

## **Spain: Selected Issues**

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Price: \$15.00 a copy

**International Monetary Fund  
Washington, D.C.**



INTERNATIONAL MONETARY FUND

SPAIN

**Selected Issues**

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Approved by the European Department

January 21, 2005

As background to the 2004 Article IV Consultation, this Selected Issues paper contains two studies examining key issues for fiscal management and long-run fiscal sustainability in Spain:

- The first study discusses how best to ensure fiscal discipline at lower levels of government by examining the institutional setting and mechanisms that make this task particularly challenging in Spain’s highly devolved political and fiscal system. Drawing also from international experience, the paper concludes that there are nonetheless various means that could play a useful role in this regard, such as: enhancing the publication of timely and comprehensive data on sub-national fiscal outcomes; containing sub-national borrowing; extending expenditure limits to the sub-national level; promoting greater reliance on local taxes to finance discretionary expenditure; and providing incentives to reward regions that save during good times, including by encouraging the constitution of “rainy day funds.”
- The second study seeks to analyze the potential macroeconomic impact of different approaches to deal with the fiscal costs of aging in Spain—where life expectancy has increased the most and the birth rate has fallen more abruptly than elsewhere in Europe. The study goes beyond measurement of the fiscal impact per se, using a general equilibrium overlapping generation model to examine the trade-offs of alternative policies. It concludes that while “pre-funding” the demographic shock by running down debt clearly helps to moderate the shock’s consequences, it does not obviate the need for pension reform—even under optimistic immigration scenarios. The most beneficial strategy is one that combines pre-funding and parametric reforms, with early implementation helping to lessen adjustment costs.

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## I. FISCAL DISCIPLINE AT LOWER LEVELS OF GOVERNMENT: THE CASE OF SPAIN<sup>1</sup>

1. **Over the last twenty years, Spain has reached a very high degree of fiscal decentralization.** In 1985, sub-national governments accounted for 14½ percent of expenditure; in the 2005 budget, the same figure is around 49 percent. This is among the highest in industrial countries. Excluding social security and debt service, the central government will control less than 30 percent of public expenditure in 2005.
2. **Such a high level of devolution poses challenges for the conduct of fiscal policy.** In 2003, 11 of the 17 regional governments ran a deficit despite the fact that the Budgetary Stability Law (BSL, *Ley de Estabilidad Presupuestaria*), which was first applied in that year, mandated a balanced budget or a surplus at the sub-national level. While the total regional deficit remained relatively contained in terms of national GDP, the relatively widespread violation of the budget target in the first year of the law's application is seen by the government to raise questions about the framework's effectiveness in ensuring fiscal discipline. The government is thus reconsidering the present legal framework, with a view to increasing ownership and observance by the regions, as well as providing explicit room for countercyclical action. In addition, the present regional financing system is being revisited, with some regions claiming that public health expenditure, which was fully devolved to all regions as from 2002, is under-funded, especially going forward.
3. **This paper analyzes various aspects of regional fiscal finances in Spain.** The first part of the paper describes the institutional framework, including the constitutional provisions on fiscal regional autonomy, the laws regulating regional budgets, and informal but all-important operating rules. The second part highlights the characteristics of the regional business cycle in Spanish regions compared with other European economies. The third section summarizes the experience of other countries in monitoring sub-national borrowings. The last section discusses some possible approaches to ensuring fiscal discipline at lower levels of government in Spain.

### A. Institutional Framework

4. **The process of fiscal devolution in Spain, which started with the promulgation of the Constitution in 1978, has been driven largely by political considerations.** After a period of strong centralization during the Franco regime, the prevalent view within Spanish society was that the new democratic state should be characterized by a decentralized organization. The new Constitution enshrined the classical principles of federal democracy: the competences of the central government and the autonomous communities (*Comunidades Autónomas*, henceforth CCAA or regions) are clearly determined, locally elected representatives govern the CCAA, and the Constitutional Court resolves possible conflicts

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<sup>1</sup> Prepared by Antonio Spilimbergo (FAD).

between the central government and the CCAA. The federal political organization enshrined in the Constitution has important economic implications.

5. **The Constitution clearly specifies expenditure responsibilities.** The Constitution specifies that CCAA may assume competence in several areas including education, health, public works in their territory, and the environment.<sup>2</sup> The central government has exclusive competence in a set of functions, which include, inter alia, general coordination of economic activities, general finance and public debt, regulation of the financial markets, and the monetary system (Article 149 of the Constitution). Article 149 also states that: (i) any matter that is not defined by the Constitution as reserved to the central government belongs to the CCAA as stipulated in their respective Statutes of Autonomy (*Estatutos de Autonomía*); (ii) all matters not envisaged by the Statutes of Autonomy shall belong to the central government; and (iii) central government legislation shall be supplementary to CCAA's laws and prevail in cases of conflict.<sup>3</sup>

6. **In contrast to the exhaustive list of expenditure responsibilities, the Constitution sets only general principles on the financing of CCAA:**

- *Financial autonomy.* Article 156 enshrines the principle that CCAA must enjoy financial autonomy for the exercise of their functions. This principle is the legal basis for the devolution of taxes and for the existence of transfers to regions.
- *Financial solidarity among regions.* This principle, enshrined in Article 2, must be guaranteed by the central government (Article 138), and provides the legal basis for the solidarity or sufficiency fund.
- *Coordination.* Article 156 specifies that the right to fiscal autonomy must be exercised in conformity with the principle of coordination with the central government Treasury and in solidarity with other CCAA.
- *Limit to tax autonomy.* The Constitution also establishes that the legal power to establish taxes belongs exclusively to the central government (Article 133). Consequently, the CCAA may establish and levy taxes only within the limits established by the

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<sup>2</sup> Recognizing the different aspiration and preparation for autonomy in different CCAA, the Constitution envisioned different speeds of devolution of fiscal responsibilities in different regions. Since the devolution of health expenditure to ten remaining regions January 2002, all regions have the same expenditure responsibilities.

<sup>3</sup> See fiscal Report on the Oservance of Standards and Codes for Spain (hereafter ROSC, 2005) for a detailed account of the legal framework regulating the fiscal operations of the central government and CCAA.

- Constitution; in particular, CCAA cannot tax properties outside their jurisdiction, or levy taxes that hinder trade (Article 157), and taxes must be based on the principle of equity and progressivity (Article 31). Finally, CCAA cannot impose taxes on goods already taxed by the central government.

The implementation of these general principles was left to organic and ordinary laws.<sup>4</sup>

7. **The asymmetric treatment of expenditure responsibilities, which are clearly detailed by the Constitution, and their financing, which is regulated only by general principles**, has created an ‘institutional’ need for a periodic reconsideration of the financing agreements between the central government and the CCAA. After a transitory period between 1979 and 1986, the central government and the CCAA have regulated their financial relationships every five years in the institutional setting of the Fiscal and Financial Policy Council (*Consejo de Política Fiscal y Financiera*; FFPC hereafter).<sup>5</sup> The latest agreement, concluded in 2001, differently from the past, was intended to be permanent.

8. Against this backdrop, **in order to consolidate the fiscal stabilization undertaken in the late 1990s, the government enacted the Budgetary Stability Laws** (*Ley de Estabilidad Presupuestaria, Ley 18/2001*; and the Organic Law 5/2001; BSL, hereafter), which introduced the principle that the central administration (defined as the central

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<sup>4</sup> The Organic Law on the Financing of the Regional Governments (LOFCA, *Ley Orgánica de Financiación de las Comunidades Autónomas*) of 1980, which was revised in 2001, provides the latest legal framework for CCAA financing. The approval or modification of Organic Laws, which are regulated by Article 81 of the Constitution and concern fundamental rights, require an absolute majority in a final vote of the entire bill.

<sup>5</sup> Formally, the FFPC, which was established by LOFCA in 1980, is only a technical and consultative body composed by economic ministries of the central government and representatives of the CCAA. In practice, the FFPC takes all decisions concerning the financial relationships between the central government and the CCAA. The decisions are taken by qualified majority in which the representatives of the central government and the combined representatives from the CCAA have the same weight. The voting patterns often reflect party lines; for instance, the September 1996 agreement for the period 1997–2001 was voted by the central government’s representatives and by representatives of the CCAA in which the governing party was in power, while representatives from Extremadura, Andalucía, and Castilla-La Mancha, which were governed by the opposition, voted against. In contrast, the latest (2001) agreement was voted unanimously by the central government and the CCAA.

government and social security) and the CCAA cannot run a deficit; in addition, the BSL established formal processes to enforce the fiscal stability targets (see below).<sup>6</sup>

9. Under the 2001 agreement, the **sources of financing** for the “common regime” CCAA are:<sup>7</sup>

- *Shared taxes.* The CCAA are assigned the following amounts:
  - a. 33 percent of personal income tax revenues. Moreover, CCAA have the discretion to increase the marginal personal income tax rate. In practice, no CCAA has used this possibility;

In addition, the CCAA may introduce new deductions to the base of the personal income tax. CCAA have used this faculty often, introducing, *inter alia*, deductions to increase natality. However, the revenue consequence of these deductions are estimated to be limited.

- b. 100 percent of the tax on retail sales of hydrocarbon fuels; and
  - c. 100 percent of special taxes on certain means of transportation.
- *Transferred taxes.* CCAA receive the following amount without the possibility of modifying the tax rate or the legislation:
    - a. 35 percent of VAT revenues;
    - b. 40 percent of some excises; and
    - c. 100 percent of taxes on electricity.
  - *Regional taxes.* CCAA have exclusive power to tax gifts and bequests, wealth, legal documents, and gambling wins. Starting in 2002, the CCAA have freedom to set the tariffs and the exceptions for these taxes.

