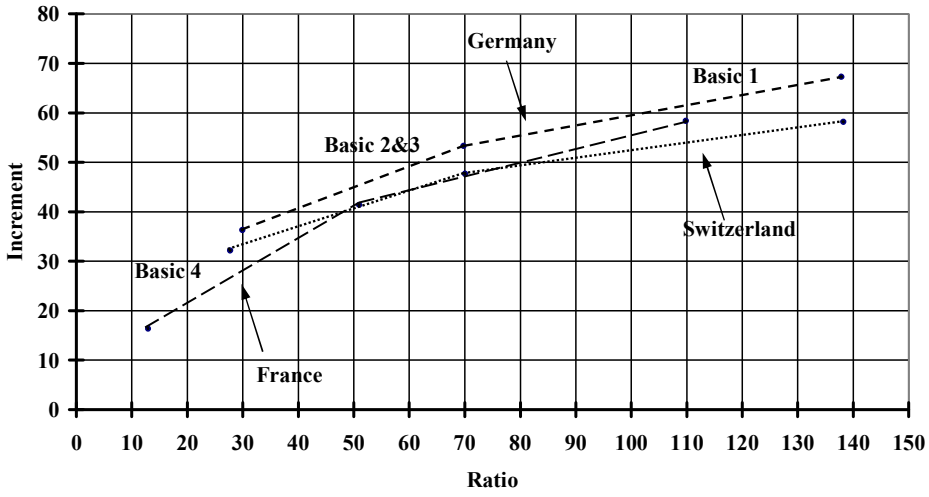


Figure 5, Panel I
Cumulated immigration effects versus proportion allochthon increment effects;
France
(in percentage points)

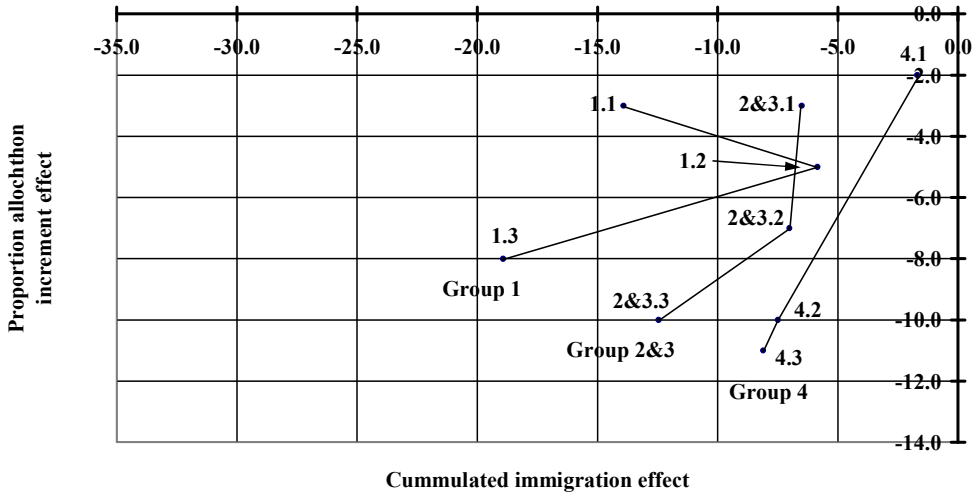


Figure 5 (cont.), Panel II
Cumulated immigration effects versus proportion allochthon increment effects; Germany
(in percentage points)

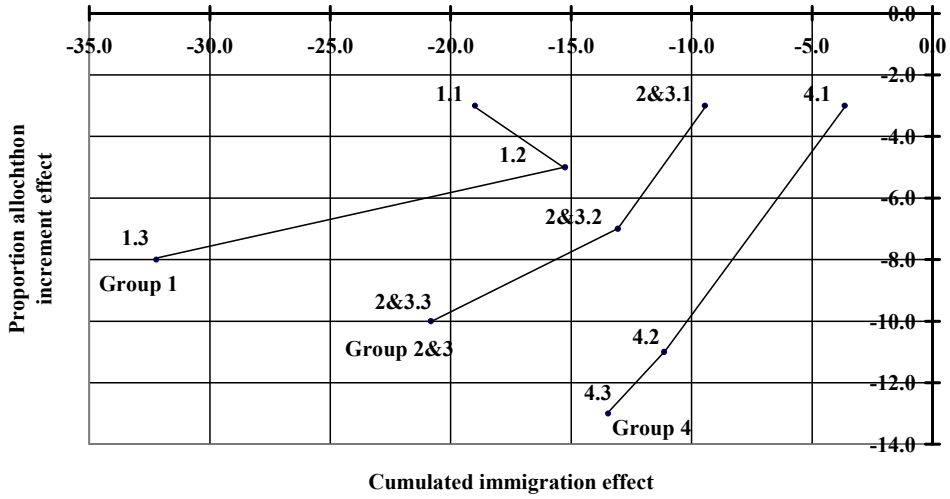


Figure 5 (cont.), Panel III
Cumulated immigration effects versus proportion allochthon increment effects; Switzerland
(in percentage points)

