IMMIGRATION, AGING AND THE REGIONAL ECONOMY:

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Immigration, Aging and the Regional Economy

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Abstract

Using a two-region (Chicago and the Rest of the US) computable general equilibrium model integrated with an overlapping generations model, the analysis explores the implications for changes in the level of immigration into the Chicago on a variety of indicators. Initially and not surprisingly, wages fall as a result of increased immigration. This finding is consistent with an equilibrium view of a market receiving a supply shock and a fall in the capital/labor ratio; but after 2040, the effects appear to be reversed. One reason for this can be traced to the retirement of the first wave of immigrants but more importantly, increasing numbers of immigrants will provide contributions to taxes that will reduce the social security tax burden and thus increase the after-tax income of native workers. Over time, the model assumes that immigrants and their offspring begin to accumulate skills in such a way that they become undifferentiable from the native population. In terms of regional macroeconomic impacts, immigration would appear to reverse a projected decline in gross regional product that would occur essentially as a result of an aging population with no stimulus provided by immigration. However, in per capita GRP terms, the positive effects only occur once the immigrants (cumulatively) acquire skills to elevate their productivity levels. The Chicago region, under an asymmetric immigration policy (Chicago gains more immigrants as a percentage of its base population than the US as a whole), actually increases its share of Gross National Domestic Product. One might expect that, given these findings, the effect on the social security tax rate would be "positive" in the sense of either muting increases or actually decreasing the rate. This is true until the immigrants start to retire in significant numbers after 2050; this result stems from the fact that over time, the impacts of immigration begin to diminish – a finding that is revealed in the results for the US as a whole.

1. Introduction

Yoon and Hewings (2006) found significant evidence for the presence of non homothetic consumption preferences by age and income distribution in the Chicago regional economy.[1] Over a thirty year time period, 2000-2030, these differences were estimated to generate a statistically different impact on the growth and structure of the region's economy. However, the econometric-input-output model that was used failed to fully explore the implications of changes

[1] The Chicago region is the MSA, comprising the counties of Cook, Will, DuPage, McHenry, Lake, and Kane.

in migration behavior, especially the significant influx of younger immigrants and the out-migration of retirees. Expanding and elaborating on these findings, Park and Hewings. (2007a) examined the impact of an aging population using an Overlapping Generations framework in a two-region (Chicago-Rest of the US) computable general equilibrium model built on the same data base. Absent significant in-migration of largely younger aged people of working age and the continued out-migration of retirees, the Chicago region could expect to experience generally negative impacts from an aging population, especially in terms of economic growth. The previous simulation results point out two factors, the labor shortage and insufficient savings, as the main reasons for the economic downturn. In addition, according to the results, the aging could be expected to generate a fiscal burden that would become too onerous for the government to manage given the current structure of the pension system. Recognizing these concerns, both federal and local governments have been exploring options for handling aging problems.

Therefore, it is useful to assess the potential benefits and costs of policy reforms and find alternative solutions. At the national level, the existing literature investigating the economic impacts of policy reforms under an aging population has grown explosively since the 1990s and substantially sharpened our understanding of their potential impacts. For example, Denton and Spencer (2005) noted that while population growth and technological change were the principal drivers of economic growth, attempting to change population fertility would generate uncertain responses and would take several years to have an impact on the economy (through labor force expansion). On the other hand, an increase in immigration of say people aged 20-35 would have an immediate effect on the economy. However, the results of national policy changes may not apply at the regional level because there could exist diverse regional effects stemming from variations in economic and demographic structure. In particular, federal government policies that respond to the aging population problem may have different implications across regions. For example, there could be regional wage and employment effects of international immigration that are different from those at the national level because differential rates of interregional migration may respond (with some lag) to changes in regional labor market conditions (crowding out, or depressed wages in some regions or enhanced wages in others due to relative labor shortages).

This paper explores the impacts of changes in immigration policies; it is assumed that the immigration policies between local and federal government are differentiated. This

differentiation is not in terms of issues such as quotas, visa requirements, or guest worker programs but more in terms of a region's ability to compete more effectively for the pool of in-migrants. Focusing on the Chicago region, it is assumed that the local government in this region implements a more favorable set of incentives to attract more immigrants than the federal government. These might include housing subsidies, enhanced social and health care programs, pro-active recruiting policies (through public-private partnerships) and general enhancement of the current process of channelization of immigrants flows (regions with high existing levels of immigrants have a higher probability to compete more effectively for new immigrants using family and community (Chicago)-to-community (source of immigrants in their home country) ties. Roseman (1971) identified this process in examining the flows from the US south to specific Midwest cities in an earlier time period; it is likely that such process characterize international flows to the US. Of course, another potential source of increased immigration would be through increased attraction of migrants from other regions in the US; as Plane (1992) and Plane and Heins (2003) have demonstrated, there are striking age effects in the characterization of these flows. Considering both in- and out-migrants, over the period 1985-1990, Illinois experienced a net loss of 70,000 retirees, who were 60 and older, ranking the state as second largest among all the states. Further, the Chicago area accounts for over 80 percent of the older migrants who leave Illinois, i.e. Chicago region loses about 0.9 percent of the old population, or about 12,000 retirees, every year.

The paper is organized as follows; the next section provides a brief review of the model and a summary of prior analysis of the impacts of aging alone on the Chicago economy. Section 3 considers some plausible scenarios for the regional impacts of different volumes of in-migration; the results are presented in section 4 while the paper concludes with a summary evaluation.

2. The Model[2]

The model is presented in more detail in Park and Hewings (2007a); the critical components are reviewed here in terms of the immigration impact analysis. The model is represented by a two-region dynamic general equilibrium model with an overlapping generations (OLG) framework, drawing on Auerbach and Kotlikoff (1987). Individual earnings heterogeneity, demographic

[2] This section draws on Park and Hewings (2007)

transitions, and the existence of a social security system are assumed. There are two major differences to the prior OLG framework, the first being the specification in a two-region context (Chicago-Rest of the US) where each region is interlinked with the other by migration, trade, and the social security system. Labor is assumed to be partially mobile in domestic regions, while internationally immobile (immigrants enter but no consideration of international out-migration is provided), taking into account people's preference for staying in the region where they originally reside.[3] This locational preference is represented by the wage elasticity of labor migration. With partial mobility of the labor, wage differentials between regions take multiple periods to adjust because of the lagged responses of labor market. However, capital is assumed to be immobile interregionally.[4] This results in the return on capital being different across the regions. Secondly, the model features age-specific mortality and borrowing constraints which are critically important to generate realistic implications of the effects of demographic changes.

Households (in this model, there is a one to one mapping between individual agents and households) maximize their utility by choosing a profile of consumption over the lifecycle and firms demand factors following from profit maximization, responding to differences in goods and factor prices. Prices adjust in both goods and factor markets to clear the excess demand. A nesting structure is assumed for the household's decision process, since both regions trade in goods and each individual considers products from different regions as imperfect substitutes following the familiar Armington assumption, thus ensures that consumers demand goods produced in both regions. The hierarchy in the nesting structure of this model consists of the following two steps. In the first step, each agent determines the aggregated consumption path over time, maximizing a time-separable utility function subject to lifetime income. Time separability allows a separation between intertemporal and intraperiod decision-making in the nesting structure. Once optimal conditions governing the aggregate consumption levels are established, the next step is to allocate these expenditure levels among differentiated goods in terms of geographic origin, i.e. goods produced in Chicago versus goods from rest of the U.S. In this step, substitution elasticities play an important role in determining each agent's optimal choice, thus, the values of elasticities between two regions are very important to influence the

[3] According to Jones and Whalley(1986), perfect labor mobility is not useful in analyzing the region specific effect of government policies because under perfect mobility, the policy effect might be underestimated with complete labor movement between regions.