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<sup>6</sup> Note that the BSL contains more specific norms for the central government, including the obligation to set an expenditure limit and to include a contingent line item in the budget, equivalent to 2 percent of total expenditure, to cover unforeseen non-discretionary spending. In contrast, the BSL does not contain expenditure norms for the CCAA. For a more detailed discussion of the BSL see Box 7 of the fiscal ROSC, 2005.

<sup>7</sup> “Common regime” CCAA include all regions with the exception of the Basque Country and Navarre.

- *Transfers from the central government.* The major part of central government transfers to the CCAA is channeled through the sufficiency fund, which is intended to cover the gap between the mandatory expenditures and revenues accruing to the CCAA. The initial amount of the sufficiency fund was calculated as the difference between the estimated cost of the CCAA mandates and revenues calculated in the year 1999. Every year this amount is increased at the same rate as the central government's tax revenues.<sup>8</sup>

$$\text{Sufficiency Fund}_{\text{year } x} = \text{Sufficiency Fund}_{1999} * \frac{\text{central government's tax revenues}_{\text{year } x}}{\text{central government's tax revenues}_{\text{year } 1999}}$$

If the other sources of financing, including own and shared taxes, were larger than a region's expenditure responsibilities, the region is a contributor to the central government's treasury. The amount devolved will be equal to the amount devolved in 1999 (the base year) increased by the rate of growth of the national taxes or the regional taxes, whichever is lower.<sup>9</sup>

The above formula is independent of the actual costs of providing services in the year after 1999. Regions which are efficient and lower the cost of providing the services, can retain the totality of resulting savings in the future.

Finally, the law mandates that the formula regulating the regional allocation of the sufficiency fund should be revised if new expenditure responsibilities or taxes are devolved to the CCAA. There is however no automatic revision after five years, as was customary under the previous agreements. In addition to the sufficiency fund, some CCAA also receive resources from other funds, including the Interregional Compensation Fund (*Fondo de Compensación Interterritorial*), which is the main instrument for regional development and is coordinated with regional transfers from the European Community (Table 2).

**10. The 2001 financing agreement does not include (permanent) floors on regional financing that are tied with the economic cycle.** In contrast with previous financing arrangements, the agreement was seen to be based on full fiscal "co-responsibility." In other

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<sup>8</sup> The year 1999 was chosen, because it was the last available year for which the information was available in 2001 when the agreement was signed. The rules to revise the amount for the sufficiency funds were quite complex, to the point that some observers claim that the technical rules for the determination of the sufficiency fund are simply an ex-post rationalization of political agreements between the central government and CCAA (see Salinas Jiménez, 2002).

<sup>9</sup> Note that this introduces some asymmetry since the CCAA that are net contributors to the fund are able to keep a higher share of resources if regional revenues are higher than expected.

words, the central government and regions would both face the cyclical fluctuations in revenues. **The law established, however, transitory financing floors**, which were not as such designed to provide insurance for the regions against economic downturns. Specifically, it introduced the following:

- Transfers to cover health expenditure would grow at least as much as (nominal) GDP through 2004.
- In its first year of application (2002), no region would receive less financial resources than it did under the previous regime.

11. **The law also provides some compensation for demographic shocks and solidarity.** The former consists of a compensating formula that increases the share of the transfer to regions experiencing population growth substantially larger than that of the national average (*fondo de nivelación*). The solidarity factor established, *inter alia*, that poorer regions—those with income levels below 70 percent of the national average—would see their transfers increase by at least 20 percent more than the national average.

12. Because of historical developments, the **Basque Country and Navarre have a separate financing system** (*régimen foral*). Both regions enjoy considerable freedom in establishing and administering personal and corporate income taxes. Most expenditure responsibilities have been devolved with the only notable exception of pensions, which are still administered by the central social security system. Both regions contribute to the central government with a fixed share of GDP for the general expenditures that remain in the hand of the central government, including defense and nationwide infrastructure.

13. **CCAA may borrow from the financial markets but are subject to the central government's authorization.** Formally, the FFPC establishes, by the first quarter of every year, the borrowing limits for each CCAA for the following three years.<sup>10</sup> In addition, long-term debt may be issued only to finance capital expenditure and the debt burden may not exceed 25 percent of current revenues. However, in practice, the FFPC has set a balanced budget target for every CCAA.

14. **Enforcement mechanisms are weak.** If a CCAA does not comply with the budgetary stability laws it must present a three-year adjustment plan to the FFPC following the year of the violation. However, the central government has only two legal instruments to ensure adherence to the plan: (i) in the event that Spain were to be fined by the European Union for violation—under the excessive deficit procedure—of the Stability and Growth Pact, and that such violation was attributable to regional deficits, the fine would be charged

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<sup>10</sup> In principle, the FFPC may assign a different level of deficit or surplus to each region; in practice, every CCAA has been required to run a balanced budget. In April 2002, the FFPC established that every CCAA should run a balanced budget for the following three years.

to the errant CCAA in an amount proportional to its/their contribution to the excessive deficit; (ii) the central government must consider compliance with the BSL before authorizing the issuance of debt by a CCAA. The first enforcement mechanism is unlikely to be called upon since it is quite improbable that Spain will be fined for running a deficit larger than 3 percent of GDP in the foreseeable future. The second mechanism can be quite easily circumvented as CCAA can create semi-private companies, which are difficult to monitor. In addition, the fiscal outcomes for individual CCAA are available only nine months after the end of the fiscal year, so that adherence to the BSL can be verified only with some delay and a possible adjustment plan can start only about two years after occurrence of the violation.

15. **The formal rules described above are only part of the institutional framework; informal or unwritten practices are as important in determining the functioning of decentralization in Spain.** Informal features are important because the decentralization process has been largely motivated by political considerations as the country moved from a highly centralistic and undemocratic regime toward democracy (Pérez-Díaz, 2004).<sup>11</sup> The main informal features of the system can be summarized as follows:

- **Regional authorities are unwilling to use their power to increase regional taxation.** For instance, no CCAA has used the legal power to increase the marginal rates for the personal income tax. In contrast, all CCAA have used their power to extend deductions to the personal income tax base to particular groups. Moreover, only a few CCAA have used the faculty of imposing a surcharge on hydrocarbon fuels to increase funding for health expenditure.
- **Regional governments seem more subject to pressure of special groups than the national government.** For instance, CCAA are more willing to restrict competition through regulation than the general government. A clear example is the special taxation and the regulation concerning large distribution chains in some CCAA.
- **Regional authorities have close links with the local financial system,** given representation on the board of directors of local saving banks (*cajas*). Though strict regulations avoid direct conflicts of interest, informal avenues of influence remain potentially available.

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<sup>11</sup> The importance of informal rules for the working of institutions has been highlighted by North (1981). Aggressive decentralization as a reaction to a very centralized system is quite common. This may reflect the pent-up demand for direct democracy and the idea that a decentralized political system may provide insurance against the risk of undemocratic relapse. Alesina and Spolaore (2003) review the evidence of the correlation between decentralization and democratization.

- **Timely information on budget execution of individual CCAA is not released.** This lack of transparency is partly due to understandings under which the information is provided to the central government.
- **Scarce interregional labor mobility has limited the scope for the race to the bottom in the provision of public services,** which is the traditional view of decentralization (Oates, 1972), and for welfare enhancing tax competition, which has been highlighted by Brennan and Buchanan (1980).
- **Finally, the central government has at times depended on the parliamentary support of regional parties,** whose main objective is the defense of regional interests.<sup>12</sup> Moreover, regional authorities' votes in the FFPC have tended to reflect, where applicable, nationwide party affiliation rather than pure regional considerations. This political configuration contributes to an unwillingness of the central government to go against its political allies at the regional level.

## **B. Regional Shocks**

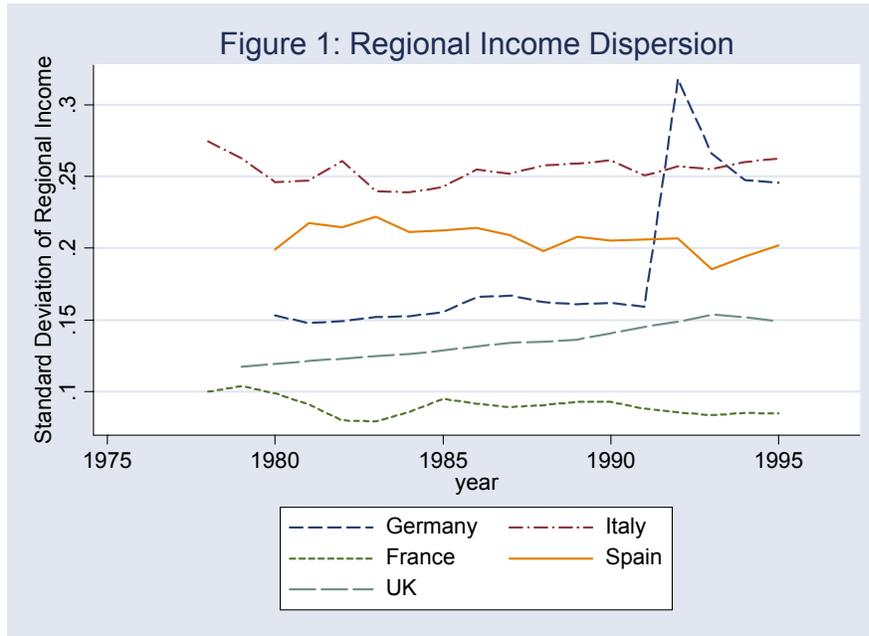
16. **Different institutional frameworks may produce very different outcomes if the economic fundamentals are different.** This section analyzes the extent of regional disparities and regional shocks and their persistence in Spain compared to other large European countries.