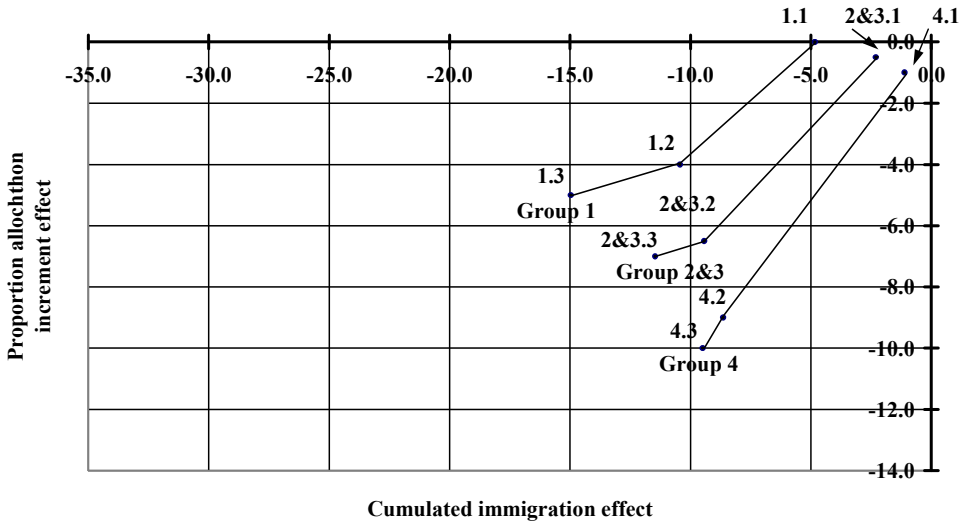
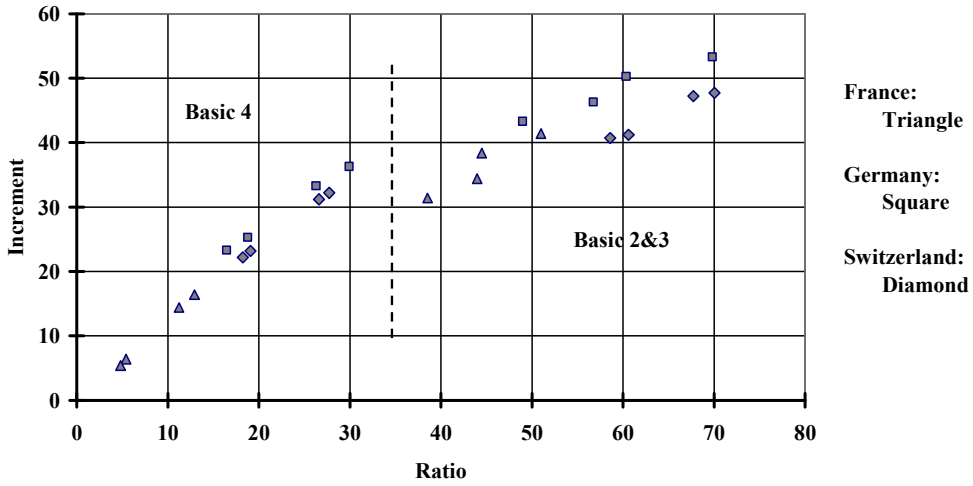


Figure 6
The ratio of cumulated immigration to initial population versus proportion allochthon increment; France, Germany and Switzerland (in per cent and percentage points)



Note: There is a set of four points for each country in the sections of the graph corresponding to Basic 2&3 and Basic 4. Note that within each set, the points are scattered from a north-eastern to a south-western position. Along the scatter, from one position to another the points stand for the results coming from the Basic, Related 1, Related 2 and Related 3 simulations.