[4] The treatment of capital mobility is important when assessing the regional investment policies.

magnitude of the regional effects. For example, even if the aging population changes the age structure in a similar pattern across the nation, the effect on regional economies will depend on this elasticity.

To measure the effects of the demographic change on the behavior of different generations, it is necessary for the model to be disaggregated by the age cohorts as well the dynamic processes that describe the path of consumption and savings behavior of each age cohort over time. There are three types of agents in each region: households, firms, and government. Each sector represented by these agents has stylized components, but their interactions can be quite complex. By solving for the economy's general equilibrium transition path, the model takes into account all relevant feedbacks among these agents according to demographic changes and relevant government policies.

In this model, each region is populated by individual agents who live up to age 85. This limited age does not appear to be crucial since, under this assumption, less than 3 percent of U.S. population is not considered.[5] The individual agent enters the labor market at the age of 21 and retires mandatorily at the age of 65. Since all the individuals between ages 0 and 20 are considered not to perform economic activities, reflecting they are supported by their parents, this model deals with only the individual agents above age 21. Lifetime uncertainty is considered in this model, i.e., each individual faces a different probability of death in every period, which becomes higher as they age. Therefore, in every period, some fraction of people dies earlier than age 85, and leaves accidental bequests since annuity markets are assumed to be missing.[6] Total accidental bequests are distributed evenly over all the agents alive in the next period. Moreover, each individual is assumed to face borrowing constraints. Under borrowing constraints, social security could further distort the intertemporal consumption allocation by levying a higher payroll tax on younger generations who face binding borrowing constraints.

Individuals are endowed with one unit of time and supply the labor inelastically. Since all agents in the same age cohort are identical in terms of preferences, individual heterogeneity is present

[5] There is evidence that the migration behavior of retirees is not homothetic with respect to age with the out-migration in the early 60s age group accompanied by significant return migration in the 70s and 80s age groups. Frey (2007) has recently estimated that more people aged 75 and older moved from the South to the Midwest between 2000 and 2005.

[6] With perfect annuity markets, each individual does not leave unintended bequests. However, the social security system substitutes partially for the missing annuity system and reduces unintended bequests.

only across age cohorts with respect to labor productivity and wage income depends on the individual's productivity, which is assumed to be identical across regions. However, wage income might differ across regions because the wage rate per unit of effective labor is region specific due to the partial labor mobility. Because of wage differences by age, the individual life cycle of an individual is described by a hump shaped income profile. The individual agent starts to work at age 21 and receives the highest wage income during his/her middle age. Retirement terminates the flow of wage income and entitles the individual to pension benefits. As a result of the uneven pattern of wage rates over their working lifetime and borrowing constraints, individuals save during middle aged working periods and dissave in retirement, which results in uneven distribution of wealth by age cohorts.

The working population in the model age comprise the groups from 1 to 44 (age 21 to 65) is and is assumed to be partially mobile across domestic regions. The net out-migration of labor is determined by the wage elasticity of labor migration.

$$M_t^w = POP_t^w (1 - \frac{w_t^{CHI}}{w_t^{ROUS}})^{\eta} \tag{1}$$

where M_t^w denotes the number of net out-migration of labor at time t, POP_t^w is the aggregate stock of labor given at the beginning of time t, w_t^{CHI} and w_t^{ROUS} are the wage rates in Chicago and rest of the U.S. (ROUS), and η refers to the wage elasticity of labor migration.

The stock of effective labor L_e is defined as the number of net workers $\left(N_t^w\right)$ times their corresponding productivity level (e_j).

$$\begin{aligned} L_{e,t} &= \sum_{j=1}^{44} (POP_{j,t}^w - M_{j,t}^w) e_j \\ &= \sum_{j=1}^{44} N_{j,t}^w \cdot e_j \end{aligned} \tag{2}$$

Retirees aged over 65 are assumed to migrate from one region to the other region with an exogenously given rate ε where M_t^R and POP_t^R are the number of retiree migrants and total retirees population at time *t*, respectively.

$$M_t^R = \varepsilon \cdot POP_t^R \tag{3}$$

3. Increasing Immigrants

The issues surrounding international immigration has become one of the most debated topics because it has both positive and negative impacts on the host economy. One of the biggest costs that immigration may create would be through adverse effects on the local labor market by crowding out; increased immigration could reduce wages and exhaust employment opportunities for native workers, especially for those who are young and have low skills. Also, high income disparities could be generated due to the large decline in the income of low-skilled workers. On the other hand, however, immigration fundamentally changes the age structure, and may be very helpful in contributing to a solution to the demographic imbalance caused by an aging population. Also, one of the most common arguments in favor of immigration is that it will significantly alleviate the potential insolvency problem of the social security program because immigrants pay social security tax, and usually have no parents in the country who are currently drawing on the system. Of course this assumes that the immigrants participate in the formal economy (whether they are legal or not) and thus contribute through direct and indirect taxes.

Over the past decade, about 800,000 legal immigrants have been newly admitted in the United States every year, according to the Department of Homeland Security. Among U.S. states, Illinois has long been a major immigrant settlement place as the fifth leading immigrant-receiving state. It has admitted nearly 0.4 million legal immigrants in the last decade, an average of 40,000 immigrants per year. The cumulative total of legal immigrants in Illinois between 1965 and 2002 was estimated to be 1.3 million. In addition, according to the Immigration and Naturalization Service (INS), over 0.4 million illegal immigrants reside in Illinois, and most of them are concentrated in Chicago region. Among these immigrants, more than three-fifths (64.7 percent) of all immigrants since 1993 came from Mexico, Poland, India, Philippines, former Soviet Union, and China. Mexico alone accounted for nearly one-quarter of all new immigrants (24.8 percent). This influx of new immigrants will account for a much more significant share of the Chicago's population in the next decade; now, the Latino population of Chicago slightly exceeds that of the African-American population and is growing more rapidly as a result of higher rates of natural increase as well as through in-migration (including both interregional and international contributions).

Simulations for impact analysis are conducted through the following three scenarios, which are differentiated by the size of immigrants for both regions; Chicago and rest of the U.S. Scenario 1 assumes that each region admits new immigrants amounting to 0.6 percent of the regional population every year, which is equivalent to the historical average of immigrants entering the Chicago region between 1993 through 2002. Scenario 2, in contrast to the first scenario, assumes that only the Chicago region admits more immigrants, while the rest of the US fixes the share of immigrants at 0.6 percent. That is, in Scenario 2, the proportion of newly admitted immigrants into Chicago region is adjusted to 1.2 percent of the population, or about 0.1 million per year.[7] Scenario 3 assumes that the local government for Chicago adopts more favorable immigration attraction policies whereby the number of annual immigrants entering the Chicago region increases to 1.5 percent of its population, or about 0.12 million per year. According to these scenarios, the dependency ratio [the percentage of the dependent old age populations (those ≥65) to the population in the working age groups (between 15 and 64)] in the Chicago region is expected to be substantially reduced over the next several decades. For example, without immigration, the model projects a significant increase in the dependency ratio from 19 percent to 32 percent over the next 30 years, whereas new immigrants associated with Scenario 3 contribute to dropping the dependency ratio in the 2030s to 19 percent, about the same level (in 2005) as before the impacts of an aging population. Taking into account the characteristics of immigrants, who are assumed to be younger and lower-skilled than the resident population, newly admitted immigrants are assumed to be equally distributed between the ages of 21 and 35, and whose average productivity is about 60 percent of the peak at 47 years of age. The baseline Scenario, whose results are compared with Scenario 1 through 3, assumes an aging population with no immigration.