17. **Spain presents larger regional disparities, defined as the standard deviation of regional (log) real income per capita, compared to other large European countries.** Figure 1 illustrates the income disparity across regions in Spain, France, Germany, Italy, and the United Kingdom.<sup>13</sup> There is furthermore no clear evidence of convergence in regional incomes over time (Decressin, 2002). In response to this persistent differential, which is viewed as a major challenge for the development of Spain as a whole, an Interregional Compensation Fund was created. The Interregional Compensation Fund is intended to finance public infrastructure and often complements transfers from the European Union.

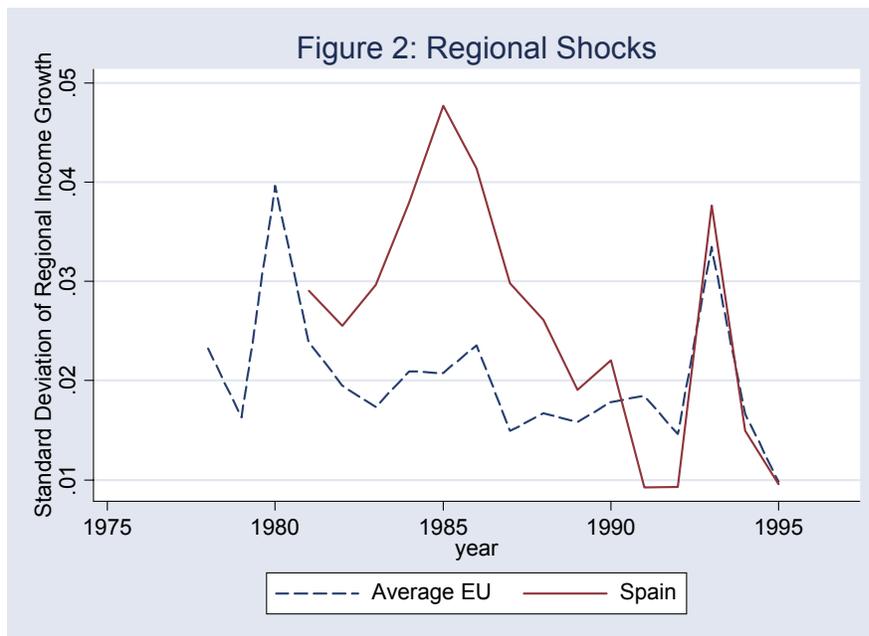
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<sup>12</sup> This is only formally similar to the political situation in Germany in which the Bavarian Christian Democrat party was a fundamental component of the center-right coalition. In the German case, nationwide party ideology is stronger than regional identification while in Spain regional parties do not have nationwide counterparts with similar ideology. In this respect, Spain is more similar to the political setting of contemporary Italy and Canada.

<sup>13</sup> Regions correspond to the NUTS2 classification of EUROSTAT. The sharp jump in the regional income dispersion in Germany reflects the German unification.



18. **In addition to a high degree of regional income dispersion, Spain also exhibits a relatively high volatility of regional incomes.** Figure 2 shows that Spain's regional income shocks, measured by the standard deviation of de-trended regional growth for each year, are among the highest in large European countries.



19. **Despite being relatively large, Spanish regional shocks are not particularly persistent by international comparison.** In order to calculate the persistency of regional shocks, the following regression for the regions of a selected number of large European countries was run:

$$[Growth_{regional} - Growth_{national}]_t = \alpha + \beta[Growth_{regional} - Growth_{national}]_{t-1} + trend_{regional} + \varepsilon_{it}$$

20. The coefficient  $\beta$  measures the persistency of a regional idiosyncratic shock, defined as the difference between annual regional growth and national growth controlling for the regional growth. If the parameter  $\beta$  is close to 1, regions which experienced ‘excessive growth’ with respect to the national average and their own trend will continue to experience higher growth during the following year. The size of the regional shock is the standard deviation of the regional growth in excess of the national average ( $[Growth_{regional} - Growth_{national}]_t$ ). The size of the national shocks is defined as the standard deviation of national income growth; the persistence of national shocks is defined as the coefficient  $\beta$  in the following regression:

$$Growth_{national\ t} = \alpha + \beta Growth_{national\ t-1} + trend + \varepsilon_{it}$$

Table 3 presents the results.

21. **Volatile regional growth does not automatically translate into volatile tax revenues for local authorities.** As is common in other countries, the structure of sub-national taxes has delivered more stable revenues to the CCAA than to the central government.<sup>14</sup>

22. **In summary, Spanish regions exhibit large and lasting disparities in terms of income per capita, and a high volatility of regional growth, but a comparatively low persistence of these idiosyncratic shocks.** This is consistent with a fair amount of regional specialization, with some regions highly specialized in tourism and others in agriculture. At the same time, this specialization may explain the comparatively temporary nature of the shocks, since agriculture and tourism are more subject to temporary weather-related shocks than sectors such as manufacturing. The scarce persistence of local shocks would suggest a potential role for “rainy day funds” in the CCAA (see below).

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<sup>14</sup> The calculation of the relative variability of tax revenues at the CCAA and central government levels is complicated by the fact that the taxes assigned to the CCAA have changed over time. For this reason, simple extrapolation from the past could be only indicative of future volatility. The experience of countries with a long tradition of decentralization, such as the U.S., suggests that the base of local taxes tends to become more volatile over time as the importance of local consumption based taxes diminishes.

### C. International Comparison

23. The purpose of this section is to evaluate Spain's decentralization vis-à-vis international experience. Spain's decentralization is notable for a number of reasons:

- **Decentralization, measured as share of sub-national spending in general government spending, has proceeded more aggressively in Spain than in other countries:** from being one of the most centralized countries, Spain has become one of the most decentralized.
- **Sub-national expenditures have increased relatively more rapidly than those of the central government while sub-national revenues have lagged.** This is a common trend in almost all OECD countries but has been particularly marked in Spain.
- **The share of sub-national employment in total public employment has increased greatly and now is well above the OECD average.** With the devolution of health expenditure to the remaining CCAA, this share increased further starting in 2002.

24. **The relatively low level of sub-national revenues in Spain is notable especially because Spanish CCAA have relatively larger taxing capacity** than sub-national authorities in other large European countries. Joumard and Kongsrud (2003) calculate that Spanish sub-national governments could raise taxes equivalent to 2.9 percent of GDP in 1995 compared with only some 1½ percent of GDP in Germany, Poland, or the United Kingdom. However, sub-national governments often do not fully use the tax capacity assigned to them; for instance, according to the same study, sub-national governments in Korea, Finland, and Norway show a similar reluctance to using local taxes.

25. **As in other countries, transfers from the central government have increased over time.** However, differently from other countries, the transfer system provides an incentive to improve efficiency. In general, inter-regional equalization funds risk providing insufficient incentives to sub-national governments to improve the efficiency of tax collection and expenditure, as part of the financing gap is covered through transfers. The issue arises because the effort level of the agent (sub-national government) in collecting taxes and in using resources efficiently is not perfectly observed by the principal (central government). In this case, the optimal insurance literature suggests that the principal should give some incentive to the agent to improve efficiency. Spain's transfer system aims to address the moral hazard by calculating the needs with respect to a base year and by leaving substantial taxing capacity to finance marginal expenditure. In this respect, Spain compares well with respect to other countries.<sup>15</sup>

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<sup>15</sup> In reforming the interregional equalization system, Germany has introduced incentives for Länder that perform well in terms of tax collection (Wunzel, 2003).

26. **The increase in central government transfers has also highlighted the importance of fiscal discipline at the regional level, which countries have managed in different ways.** The possible control systems range from purely administrative approaches, in which local administrations are strictly controlled by the general government, to an arrangement without any formal central government coordination (Table 5 provides an OECD classification, based on the categories of Ter-Minassian, 1997; see also Box 1 on market-based discipline). In the middle, there are solutions in which sub-national governments have some level of discretion within some rules. Spain falls into the category in which sub-national governments formally cooperate because all the decisions concerning inter-governmental relationships are taken by the FFPC on which they are represented. In summarizing the experience of the largest European countries with fiscal rules for local government, Rattsø (in Dafflon, 2002) concludes that, overall, European countries have been able to avoid financially unsustainable situations at sub-national level through the use of rules and some discretion.

27. Countries with **fiscal rules** for sub-national governments use different **targets** as well as different **sanctions** in case a sub-national government deviates from the rule. Table 6 summarizes the experience of several countries.

28. Beside the strict design of the rule, the **success in maintaining fiscal discipline at sub-national levels depends on many other institutional factors**, including whether (Rodden, 2003):

- the central government can monitor all direct and indirect activities of sub-national governments, including activities through state-owned enterprises and entities;
- the central government can credibly commit to enforce the rule(s), especially a firm no bail-out condition;
- sub-national governments are relatively homogenous in economic strength and political power.

Spain meets these criteria only partially because the monitoring of extra-budgetary activities of CCAA is still imperfect, there has not been a long enough history to demonstrate a firm no bail-out commitment, and the CCAA are not homogenous.

### **Box 1. Pure Market-based Enforcement Mechanisms**

Among existing federations, the United States and Canada use almost pure market-based mechanisms to instill fiscal discipline at the sub-national level of government. While this solution has the appeal of relieving the central government of the onerous political task of monitoring local authorities, a pure market-based approach is effective only if the central government can credibly commit not to bail out sub-national governments in difficulty.

The central government can earn such credibility through a history of no bail-outs and strong institutions. The case of Canada and the United States provide examples to this effect. In both cases, sub-national governments (provinces and states) existed before the formation of a national government. Moreover, both central governments were “tested” in the XIX century as sub-national governments experienced serious financial crises. During the 1830s and 1840s, the federal government resisted pressures to provide loans to states in financial straits (Rodden et al. 2003).