Annex

Panel I

Simulation inputs, France

GDP growth rates (annual in per cent)

1999-2004	*2004-2009*	*2009-2014*	*2014-2019*	*2019-2024*	*2024-2029*	*2029-2034*	*2034-2039*	*2039-2044*	*2044-2029*
2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
2.3	2.8	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0

Productivity growth rates (annual in per cent)

1999-2004	*2004-2009*	*2009-2014*	*2014-2019*	*2019-2024*	*2024-2029*	*2029-2034*	*2034-2039*	*2039-2044*	*2044-2029*
0.8	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1.1	1.7	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0

Employment rates (in per cent)

	1999	*2004*	*2009*	*2014*	*2019*	*2024*	*2029*	*2034*	*2039*	*2044*	*2049*
Autochthon											
Total 15-64	61.3	65.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0
Female 15-64	54.8	60.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0
Both sexes 55-64	28.1	40.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0
Allochthon											
High											
Total 15-64	48.3	61.6	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0
Female 15-64	35.9	50.4	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0
Both sexes 55-64	32.4	43.7	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0
Low											
Total 15-64	48.3	53.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0
Female 15-64	35.9	46.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0
Both sexes 55-64	32.4	38.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0

Total fert. rates

	1999	*2004*	*2009*	*2014*	*2019*	*2024*	*2029*	*2034*	*2039*	*2044*	*2049*
Low fertility											
Autochthon	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72
Allochthon	2.8	2.7	2.6	2.5	2.4	2.3	2.3	2.3	2.3	2.3	2.3
High fertility											
Autochthon	1.72	1.85	1.97	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Allochthon	2.8	2.57	2.33	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1

Annex (cont.)

Panel II

Simulation inputs, Germany

GDP growth rates (annual in per cent)

2002-2007	*2007-2012*	*2012-2017*	*2017-2022*	*2022-2027*	*2027-2032*	*2032-2037*	*2037-2042*	*2042-2047*	*2047-2052*
1.7	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
2.0	2.7	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0

Productivity growth rates (annual in per cent)

2002-2007	*2007-2012*	*2012-2017*	*2017-2022*	*2022-2027*	*2027-2032*	*2032-2037*	*2037-2042*	*2042-2047*	*2047-2052*
1.2	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1.5	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0

Employment rates (in per cent)

	2002	*2007*	*2012*	*2017*	*2022*	*2027*	*2032*	*2037*	*2042*	*2047*	*2052*
Autochthon											
Total 15-64	66.4	70.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0
Female 15-64	60.3	62.5	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0
Both sexes 55-64	38.6	47.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0
Allochthon											
High											
Total 15-64	56.0	65.5	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0
Female 15-64	44.9	55.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0
Both sexes 55-64	34.8	44.9	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0
Low											
Total 15-64	56.0	60.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0
Female 15-64	44.9	50.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0
Both sexes 55-64	34.8	40.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0

Total fert. rates

	2002	*2007*	*2012*	*2017*	*2022*	*2027*	*2032*	*2037*	*2042*	*2047*	*2052*
Low fertility											
Autochthon	1.33	1.36	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38
Allochthon	1.43	1.51	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58
High fertility											
Autochthon	1.33	1.55	1.78	2	2	2	2	2	2	2	2
Allochthon	1.43	1.62	1.81	2	2	2	2	2	2	2	2

Annex (cont.)

Panel III

Simulation inputs, Switzerland

GDP growth rates (annual in per cent)

2002-2007	*2007-2012*	*2012-2017*	*2017-2022*	*2022-2027*	*2027-2032*	*2032-2037*	*2037-2042*	*2042-2047*	*2047-2052*
1.6	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
1.9	2.7	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0

Productivity growth rates (annual in per cent)

2002-2007	*2007-2012*	*2012-2017*	*2017-2022*	*2022-2027*	*2027-2032*	*2032-2037*	*2037-2042*	*2042-2047*	*2047-2052*
1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1.5	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0

Employment rates (in per cent)

	2002	*2007*	*2012*	*2017*	*2022*	*2027*	*2032*	*2037*	*2042*	*2047*	*2052*
Autochthon											
Total 15-64	79.7	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
Female 15-64	72.8	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0
Both sexes 55-64	65.4	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0
Allochthon											
High											
Total 15-64	76.0	78.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
Female 15-64	66.3	70.7	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0
Both sexes 55-64	61.6	65.8	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0
Low											
Total 15-64	76.0	77.0	78.0	78.0	78.0	78.0	78.0	78.0	78.0	78.0	78.0
Female 15-64	66.3	67.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0
Both sexes 55-64	61.6	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0

Total fert. rates

	2002	*2007*	*2012*	*2017*	*2022*	*2027*	*2032*	*2037*	*2042*	*2047*	*2052*
Low fertility											
Autochthon	1.22	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Allochthon	1.92	2.01	1.88	1.76	1.67	1.62	1.61	1.61	1.61	1.61	1.61
High fertility											
Autochthon	1.22	1.4	1.6	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Allochthon	1.92	2.01	1.88	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8