4. Results

The main results for the simulations will now be presented and interpreted. Figures 1 and 2 provide plots of the transitional profiles for the capital/labor ratio and wages, respectively. Initially, the inflow of young immigrants lowers the capital/labor ratio that in turn contributes to

[7] Storesltten (2000) found that the minimum number of immigrants required to balance the fiscal budget is 1.08 percent of the population in the US.

decreases in wages. However, after the initial period, the fall in the capital/labor ratio corresponding to accumulating immigrants begins to decrease and ceases its downward trend around 2040, about five years earlier than the case of baseline (no immigration). After 2040, the wages under favorable immigration remain higher than the baseline case. This result is somewhat counter-intuitive because large immigration should be expected to exert a strong downward impact on wages. One possible reason for this result is because the first immigrants start to retire in the early 2040s, resulting in an increase in the capital/labor ratio. However, there are two more important factors at work for this result to happen. The first factor is that the more immigrants that are admitted, the more native workers can save since immigrants will significantly reduce the social security tax burden (by increasing the after-tax income of native workers). Next, at the time of immigration, it is assumed that the capital does not flow into the host country with immigration, but once immigrants start to work and acquire the higher levels of productivity, they can accumulate more savings, thereby increasing aggregate capital stock. This is a critical assumption, especially as it pertains to the second and succeeding generations of offspring from the original immigrants

<<insert figures 1 and 2 here>>

These dynamic changes of the capital/labor ratio over the transition period might imply different effects of immigration between the short run and the long run. Figure 3 shows how the regional output would be changed by immigration streams over time. According to the simulation results, an increase in immigrants appears to have more positive impacts on regional output growth. For example, in the case of the maximum contribution by the most favorable policy (Scenario 3), the Chicago region appears to grow annually by 0.9 percent between 2005 and 2070, while without immigration it will face negative growth (-0.2 percent per year) over the same period due to the effects of an aging population. This result can be fully expected because immigration provides a positive labor supply shock to the local economy. However, the transitional profile of per capita GRP is not similar to that of aggregate GRP as shown in figure 4. During the initial period, relatively larger immigration, in Scenarios 2 and 3, keeps the per capita GRP remaining at a lower level than that of the baseline case because the immigration increases (by assumption) only the supply of low skilled workers. However, after 2030s, when the first immigrants really begin to acquire higher levels of productivity, per capita GRP assumes an upward trend and grows faster than the baseline case. This positive trend also substantially contributes to reducing the

decline of per capita GRP under an aging population. For example, between 2005 and 2070, negative 5.5 percent of per capita GRP growth under an aging population is reduced to, raging from negative 2.6 percent in scenario 1 to negative 1.9 and negative 1.2 percent in scenario 2 and 3, respectively. Figure 4 reveals that the GRP share of the national GNP for the Chicago region noticeably increases from 3.0 percent to around 3.5~4.0 percent in Scenario 2 and 3 because both scenarios assume a relatively higher share of immigrants are admitted only in the Chicago region.

<<insert figures 3, 4 and 5 here>>

The projected effect on the social security tax rate is shown in figure 6. Not surprisingly, a larger number of working-age immigrants appears to have significant downward impact on the social security tax rate. Thanks to this downward pressure, in 2050, the social security tax rate is projected to return to the level established before the impacts of an aging population. This is one of the most significant benefits generated from immigration. However, on closer look, the benefit for social security system is reversed when the immigrants start to retire. After 2050, the social security tax rate starts to increase and eventually converges to around 9 percent which is higher than the rate expected under no immigration. This result reveals that in the longer run, immigration could generate a different impact; as immigrants age, like everyone else, a sustained policy of immigration has little long-run impact on the age structure of the population, and thus its benefit declines. Another important policy implication, especially for local government, arises from the different stance on immigration between federal and local governments. In case of Scenario 2 and 3, only the Chicago local government optimistically attracts more immigrants than the national average. However, the social security tax rate changes insignificantly because the additional working-age immigrants in Chicago region are not of a significant size to decrease the tax rate which is influenced by changes in the national population. Therefore, locally increased immigration may only hurt the local labor market without generating additional tax benefits. This is an important point; local autonomy in the case of a small region has limited impact on national policy that in turn could affect the outcome in Chicago.

<<insert figure 6 here>>

Figures 7 and 8 present the effects of immigration on both income and asset distribution, respectively. Immigration turns out to have a negative impact on equality in terms of income

distribution, i.e., the income Gini coefficient becomes larger as more immigrants are admitted. This can be explained by the following two reasons. First, younger, lower income groups substantially rely on labor income, while middle-aged populations earn larger incomes from both asset holdings and labor earnings. Thus, the younger populations become relatively poorer as more immigrants decrease wage income, whereas richer, middle-aged populations are not much affected by the immigration because they earn larger capital income thanks to the increases in the interest rate. The second reason is closely related to the change in the demographic structure associated with immigration. Before the first immigrants start to retire around 2040s, the share of the population with larger income increases relatively faster than the younger and older poor populations because more immigrants acquire higher skills and become richer. This structural change in population increases the aggregate income gap between the middle-aged, richer population and poor, young and old populations. However, after 2040s, since wages start to increase and immigrants starts to retire, the Gini coefficients in all immigration scenarios start to fall. In contrast to the income distribution effect, immigration improves the equality of asset distribution until the mid 2030s, i.e., the asset Gini coefficient falls. However, the effect of immigration on asset distribution is reversed during the subsequent period. Basically, immigration has an upward pressure on the asset Gini coefficient since it increases the asset holdings of the wealthiest group without significant changes in asset holdings of younger generations who face liquidity constraints. However, in the initial period, the increasing number of younger populations associated with new immigrants drives the asset Gini coefficient down, reflecting the reduced gap of the aggregate asset between middle-aged, wealthy population and the younger, poor population.

<<insert figure 7, 8 here>>

Figure 9 shows how the welfare effects of the immigration vary over the transition periods.[8] The welfare benefit is measured by a consumption equivalent variation (EV),[9] which computes the consumption change required to keep the expected utility in the initial condition equal to that

[8] Welfare effects of the policy reforms between steady states, which does not consider the welfare changes during the transition periods, are reported in the policy mix.