As a consequence of the strong “no bail-out” commitment by the central government, voters (and tax-payers) in several affected states requested the imposition of rules to impose fiscal discipline on local politicians and avoid the tax hikes associated with irresponsible policies. As capital markets reacted favorably to these innovations, other states introduced similar restrictions. The credibility of the no-bail out clause in the U.S. was further reinforced by the Eleventh Amendment to the U.S. Constitution: “The Judicial power of the United States shall not be construed to extend to any suit in law or equity, commenced or prosecuted against one of the United States by Citizens of another State, or by Citizens or Subjects of any Foreign State.” Under this provision, not only is the central government barred from bailing out states, it cannot even act as a third party to enforce the repayment of state debt. This hard-won credibility has its clear results: studies (Singh and Plekhanov, 2004) show that countries with a history of bail-outs of sub-national governments by the central government (e.g., the Netherlands, Ireland, Mexico, and Italy) exhibit disappointing fiscal outcomes at the local level for a prolonged period thereafter.

In the case of Spain, the possibility of pure market-based enforcement is however weakened by a number of factors. First, the CCAA do not have credible self-imposed fiscal rules; second, regional fiscal accounts are not sufficiently transparent; and third, the level of regional debt is still too low to provide a powerful market-based reaction. Given this, it is not surprising that the rating of regional debt by international agencies is almost the same for all regions. Finally, an indication that Spain is not suited to a pure market-based approach is provided by the fact that market participants themselves, who should provide an independent external discipline, mention the existence of the central government’s oversight as a primary factor for regional fiscal stability (Moody’s Investors Service, *Spanish Regional Governments: System Outlook*).

#### D. Conclusions and Policy Options

29. **Spain's current fiscal stability framework, enshrined in the BSL, has appreciable merits.** Apart from its achievements at a more general level, including in promoting a broad culture of fiscal stability, it has been reasonably successful also with regard to the subject of this paper—fiscal discipline at lower levels of government. Although 11 regions out of 17 ran a deficit in 2003, these were (with one exception) all below 1 percent of the relevant regional GDP, and the combined CCAA deficit was less than 0.2 percent of national GDP. Moreover, the aggregate debt of CCAA was equivalent to only 5.8 percent of national GDP in 2003. However, spending discipline is not uniformly in place, there is appreciable scope for efficiency gains, and regional accounts suffer from a lack of transparency—including, importantly, with respect to the activities of public enterprises and entities.

30. **Enforcement mechanisms for lower levels of government are weak.** At the same time, the share of sub-national non-discretionary expenditure, which includes education and health, is large, and population aging is set to raise health spending further (see Chapter II of this Selected Issues paper). The main challenges in reforming the enforcement system for CCAA are:

- The legal and institutional setting limits the scope of possible intervention by the central government. As a result, the latter cannot credibly commit to enforce rules, especially if these imply harsh consequences (default, fines, etc.).
- CCAA have access to local financial markets and own public enterprises and other public entities so that market discipline does not appear strong and rules from the center can be circumvented.
- Timely information on CCAA budget execution is not available (or readily provided) so that many enforcement schemes are de facto cumbersome to apply. For instance, regions that exceeded the deficit target in 2003 are only now presenting adjustment plans for 2005.

31. Some options, possible in other contexts, are not feasible in Spain because of the institutional setting, but **disciplining and enforcement mechanisms could be improved along several dimensions** within the present institutional framework, through:

- **The publication of timely and comprehensive information on CCAA fiscal outcomes.** Full disclosure of fiscal accounts is fundamental for the exercise of effective public pressure by the citizens of a CCAA, who are the final judges of efficiency of local public expenditure. The exercise of such dissuasive pressure is dependent on early identification of unsound fiscal behavior, so as to increase public censure and reputational costs of profligate policies and stimulate appropriate corrective action.

- **The containment of CCAA borrowing.** Theoretical arguments and international practices suggest that the demand management (anticyclical) role is best retained by the central government, which controls the appropriate policy instruments (Box 2). In addition, regional public debt is not large enough to provide an effective market disciplining device, and the credibility of the central government's no bail-out commitment remains to be firmly established (Box 1). Finally, there is an asymmetry in the regulation of local borrowing, which could lead to higher-than-desirable debt over time. This is because the central government, through the FFPC, may authorize borrowing during downturns but does not have the legal authority to impose debt repayments during good times. There is thus an in-built risk toward debt accumulation over time.
- **The introduction of explicit expenditure limits at the regional level.** These would be a natural extension of the norms of the BSL for the central government and would provide a transparent way of monitoring sub-national finances. Given Spain's constitutional set up, such limits would likely need—as in the case of those adopted by many U.S. states—to be self-imposed.
- **The promotion of greater reliance on local taxes to finance discretionary expenditure.** While it is important that adequate financing arrangements be in place to meet mandatory spending assignments, both structurally and over the cycle, discretionary sub-national spending is best financed by resources mobilized locally. In this manner, local authorities face stronger incentives to evaluate the benefits of additional expenditure versus the costs of higher taxation, and local accountability is enhanced.<sup>16</sup> De iure, Spanish CCAA have considerable scope to raise resources by increasing taxes; however, de facto, they have been notably reluctant to exploit this faculty, tending to press rather for additional central government transfers. Consideration could be given to changing the incentives so that marginal expenditure is financed through local taxes; a possibility could be to tie some transfers to the use of local taxation.<sup>17</sup>
- **The provision of positive incentives to reward regions that save during good times.** From an economic point of view, it is more efficient to save during good times than cutting expenditure during bad times. However, strong political pressures tend to discourage saving during upswings. The present system provides some incentives for saving by CCAA (see Section B), but these incentives could be enhanced through explicit transfers or rewards.

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<sup>16</sup> According to the OECD, the experience of Canada suggests that fiscal consolidation has been inversely related to provincial reliance on transfers from the federal government (Joumard and Kongsrud, 2003).

<sup>17</sup> For example, the Italian system is designed so that the marginal expenditure equivalent to 10 percent of regional expenditure is financed through local taxes.

## **Box 2. Should Sub-national Governments Run Countercyclical Fiscal Policies?**

With almost 50 percent of public expenditure managed by CCAA (and as much as 80 percent excluding social security and debt service), it is legitimate to ask whether CCAA should share the burden of countercyclical fiscal policies with the central government. The role of countercyclical fiscal policy at sub-national level has been thoroughly studied in the context of the U.S. in the 1970s, when the fiscal role of states was becoming more relevant and the prevalent economic thinking strongly favored Keynesian countercyclical fiscal policy. The conclusions of this debate were that the discretionary countercyclical role should remain in the hands of the central authorities for several reasons (Oates, 1972):

- Fiscal policy multipliers are limited for small open economies such as most sub-national entities.
- Regional business cycles tend to be highly correlated so that there is scant need for region-specific countercyclical policies.
- Capital and labor mobility can offset the effects of stabilization policy. The countercyclical effort of sub-national authorities can lead to negative long-term consequences to the extent that the increase in local expenditure in response to a local negative shock lessens the private sector's incentive to relocate.
- Sub-national governments cannot take into proper account the externalities that their countercyclical policy can have on other sub-national units, resulting in sub-optimal stabilization efforts.
- Taxes that are usually controlled by sub-national governments, including property taxes, are by their nature less amenable to change and thus unsuitable as a discretionary tool over the business cycle.
- Some expenditure that is executed by sub-national governments including education, health, and social services, is not susceptible to discretionary cuts, reducing the scope for active sub-national countercyclical fiscal policy.
- A final argument—not however applicable to Spain—concerns the policy mix: central governments can coordinate monetary and fiscal policies, a possibility precluded to sub-national governments.

These arguments were originally discussed for the U.S. states, but many of them apply a fortiori for Spanish CCAA, which are relatively smaller and more integrated. In addition, other studies have found that local authorities, being closer to voters, find it difficult to run countercyclical fiscal policies during good times, when surpluses should accumulate. Evidence from the U.S. (Fisher, 1997) and from Russia (Kwon and Spilimbergo, 2005) shows that sub-national governments tend to spend more during periods of high economic growth, leading to procyclical fiscal policies. Finally, no European country has rules for sub-national governments that include explicit provisions for the business cycle (Balassone, 2004).

32. **One option to address the latter issue could be provided by the introduction of *rainy-day funds*.** Rainy day funds (RDF), which are part of the fiscal rules of almost all U.S. states, have proven useful in addressing deep but relatively brief fiscal crises at the state level (see Box 3)—to which, according to the analysis in Section B above on regional shocks in an international perspective, Spanish regions may be relatively prone. The benefits of RDF is that they provide a transparent mechanism to save during good times. The central government could provide incentives to the creation of voluntary regional RDF that satisfy some good governance characteristics by, for example, granting a premium interest rate to resources, which are allocated to the RDF up to a certain limit. Even a doubling of the interest rate would not be overly costly. The cost at full regime in the most expensive case in which all regions have adopted the RDF with a cap of 5 percent of expenditures can be estimated to amount to some €430 million, equivalent to 0.05 percent of GDP or less than 2 percent of annual transfers to regions.<sup>18</sup>

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<sup>18</sup> A possible drawback of RDF is that, under the *European System of National Accounts 1995 (ESA95)*, rainy day funds are considered as below-the-line items, so that drawings from RDF are considered a financial transaction and not fiscal revenue. This does not matter for macroeconomic stability, but it means that resources drawn from the RDF could not be used to comply with the Stability and Growth Pact's deficit limits.

### **Box 3. Experience with Rainy Day Funds in U.S. States**

Following the recession of the early 1980s which imposed severe fiscal strains, several U.S. states introduced measures to handle the adverse impact of recessions on local public finances. The number of states with rainy day funds (RDF) rose sharply from 12 in 1982 to 38 in 1989, to 45 in 1995. The main purpose of RDF is to smooth public spending during recessions and, possibly, increase public savings over the business cycle. In absence of RDF, states, which are compelled by their constitutions or by statutory requirements to run balanced budgets, would have few instruments to avoid procyclical fiscal policies. The need to smooth expenditure has increased over time as the composition of state expenditure shifted toward non-discretionary spending (in the early 1960s roughly a quarter of state expenditure was on highways, versus roughly 45 percent on public welfare and education; in 2000, these shares were 8 and 65 percent respectively) and because states are increasingly reliant on more volatile source of revenues such as personal income taxes (these accounted for 12 percent of state revenues in the early 1960s and over 35 percent in 2000) (Garrett and Wagner, 2004).

After a prolonged upswing, the recession of 1990-1991 constituted the first test for the RDF. There is indeed evidence that RDF alleviated the effects of the recession, though the positive effects depended crucially on the design of the rules governing the RDF, including the savings and withdrawal requirements (Douglas and Gaddie, 2002). In addition, RDF are associated with larger public savings (Knight and Levinson, 1999). Preliminary results indicate that RDF have fared less well during the state fiscal crisis of 2003-2004, which has been more severe than the crisis of the early nineties. The main problem seems to be the limited resources of the RDF; total RDF balances fell from US\$17 billion at the beginning of 2002 to US\$8.5 billion in FY 2003, and many states depleted their funds in the middle of the crisis. This experience indicates that RDF cannot be the solution for prolonged fiscal crises, but the analysis in Section II of this paper has shown that, although CCAA are subject to large shocks, these tend to be relatively short-lived.

The design of RDF can differ considerably in the rules that govern the accumulation and withdrawal of funds as well as the size of the cap on accumulated funds. The rules for withdrawing funds from the RDF range from the observance of given economic indicators to the requirement of a (super or simple) majority vote in the legislature. In the case of a simple majority requirement, rainy day funds may be used during eminently “sunny days” by complacent legislatures. As regards the size of RDF, 5 percent of general expenditures tends to be a common cap; there is however no evidence that this size is optimal for all states. In conclusion, the success of a RDF depends ultimately on its features. RDF are often combined with other fiscal rules including expenditure or tax limits. Moreover, all states with the exception of Vermont have some form of balanced budget rule.

Table 1. Personal Income Tax Brackets After the 1999 Reform

Personal Income (In 000s of euros)	Total	Share for Central Government	Share for CCAA
		(In percent)	
0-4,079	15.00	9.06	5.94
4,080-14,075	24.00	15.84	8.16
14,076-26,315	28.00	18.68	9.32
26,316-45,899	37.00	24.71	12.29
45,900-	45.00	29.16	15.84

Table 2. Allocation of Resources from Sufficiency and Interregional Compensation Funds  
(2005 budget, in million of euro)

	Sufficiency Fund	Interregional Compensation Fund	Transfers as a share of regional GDP
Catalunya	2218		1.5
Galicia	2976	170	6.2
Andalucia	7385	420	6.8
Asturias	884	49	5.2
Cantabria	566	10	5.4
Rioja	309		4.9
Murcia	908	43	4.6
Valencia	2147	70	2.6
Aragón	902		3.5
Castilla-La Mancha	1936	83	7.0
Castilla y León	2511	73	5.5
Canarias	2622	45	7.7
Extremadura	1576	84	11.4
Illes Balears	- 195		-0.9
Madrid	-146		-0.1
Total	26601	1045	3.3

Source: Staff calculations based on 2005 budget. The regional GDP used to calculate the last column is based on an approximation from regional data for 2003 and the national GDP growth as in the budget document.

Table 3. National and Regional Shocks in Large European Economies

	Regional Shocks		National Shocks	
	Size	Persistence	Size	Persistence
Spain	2.75	-0.17 (2.57)	6.46	0.48 (2.25)
Italy	2.46	-0.20 (3.12)	4.54	0.51 (2.34)
France	1.96	-0.10 (-1.78)	2.26	0.33 (1.38)
United Kingdom	1.80	0.28 (4.27)	5.27	0.57 (2.81)
Germany	2.23	0.18 (4.10)	1.53	-0.05 (-0.018)

Sources: Staff calculations based on EUROSTAT data.

Note: The size of regional shocks is defined as the standard deviation of regional income growth in excess of the national average and regional trend. To obtain the persistence of regional shocks, we run a regression of regional income growth in excess of national average and regional trend on its lag. The coefficients on the lag are reported in the third column and its t-statistics are reported in parentheses. The size of national shocks is defined as the standard deviation of national income growth in excess of the national trend. To obtain the persistence of national shocks, we run a regression of national income growth in excess of national trend on its lag. T-stat are in parentheses.

Table 4. Comparison of Decentralization in Selected Countries

Country	Share of sub-national spending in general government spending		Share of sub-national revenue in general government revenue		Share of sub-national employment in total public employment	
	1985	2001	1985	2001	1990	2001
Spain	14.5	45.3	17.0	20.3	47.1	63.6
France	16.1	18.6	11.6	13.1	...	45.8
Germany	37.6	36.1	31.9	32.4	87.6	85.5
Italy	25.6	29.7	10.7	17.6	...	20.6
United Kingdom	22.2	25.9	10.5	7.6	...	...
Average OECD	29.8	32.2	21.5	21.9	55.2	57.0

Sources: Joumard and Kongsrud (2003), Spanish Ministry of Finance, staff elaboration.

Notes: Data for the share of sub-national spending for Spain refer to the years 1982 and 2003, the data for Germany refer to 1991 and 2001, data for United Kingdom refer to 1987 and 2000. The data for revenues exclude transfers from other level of governments but include revenues from tax-sharing agreements. Data on sub-national employment refer to the most recent year available.

Table 5. Instruments to Ensure Fiscal Discipline at Sub-national Level

Administrative	Centrally imposed	Formalized	Market discipline
France, Greece, United Kingdom	Brazil, Italy	<b>Spain</b> , Germany, Austria, Belgium	United States, Canada

Source: Joumard and Kongsrud (2003).

Table 6. Fiscal Rules for Sub-national Governments  
(Targets and sanctions)

	No Sanctions	Administrative Sanctions	Financial Sanctions
Deficit Targets	Finland, Sweden	Belgium, <b>Spain</b>	Austria, <b>Spain</b>
Operating Deficit Targets (including golden rules)	Italy, Portugal	Norway	Slovak Republic
Debt Ceiling	Hungary	Poland	Brazil, Portugal
Expenditure Ceiling	Germany	Belgium	

Sources: Joumard and Kongsrud (2003) and staff elaboration.

Note: Spain appears in two cells of Table 6, because the current legal framework mandates the presentation of a three-year adjustment plan if a CCAA exceeds its deficit target; moreover, the law establishes that any fine imposed on Spain under the Stability and Growth Pact is shared with the non-complying region(s).

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## II. PENSION REFORM IN SPAIN: MACROECONOMIC IMPACT<sup>19</sup>

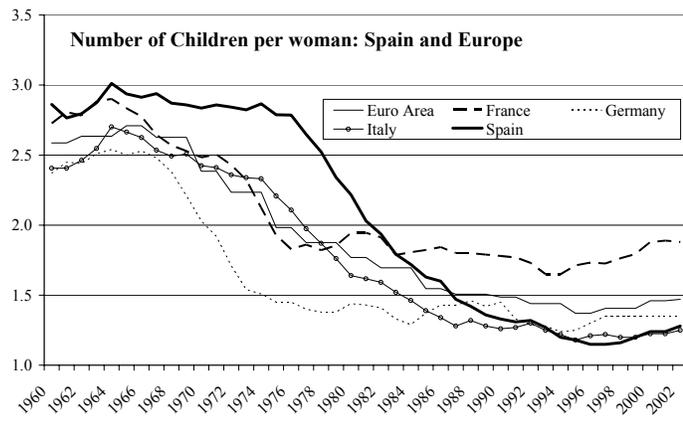
### A. Introduction

1. **Spain's population is set to age substantially.** The most recent long-run population forecast suggests that the share of the population 65 and older will double to 30 percent by 2050 (INE, 2004). Moreover, a third of these senior citizens are envisaged to be 80 years of age or older, compared with less than one fourth at the beginning of the century. Similarly, the old-age dependency ratio—the population 65 and older divided by those between the ages of 15 and 64—is expected to more than double and exceed 50 percent by 2050, with sharp increases beginning in 2020. Although long-run population forecasts are inherently uncertain—and earlier studies amply illustrate the sensitivity of results to the specific assumptions regarding demographic trends<sup>20</sup>—the factors underlying the demographic shock are incontrovertible: Spain's life expectancy has increased the most in Europe and is now comparable to that in other euro area countries, while the birth rate has fallen more abruptly (text table). These demographic features contrast markedly with those prevailing a quarter of a century ago when

Demographic Factors: Spain and Europe				
	Life Expectancy		Birth Rates	
	Years	Change	Per thousand	Change
Spain	79.6	10.4	10.1	-11.6
France	79.7	9.5	12.5	-5.4
Italy	79.7	10.0	8.8	-9.3
Germany	78.7	9.2	8.7	-8.6
Euro Area	79.1	9.5	10.2	-8.5

Source: Conde Ruiz-Alonso (2004), World Health Organization and World Bank, *World Development Indicators 2004*.

Note: Information is for 2002, and changes (+/-) are from 1960.