[9] Equivalent variation is calculated as $EV = \left(\frac{v(a, j, t+1)}{v(a, j, t)} \right)^{1/(1-\gamma)}$, where '$a$' is asset holdings, '$j$' is age, and '$t$' is time

achieved in the new condition under immigration policies. Given the form of the utility function, a positive (negative) EV implies that the long term benefit (cost) in terms of welfare would be provided as a result of more favorable immigration policies. According to the simulation results, the current young populations appear to be big gainers of the favorable immigration policy. The rationale for this is that even with the wage declines in the initial period, the prospect of higher disposable income for the rest of their lives obtained by both increased interest rates and reduced social security tax outweighs the negative effect from the wage loss. This is good news for current young generations. However, unlike the assumption of this model, if more immigrants fail to adapt to conditions in the host region's labor market, and thus, remain lower skilled workers, then immigration cannot make a sufficient contribution to increasing tax contributions.

<<insert figure 9 here>>

The last five figures, figures 10 through 14, show how the increase in the number of immigrants affects the economy of the Rest of the U.S. Like the Chicago region, the immigration fundamentally changes the age structure of rest of the U.S., and is generally helpful in solving the economic growth problems of an aging population. However, it appears that the immigration policy of the Chicago region has only a marginal effect on the economic growth and welfare of rest of the U.S. Of course, this result is due to the relatively modest size of the Chicago region compared to rest of the U.S. Thus, the reverse is not true as shown in Scenario 1.

<<insert figures 10-14 here>>

5. Evaluation and Conclusions

As with any model, the interpretation of the results is rooted in the reasonableness of the assumptions. For an economy that is small relative to the nation (although still large in absolute terms), the outcomes in terms of enhanced flows of immigrants are variable. The results provide insights into the complexity of the immigration debate and why it is so difficult to navigate a policy outcome that is consistent in the sense that it provides either continuously positive or negative outcomes over time. Consider the impacts on wages; initially and not surprisingly, wages fall as a result of increased immigration. This finding is consistent with an equilibrium view of a market receiving a supply shock and a fall in the capital/labor ratio; but after 2040, the effects appear to be reversed. One reason for this can be traced to the retirement of the first wave of immigrants but more importantly, increasing numbers of immigrants will provide

contributions to taxes that will reduce the social security tax burden and thus increase the after-tax income of native workers. Over time, the model assumes that immigrants and their offspring begin to accumulate skills in such a way that they become undifferentiable from the native population. In terms of regional macroeconomic impacts, immigration would appear to reverse a projected decline in gross regional product that would occur essentially as a result of an aging population with no stimulus provided by immigration. However, in per capita GRP terms, the positive effects only occur once the immigrants (cumulatively) acquire skills to elevate their productivity levels. The Chicago region, under an asymmetric immigration policy (Chicago gains more immigrants as a percentage of its base population than the US as a whole), actually increases its share of Gross Domestic Product.

One might expect that, given these findings, the effect on the social security tax rate would be "positive" in the sense of either muting increases or actually decreasing the rate. This is true until the immigrants start to retire in significant numbers after 2050; this result stems from the fact that over time, the impacts of immigration begin to diminish – a finding that is revealed in the results for the US as a whole.

In this paper, it is assumed that consumers are forward looking and have the capacity to adjust their consumption to anticipate needs in retirement. However, little has been said about the optimal policy strategy for a region such as Chicago. Does it make sense to adopt a pro-active immigration policy? Given the findings, is there some imperative to increase the immigration rate over time or is their some long-run optimal level? This part of the analysis is incomplete; further, it would be unrealistic to explore the issue without consideration of the expected structural transformation of the economy. Beyond 2050, confidence is forecasts must be more heavily depreciated but they cannot be ignored because there appears to be an important turning point in the welfare implications during the 2030-2050 period. Clearly, this is an area where more intensive analytical fine-tuning needs to be accomplished; what is not in dispute, however, is the importance of skill acquisition and the enhancement of productivity levels in the immigrant populations and their offspring.

References

Auerbach, A.J. and L.J. Kotlikoff, 1987. *Dynamic Fiscal Policy*. Cambridge, University Press.

Denton, F.T. and B.G. Spencer (2005) "Population aging and the macroeconomy: explorations in the use of immigration as an instrument of control," *Quantitative Studies in Economics and Population Research Report* 398, McMaster University, Hamilton, Ontario, Canada.

Frey, W. (2007) Quoted in article "'Boomerang' seniors back to frost belt," *Chicago Tribune*, July 14.
http://www.chicagotribune.com/news/nationworld/chi-returnees_14jul14,1,5409982.story

Park, S and G.J.D. Hewings, (2007b) "Does a Change in Retirement Age Affect a Regional Economy? Evidence from the Chicago Economy," *Discussion Paper* 07-T-6, Regional Economics Applications Laboratory, University of Illinois, Urbana, www.real.uiuc.edu

Park, S. and G.J.D. Hewings (2007a) "Aging and the Regional Economy: Simulation Results from the Chicago CGE Model." In A. Bayar (ed) *Regional General Equilibrium Modeling: The State of the Art*. Heidelberg, Springer (forthcoming).

Plane, D.A. (1992) "Age-composition change and the geographical dynamics of interregional migration in the U.S., *Annals of the Association of American Geographers* 82, 64-85.

Plane, D.A. and F. Heins (2003) "Age Articulation of U.S. Inter-metropolitan Migration," The *Annals of Regional Science* 37, 107–130.

Roseman, C.C. (1971) "Channelization of Migration Flows from the Rural South to the Industrial Midwest," *Proceedings, Association of American Geographers*, 3, 140-146.

Yoon, S.G. and G.J.D. Hewings, (2006) "Impacts of Demographic Changes in the Chicago Region," *Discussion Paper* 06-T-7, Regional Economics Applications Laboratory, University of Illinois, Urbana, www.real.uiuc.edu

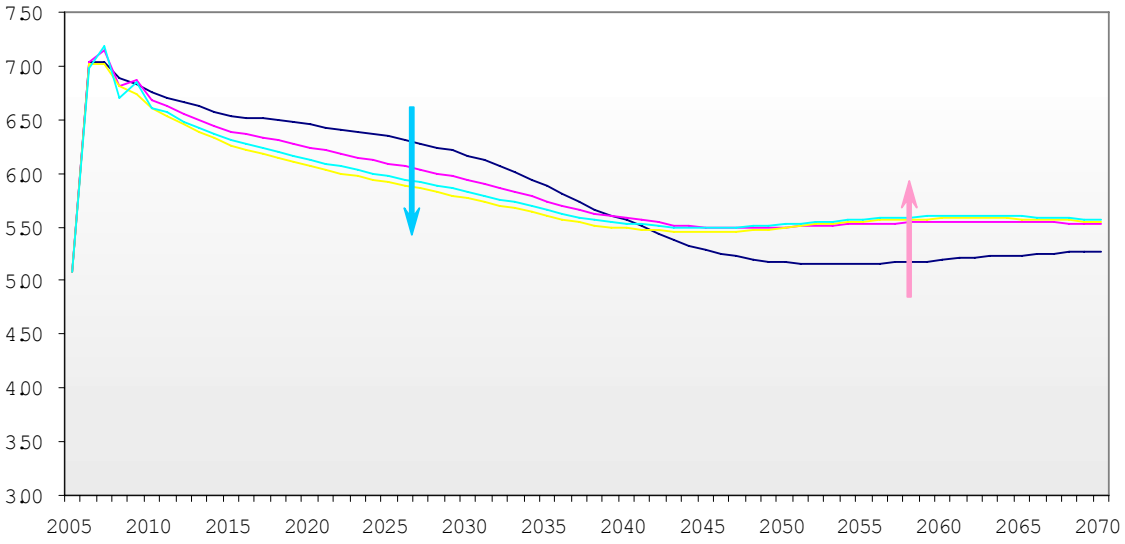

Figure 1: Capital/Labor Ratio (Chicago)