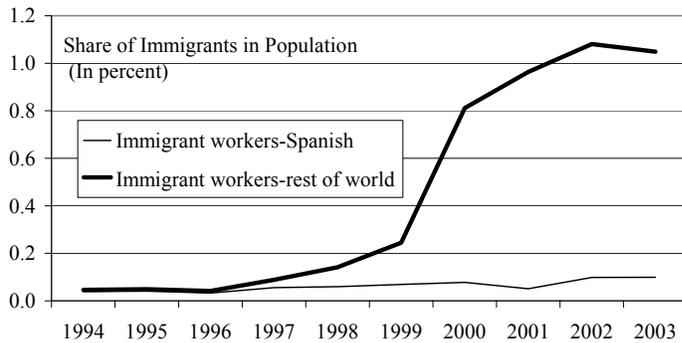
Source: World Bank, *World Development Indicators*.

<sup>19</sup> Prepared by Mario Catalán, Jaime Guajardo, and Alexander W. Hoffmaister.

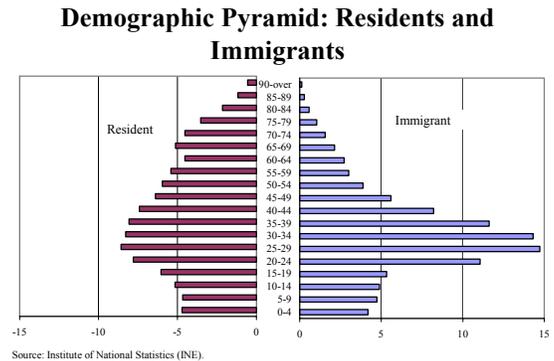
<sup>20</sup> These studies were based on information available before the 2001 census, which showed a marked increase in immigration flows. At one extreme, previous projections envisaged Spain's population to collapse by 20 percent in the first 50 years of this century, and the dependency ratio to skyrocket to 74 percent by 2050 (UN, 2000). At the other extreme, projections saw the population declining by only about 2 percent, and the dependency ratio rising to 56 percent by 2050 (Jimeno, 2000). Others saw the decline in the population and the rise in the dependency ratio to be less than 15 percent and 65 percent, respectively.

Spain's birth rates were well in excess of European levels (text figure). The transition to lower fertility accounts for both the younger population vis-à-vis Europe at present, and the growing bulge in the population "pyramid" going forward.

**2. Immigration can assuage the impact of the demographic shock, but will not eliminate it.** In the past decade, immigration grew tenfold and has exceeded 1 percent of the population annually since 2001 (text figure). This inflow will initially help mitigate the aging of the Spanish population as the immigrants' demographic profile contrasts with that of residents, primarily in the age groups between 25 and 34 years (text figure).<sup>21</sup> But unless these flows continue unabated—and recent data already show a slowing trend—the stock of immigrant population will also age. Indeed, long-term population forecasts indicate an aging of the overall population even under the assumption that the high levels of migration of 2001 continue indefinitely (INE, 2004). In short, immigration's ability to rejuvenate Spain's population and be a net contributor to the pension system will erode over time.



Sources: Institute of National Statistics (INE), *Census 2001*.



Source: Institute of National Statistics (INE).

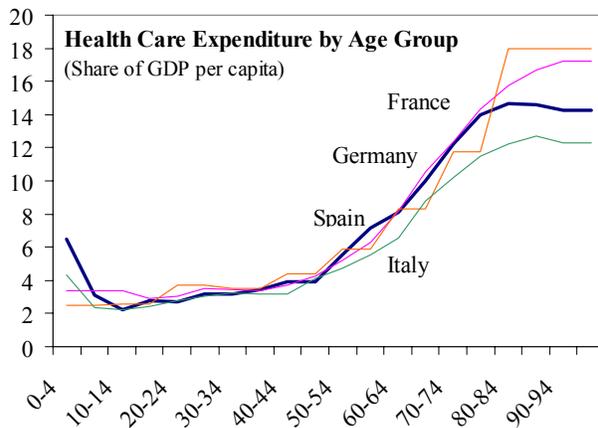
**3. The fiscal expenditure implications for old-age pensions are severe.** Not surprisingly, available studies have consistently pointed to rising pension expenditures as a share of GDP. The most recent analysis (Balmaseda and Tello, 2003) estimates that expenditures on contributory old-age pensions could increase by about 4 percentage points of GDP to over 8 percent of GDP in 50 years. This is about 2 percentage points less than projected in earlier studies (Ministry of Labor, 2001) mostly because of larger immigration flows. These estimates suggest that, as in other European countries, in the absence of wide-ranging reforms Spain's pay-as-you-go (PAYG) old-age pension system will come under considerable stress.

<sup>21</sup> This refers to immigrants from non-EU countries, which recently constitute more than three-quarters of overall immigration. The demographic profile of immigrants from EU countries (primarily retirees from France, German, and the U.K.), however, tends to be markedly older than that of Spanish residents.

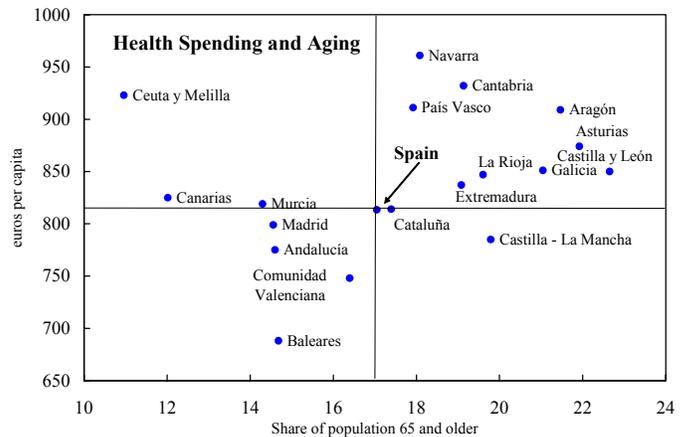
4. **In addition, health expenditures are increasing substantially and set to rise sharply as the population ages.** Spain’s health care expenditures have risen markedly in the past 30 years, outstripping increases in Europe (text table). Still, as a share of GDP these remain below the euro area average, and far less than those of other major euro area countries. Rising living standards are partly responsible as Spain’s per capita income has increased to about 90 percent of the EU-15 average and, consistent with experience elsewhere in Europe (see Newhouse (1977) and Culyer (1988)), health care has behaved as a “luxury good.” But, as in other countries, other factors are also at play. Advances in medical technology have pressured spending by increasing the array of drugs and capital-intensive procedures available to cure illnesses, and by expanding the list of sicknesses that are treatable. Also, the nature of the health care market is not conducive to thrift: doctors both supply medical care and demand it for their patients while the government foots the bill. And finally, as the population ages, health care expenditure increases, as evident from the spending patterns by age groups and in the regions (text figures).

<b>Health Spending: Spain and Europe</b>				
	1970s	1980s	1990s	2002
(Average share of GDP)				
Spain	3.6	5.5	7.3	7.6
France	5.4	7.7	9.2	9.7
Italy	...	...	7.9	8.5
Germany	6.2	8.9	10.2	10.9
Euro Area	4.7	6.9	7.8	8.4

Source: OECD, *OECD Health Data, 1st Edition*.



Source: OECD working paper, Spending on health and long-term care: projections to 2050 revisited.



Sources: Institute of National Statistics (INE) and Dirección General de Farmacia; data correspond to 2001.

5. **Against this background, Spain has long recognized the need to reform its pension system.** The Pacto de Toledo—a tripartite agreement originally signed in 1997 and renewed in 2003—has acted as an instrument to build consensus on a policy reform agenda

and forged an agreement on some initial steps. It established 15 guidelines<sup>22</sup>—including an agreement to revisit the need for reforms every five years—among which are the following:

- establishing a pension reserve fund;
- improving the alignment between contributions and benefits;
- allowing workers to voluntarily remain in the workforce after reaching the legal retirement age (with reduced social security contributions); and
- promoting complementary private pensions (third pillar of the pension system).

Progress was made early on, notably in establishing a pension fund (estimated to reach 3 percent of GDP in 2005) and raising the number of years used to compute the pension base from 8 to 15. In more recent years, however, further reform proposals have remained without follow-up.

6. **This study seeks to analyze the potential macroeconomic impact of different approaches to deal with the fiscal costs of aging.** Although several studies have measured fiscal implications of aging in Europe (notably, OECD, 2001, and EC, 2001) these largely involve extrapolating the implications of demographic profiles. A notable exception is Abío and others (2001), which formally considers generational accounting issues albeit not in a general equilibrium context. These studies have been useful in illustrating the implausible adjustments in contributions or benefits that, in the absence of broader reforms would be required to ensure the financial health of PAYG systems. But they provide only a partial view of the implications of pension reform. The framework discussed below—a general equilibrium overlapping generation model in the tradition of Auerbach-Kotlikoff—aims to move the analysis and quantification of the impact of pension reform in Spain a step forward. In particular, by using a model with population growth—to capture the transitional effects of the demographic shock—this paper considers the macroeconomic implications of the following set of policies:

- **“Tax-as-you-go (TAYG).”** In this scenario, no pension reform is implemented and fiscal policy passively reacts to the demographic shock. Specifically, tax rates (payroll, consumption, and income) are set to finance higher spending on pensions so that the level of public debt as a percentage of GDP remains unchanged.
- **Tax smoothing.** In this scenario, no pension reform is implemented either, but fiscal policy is proactive and seeks to prefund the demographic shock. The net public debt is

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<sup>22</sup> For details see ¶18-19, Country Report No 04/89, 2004. Herce and Meseguer (2000) discuss earlier reforms and reprint the original text.

reduced by increasing (permanently) consumption taxes to finance the future pension spending shock.

- **Reforming the pension system.** Two reforms are analyzed: increasing by two years the effective retirement age and raising the number of years used to compute the pension base—the *reference period*—from the current 15 years to the entire working life. These reforms are also considered jointly. In all cases, the consumption tax rate is adjusted as needed to finance higher spending on pensions.
- **Reforming the pension system and tax smoothing.** The final scenario considers combining pension reforms and prefunding of the shock with consumption tax smoothing.

In addition, the results of these exercises are contrasted with those of a high-immigration scenario and a scenario where health care expenditures reflect the aging of the population.<sup>23</sup>

## B. The Spanish Pension and Health Care Systems

Before turning to the potential effects of alternative policies to deal with the fiscal costs of aging, this section briefly summarizes the main characteristics of the pension and health care systems in Spain.

### Pension System

7. **The pension system consists of three pillars.** The first pillar, and by far the largest, is a compulsory public PAYG contributory scheme. It is divided into five types of pensions—operating under a number of distinct regimes<sup>24</sup>—of which old-age pensions constitute the largest expenditure item (about 67 percent of total outlays in 2002).<sup>25</sup> To qualify for an old-age pension, workers must contribute to social security at least 15 years, and have reached the age of 65.<sup>26</sup> Early retirement—at a reduced pension—is available for

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<sup>23</sup> The effect of moving to a fully funded system is not discussed, as it is beyond the scope of this study; Bailén and Gil (1998) discuss this case and quantify the costs of such a change.

<sup>24</sup> Special regimes exist for farmers, fishermen, coal miners, and domestic employees. For details of the pension system, see Serrano, García, and Bravo (2004).

<sup>25</sup> This also includes a small amount of expenditures on disability pensions for those individuals older than 65 years. But it does not reflect the expenditure on the separate scheme for civil servants (*pensiones de clases pasivas*) which, although distinct, is governed by rules and regulations comparable to those of the general scheme. The bulk of the remaining expenditures are pensions for widows and permanently disabled workers, respectively about 19 percent and 12 percent of the total.

those 61 and older if they have contributed at least 30 years. In all, there were about 16.6 (7.8) million contributors (pensioners) in 2003, or roughly 40 (20) percent of the population. The second pillar is a much smaller (means-tested) noncontributory minimum pension for those not eligible for an old-age pension. It covered just under half a million individuals in 2003. In addition, a third voluntary private pillar was established in 1986, comprising both individual retirement and employment-based schemes. Participation in these (primarily) defined contribution schemes has increased steadily to over 7 million in 2003, or a bit less than half of those contributing to the first pillar.<sup>27</sup>

8. **Old-age pension provisions are generous by international standards, but actual benefits are moderate.** Many of the parameters used to calculate Spain's public pensions rank among the most generous in Europe, notably the reference period used to determine benefits and the contribution period needed for a full pension (text table). Moreover, the maximum replacement rate is among the highest. This generosity is not borne out, however, by the resulting pension benefits: about 60 percent of the benefits lie below the minimum wage, which, in turn, is not particularly high by international standards (text figures next page).<sup>28</sup>

**Public Pensions Schemes in Selected Countries**

(Years, unless otherwise noted)

	Statutory Retirement Age (1)	Reference Period (2)	Full Pension Contribution Period (3)	Maximum Replacement Ratio (%) (4)	Benefit Accrual Factor (4)/(3)	Indexation of Benefits (5)
<b>Spain</b>	<b>65</b>	<b>15</b>	<b>35</b>	<b>100</b>	<b>2.9</b>	<b>Prices</b>
France	60	25	40	80	2.0	Prices and Wages
Germany	65	Career	45	70	1.6	Net wages
Italy	57-65	Career	40	No Maximum	...	Prices

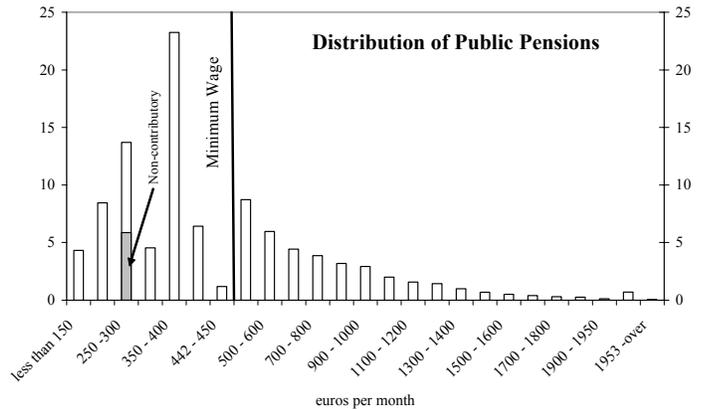
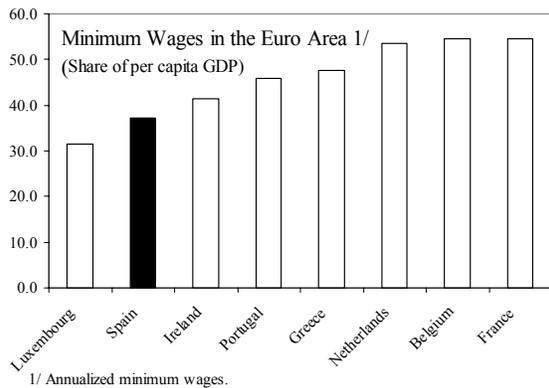
Sources: OECD, and ILO.

Note: As of 2003, except for France that is as of 2002 (prior to the recent reform).

<sup>26</sup> Benefits are topped off (*complemento a mínimo*) when the corresponding pension is less than the minimum pension established in the annual budget.

<sup>27</sup> Participation data, however, are likely to overestimate the true number of individuals, who might choose to participated in more than one plan and thus be double-counted.

<sup>28</sup> Personal income tax is paid only on pensions that exceed €500 (€750) monthly for pensioners filing individually (jointly).



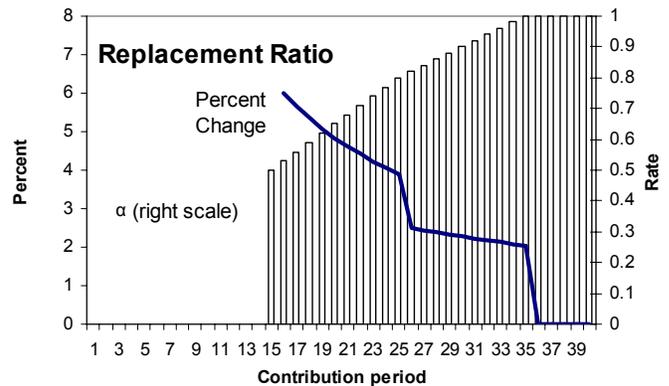
9. **The dichotomy between the generosity of rules and that of actual benefits reflects the adverse incentives of the regulations governing public pensions.** As in many countries, benefits are computed as the product of the replacement rate ( $\alpha_n$ ) and the pension base (*base reguladora*,  $BR$ ):

$$P = \alpha_n \times BR,$$

where  $\alpha_n$  depends on the number of years the individual has contributed to social security ( $n$ ) as follows:

$$\alpha_n = \begin{cases} 0 & , \text{ if } n < 15, \\ 0.5 + 0.03 \times (n - 15), & \text{ if } 15 \leq n < 25, \text{ and} \\ 0.8 + 0.02 \times (n - 25), & \text{ if } 25 \leq n < 35. \end{cases}$$

This implies that, although the replacement rate,  $\alpha_n$ , increases with the contribution period, it does so at a declining rate (text figure). In other words, rather than providing increasing rewards for individuals to delay retirement, the replacement rate provides incentives to retire early (Box 1).<sup>29</sup> Also, as discussed further below (¶15), since the pension base is computed using the last 15 years before



<sup>29</sup> These incentives remain even after applying the corresponding “reduction coefficients” for retirement before the statutory retirement age of 65.

### Box 1. Early Retirement in Spain: A Partial Equilibrium Analysis

Spaniards can opt for early retirement at a reduced rate—having contributed at least 30 years to social security—beginning at age 61. The retirement “penalty” declines with the number of contribution periods and the age of the individual (text table). For instance, an individual 61 years old with 30 contribution periods, could opt for a pension that is 61 percent of the pension base. This effective replacement rate is computed as the product of the (standard) replacement rate (0.9) multiplied by one minus the annual reduction coefficient (8.0) scaled the numbers of years needed to reach 65 (65-61), that is,  $0.9 \times [1 - 0.08 \times (65 - 61)]$ . Alternatively, an additional year of work would increase its effective replacement rate to 71, i.e., an increase of 16.5 percent. Note that the effective replacement ratio increases at a decreasing rate, regardless of the age of the individual.