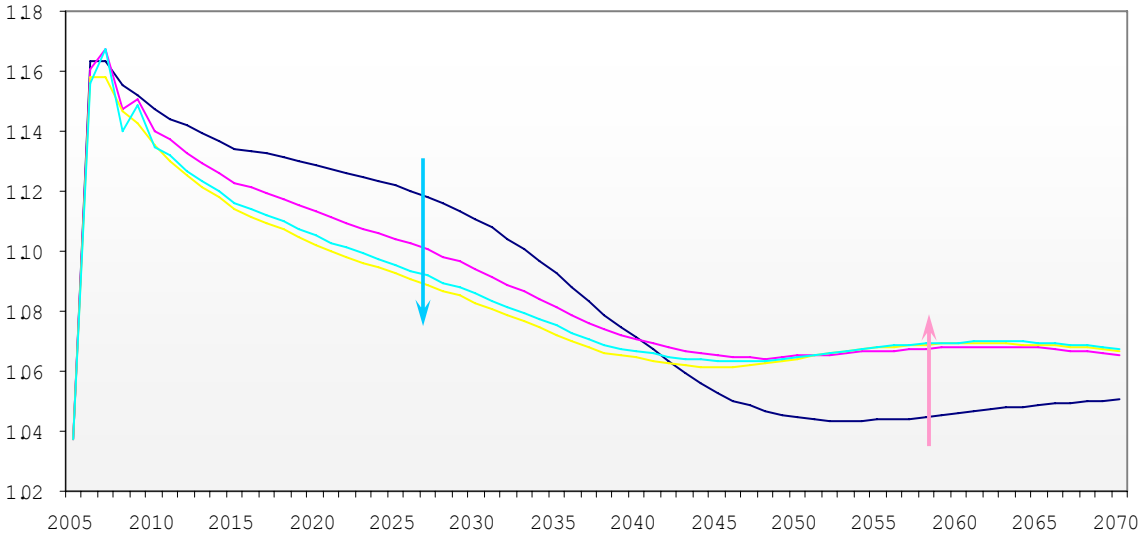

Figure 2: Wages (Chicago)

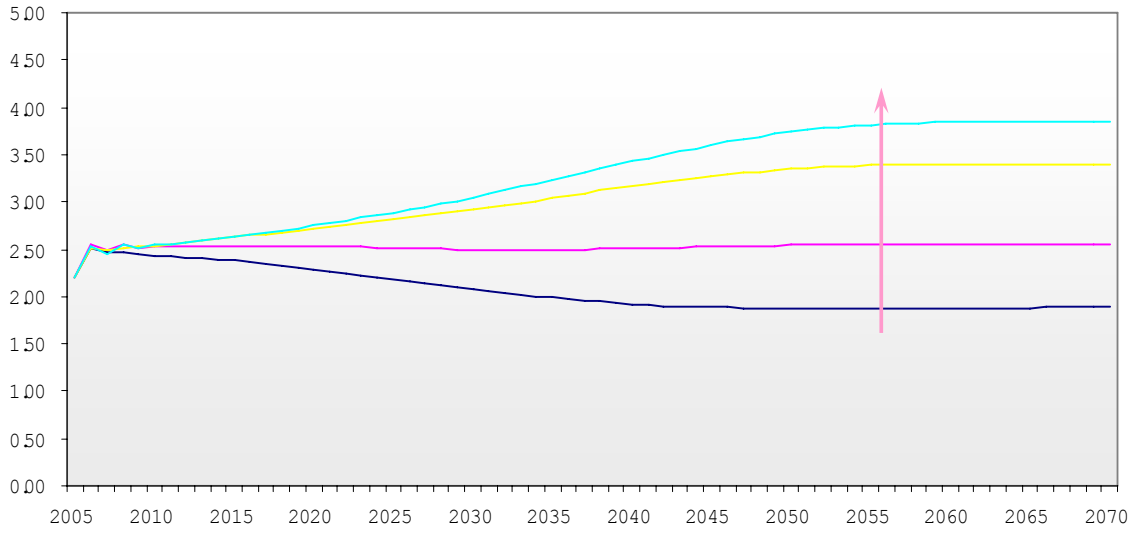

Figure 3: GRP (Chicago)

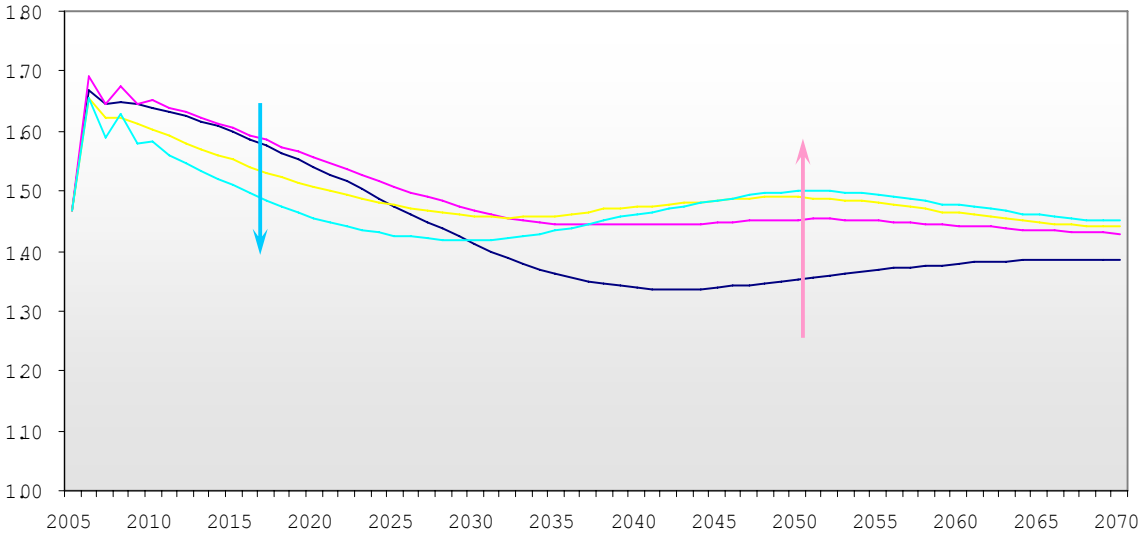

Figure 4: Per Capita GRP (Chicago)

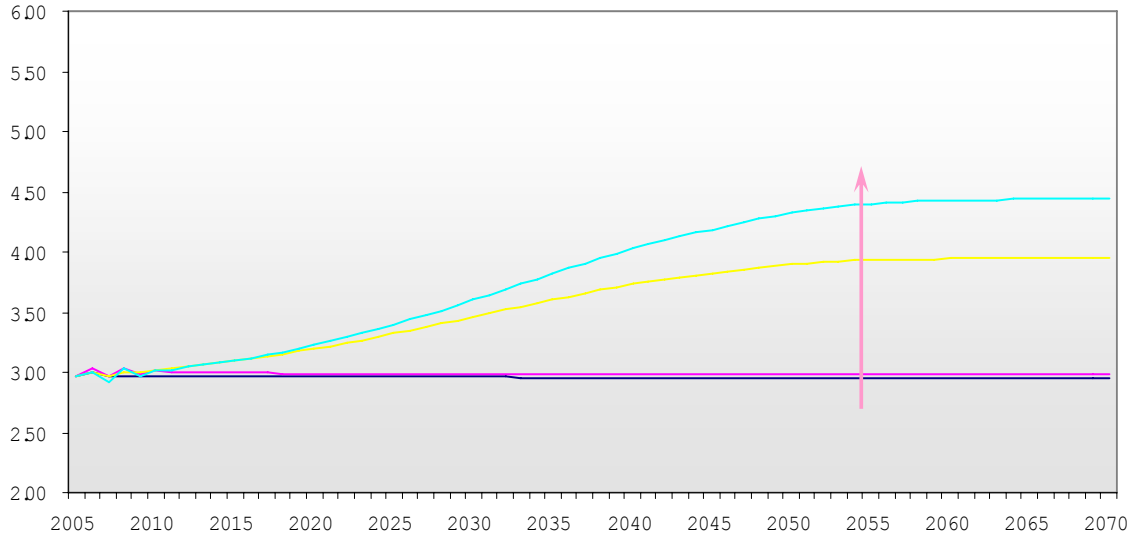

Figure 5: GRP Share (Chicago)

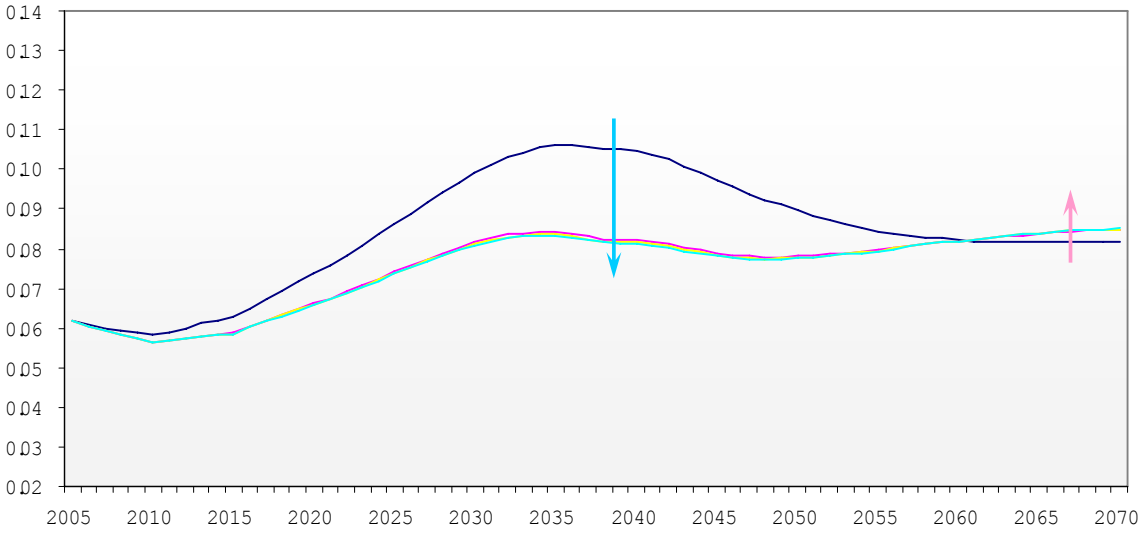

Figure 6: Social Security Tax Rate

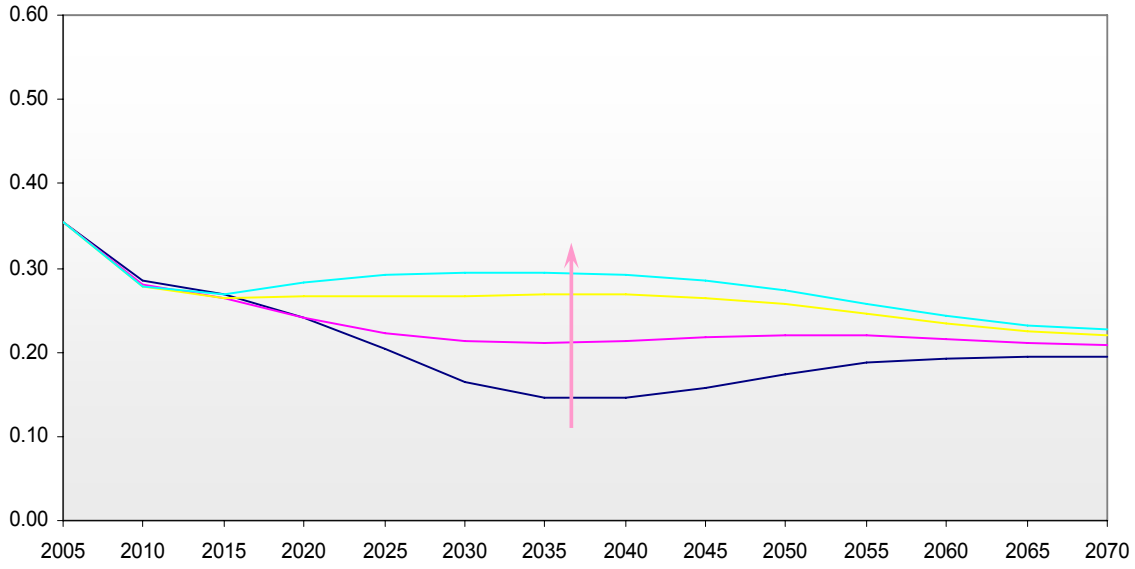

Figure 7: Income Gini Coefficient (Chicago)

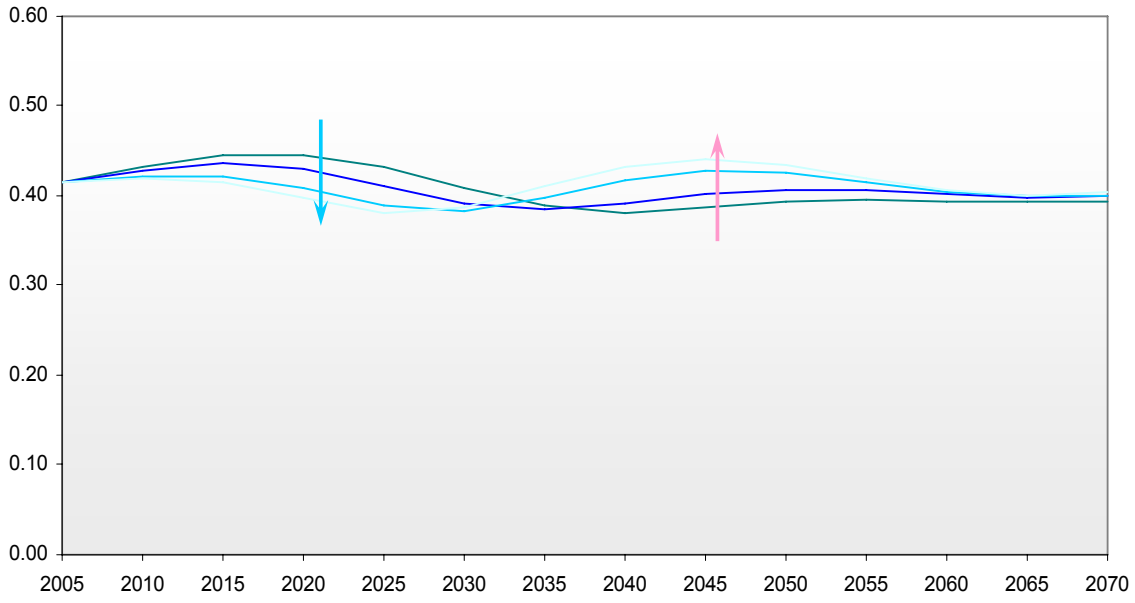

Figure 8: Asset Gini Coefficient (Chicago)

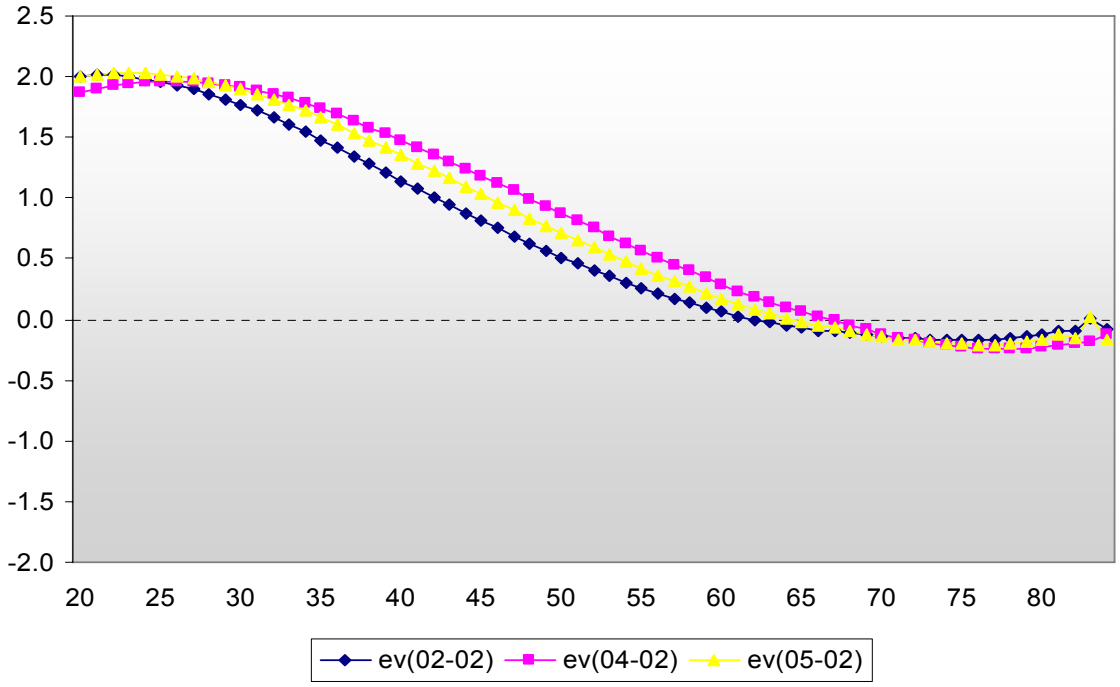

Figure 9: Equivalent Variations (Chicago)

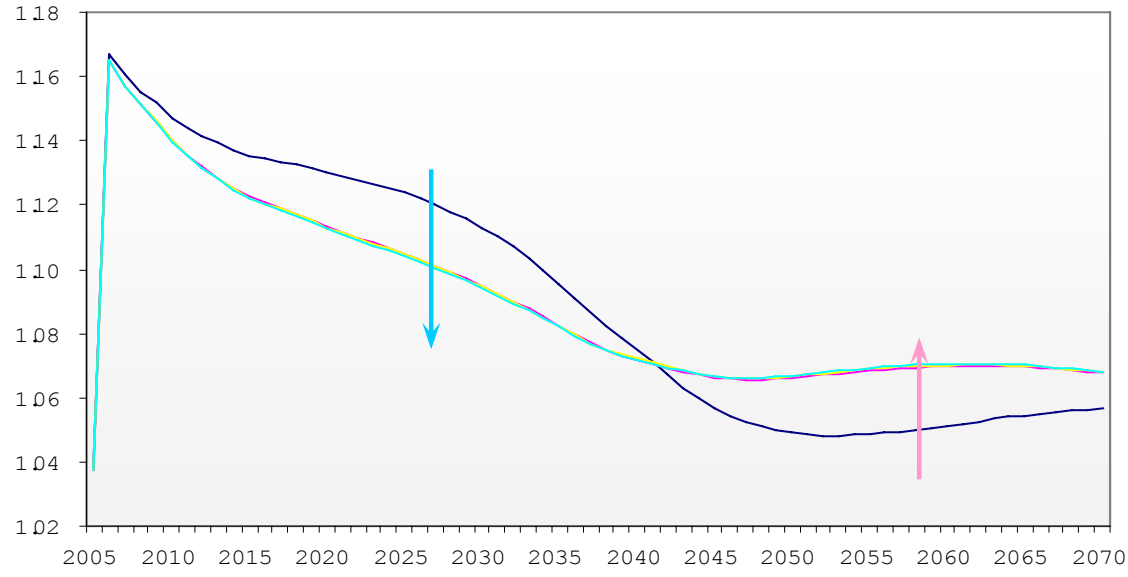

Figure 10: Wages (ROUS)

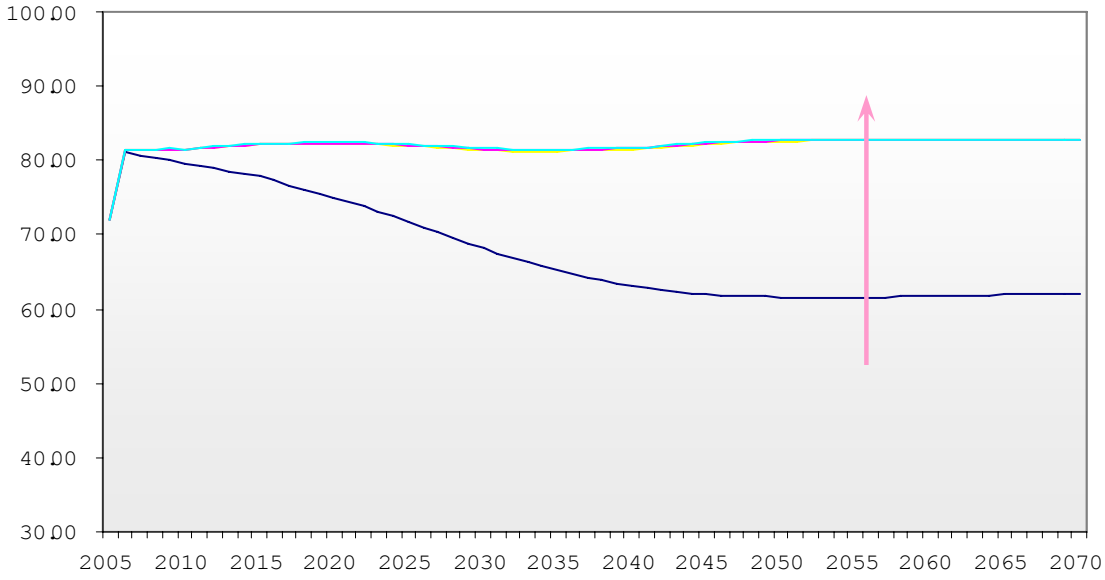

Figure 11: GRP (ROUS)

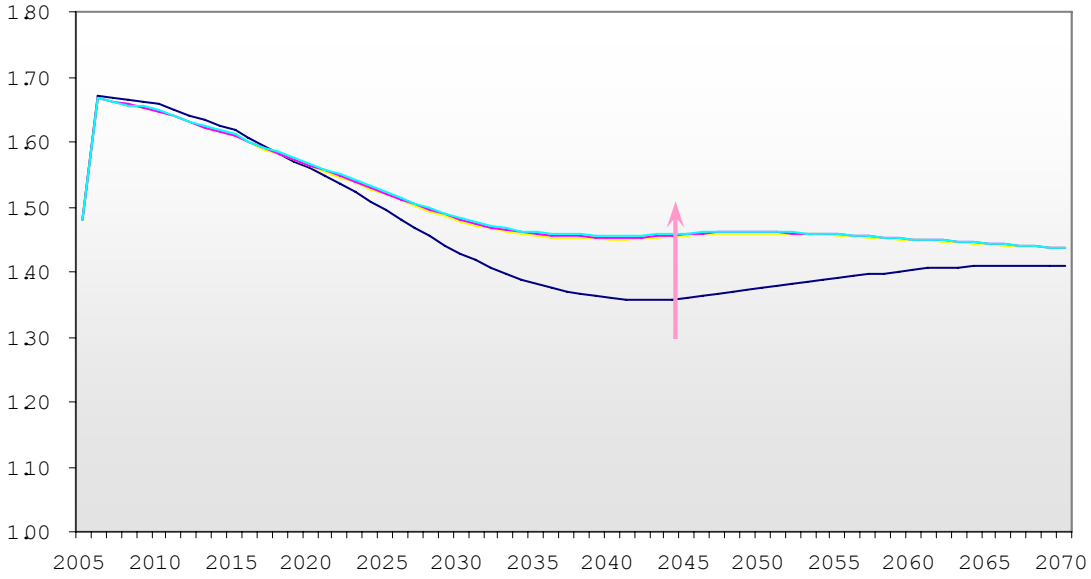

Figure 12: Per Capita GRP (ROUS)

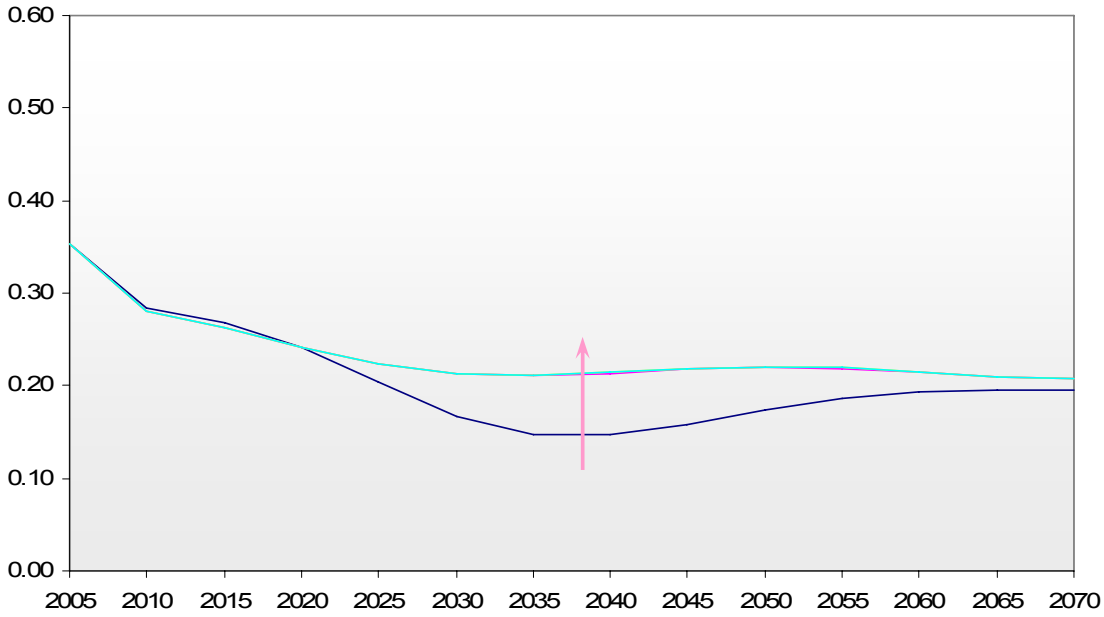

Figure 13: Income Gini Coefficient (ROUS)

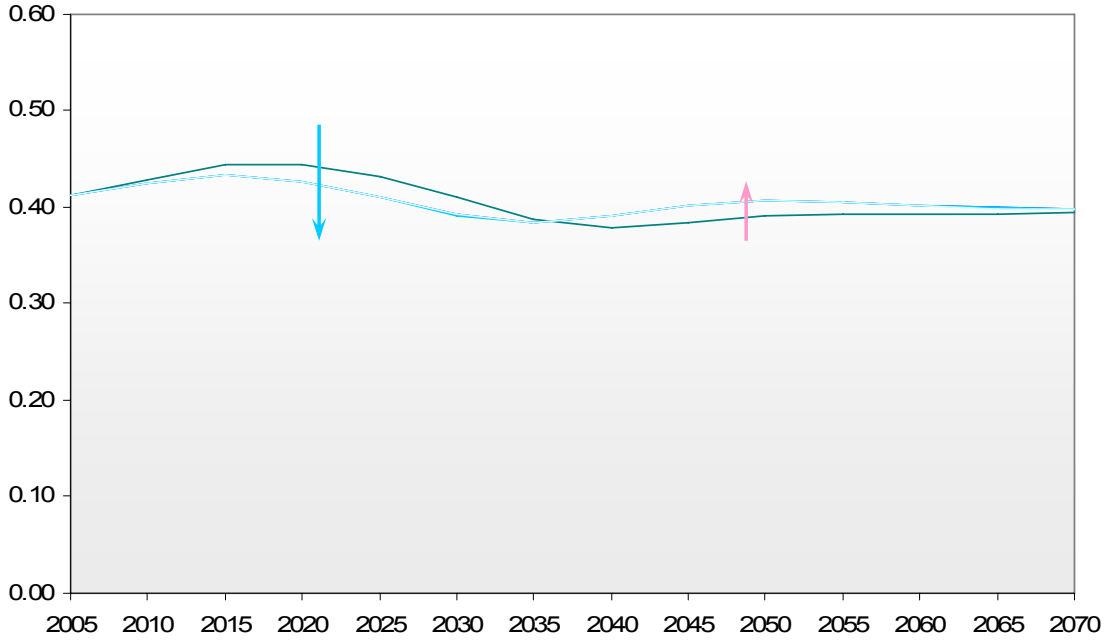

Figure 14: Asset Gini Coefficient (ROUS)