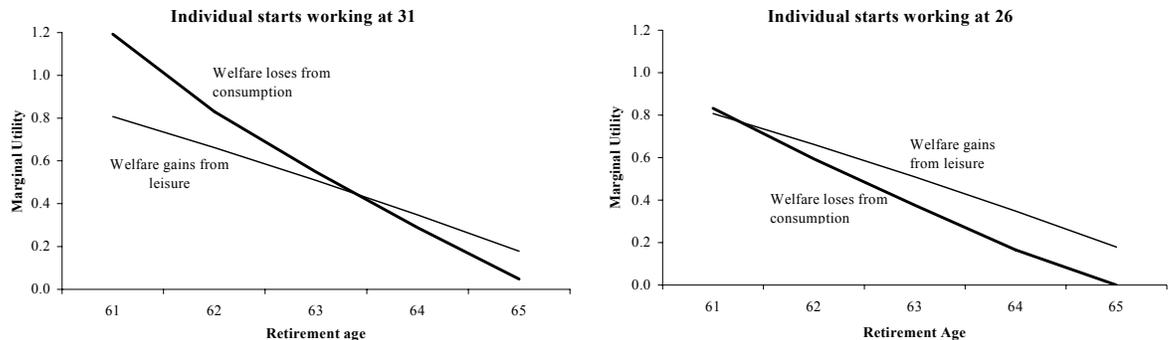
Early Pension: Parameters

Contribution Periods	Replacement Rate	Reduction Coefficient	Effective Replacement Rate (Age When Minimum Contribution Period Met)											
			56		60		61		62		63		64	
			rate	change	rate	change	rate	change	rate	change	rate	change	rate	change
30	<b>0.90</b>	<b>8.0</b>					<b>0.61</b>		0.68		0.76		0.83	
31	0.92	7.5			0.64		<b>0.71</b>	<b>16.5</b>	0.78	14.3	0.85	12.6	0.92	11.1
32	0.94	7.5			0.73	13.1	0.80	12.1	0.87	11.2	0.94	10.5		
33	0.96	7.5			0.82	12.0	0.89	11.1	0.96	10.4				
34	0.98	7.5			0.91	11.1	0.98	10.4						
35	1.00	7.0	0.72		1.00	10.3								
36	1.00	7.0	0.79	9.7										
37	1.00	7.0	0.86	8.9										
38	1.00	6.5	0.94	8.7										
39	1.00	6.5	1.00	7.0										
40	1.00	6.0												

Sources: Royal Decrees 1131/2002 and 1132/2002, and Staff estimates.

In deciding whether to retire, an individual faces a tradeoff between the welfare from additional leisure and the losses incurred in retirement due to a reduction in pension benefits (and lower consumption). Retirement will be delayed whenever the gains from leisure do not compensate the losses from lower pension benefits. A simple illustration of this tradeoff (in partial equilibrium) can be obtained by using the effective replacement rates noted above and the utility function from the model posed in Section C (suggesting that 52 percent of consumption in retirement is financed with the old-age pension, the remainder is financed by drawing on private savings). Assuming that lower pension benefits are not offset by higher savings, the welfare gains (losses) from leisure (lower consumption) are computed (text figures).

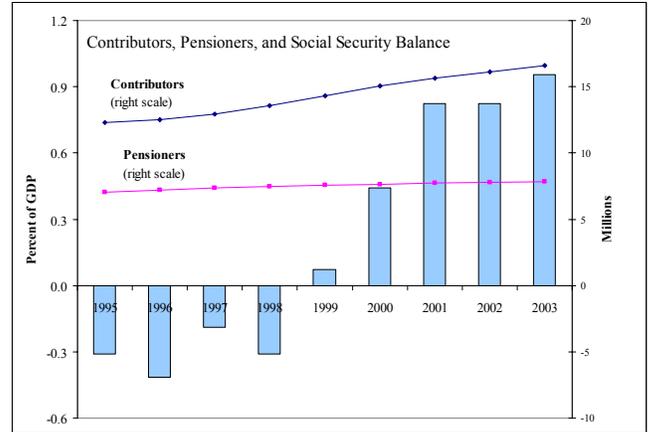
#### Costs and Benefits of Early Retirement



Thus, an individual that starts working at the age of 26 will decide to retire at age 61. Even an individual that enters relatively late into the labor force, say at age 31, will retire before the statutory age of 65. In any case, the incentives favor early retirement.

retirement,<sup>30</sup> lifetime supply of labor jumps as individuals have an incentive to work harder at the end of their work lives.<sup>31</sup>

10. **The public pension system has been running a surplus for several years.** This surplus approached about 1 percent of GDP in 2003 (text figure). This favorable trend is associated with the combined impact of the coming of age of Spain’s baby boomers (those born in the 1970s) and the large number of immigrants of working age. The resultant substantial increase in the number of contributors to social security served to buoy the system’s revenues. This coincided with a small cohort of pensioners associated with the low birth rates in the aftermath of the Spanish Civil War.



Part of the surplus has been used to endow the social security fund (text table), whose assets are set to approach 3 percent of GDP in 2005 (equivalent to some four months of benefits). A dramatic reversal of demographic trends is, however, in store as baby boomers age and swell future cohorts of pensioners, and as the number of contributors dwindles in the wake of the recent drop in fertility rates.

Pension Fund (Million euros)						
Year	Government Contributions	Cumulative Sum	Interest Earnings	Balance	Social Security Surplus	Cumulative Sum
1999					1017	1017
2000	601	601	3	604	3336	4354
2001	1803	2404	26	2430	5844	10198
2002	3575	5979	161	6140	6343	16541
2003	5494	11473	550	12023	7840	24381
2004	6720	18193	1137	19330	...	...

Source: Ministerio de Trabajo y Asuntos Sociales.

<sup>30</sup> The pension base—average gross wage during past 15 years—is computed as

$$BR_t = \frac{1}{15 \times (12 + 2)} \times \left( \sum_{j=1}^{2 \times 12} W_{t-j} + \sum_{j=2 \times 12 + 1}^{15 \times 12} W_{t-j} \times \frac{CPI_{t-(2 \times 12 + 1)}}{CPI_{t-j}} \right),$$

where wages ( $W$ ) are adjusted for inflation ( $CPI$ ), except those from the two most recent contribution periods; the average is computed based on 14 annual installments (12 monthly plus additional payments in June and November).

<sup>31</sup> Low female labor market participation and longer female life spans have meant that most elderly women receive only a widows’ pensions, of which about three-fourths are less than the minimum wage and average about 60 percent of old-age pensions.

## Health Care System

11. **The health care system in Spain is mainly public, although there is an incipient private insurance market.** Virtually the entire population is covered by the National Health System (NHS), which is financed mainly from the budget. The NHS covers primary and specialized health care, hospital medical services, and a share of prescription drugs. The latter are free for pensioners. The system does not include dental treatment (except for teeth extractions). In addition, about 13 percent of the population subscribes to private health insurance plans, of which 3 percentage points correspond to a primary coverage (substitute of the NHS) and the other 10 points to supplementary coverage.<sup>32</sup>

12. **Overall, Spain spends less for health care than other major euro area countries even though its health indicators are comparable to those countries** (Table 1). Health expenditures remain below those in other major euro area countries not only as a percentage of GDP (about 7½ percent of GDP), but also in (purchasing power parity) dollars per capita. This results in fewer practicing physicians and available acute care beds. Still, health indicators suggest that the quality of health services in Spain is high: life expectancy, child mortality, and estimated loss of healthy years at birth due to poor health are in line with those in countries with higher health care costs.

13. **Also, the share of publicly financed health care is smaller, except in prescription drugs.** Roughly one fourth of medical spending is private out-of-pocket expenditure, significantly higher than in other major euro area countries where private insurance foots a larger share. This situation contrasts with pharmaceuticals, where the share of public financing accounts for some three-fourths of the total; prescription drug expenditures are expected to increase sharply as the population ages, retires, and qualifies for free medicines.

### C. The Model and Simulations

#### Model Overview, Demographic Transition, and Immigration

14. **An overlapping-generations model in the Auerbach-Kotlikoff tradition<sup>33</sup> is developed to study the macroeconomic effects of the demographic shock in Spain.** In this type of models the (closed) economy is populated by overlapping generations of households, atomistic firms, and the government. Credit-constrained households consume and accumulate assets during their lifetime, work during their youth and middle age, and retire when old. Firms produce the single good using labor and capital, and the government collects income,

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<sup>32</sup> Civil servants may choose between private and statutory insurance.

<sup>33</sup> See Auerbach and Kotlikoff (1987). For a more recent survey of this literature see Kotlikoff (2000); numerical methods to solve these models are described in Heer and Maußner (2004), and Judd (1999).

consumption and payroll taxes to finance government expenditures and pension benefits, and redeem the initial government debt. Although the general equilibrium structure is standard, the model incorporates specific features of the Spanish pension system. Specifically, it incorporates a stylized version of the pension rule whereby the old-age benefit is calculated based on wage earnings in the last 15 years in the workforce. This and the endogenous labor supply allow the model to capture the effect of policies on labor market incentives and macroeconomic outcomes. The model also includes labor-augmenting productivity growth. The full model is detailed in Appendix I.

15. **For the discussion of the results below, it is important to understand household behavior.** Specifically,

- ***Two sets of conditions solve the household's objective—maximizing lifetime utility—under standard dynamic optimization techniques.*** The first set refers to household's consumption-leisure choice in a specific year (intratemporal first order conditions). In each period, the household equates the marginal utility of consumption (scaled by wages)—made possible by increasing time devoted to work—to the marginal utility of leisure. The second set governs the household's consumption-savings decisions over time (inter-temporal first order conditions or Euler equation).<sup>34</sup> In this case, households equate the marginal utility of current consumption to the marginal utility of savings, that is future consumption.
- ***Each set of equations reflects whether a household is in the labor force or not, and the peculiarities of the pension rule.*** From an optimization point of view, the pension rule introduces three subperiods in the household's work life. The first comprises the initial years in the labor force prior to the reference period ( $\mu$ ), when the household complies with standard intratemporal and intertemporal conditions. The second corresponds to the first  $\mu-1$  years of the reference period, when the consumption-leisure choice (intratemporal first-order conditions) also reflects the fact that wage earnings accrued in this subperiod provide additional utility during retirement because of their effect on the pension benefit. Thus, all else equal, the household increases the supply of labor during the reference period because of this added "benefit" to work (Box 2). However, the consumption-saving decision remains unchanged. In the final year of the reference period, the consumption-saving decision reflects, nonetheless, the retirement of the individual in the following period. Finally, when the household retires, there is no labor supply choice by definition, and only the consumption-saving decision remains.
- ***Specific properties of the utility function used.*** The log utility function has some peculiarities that are relevant for the analysis below, and favor policies based on adjustments in consumption taxes over other taxes. Specifically, consider household

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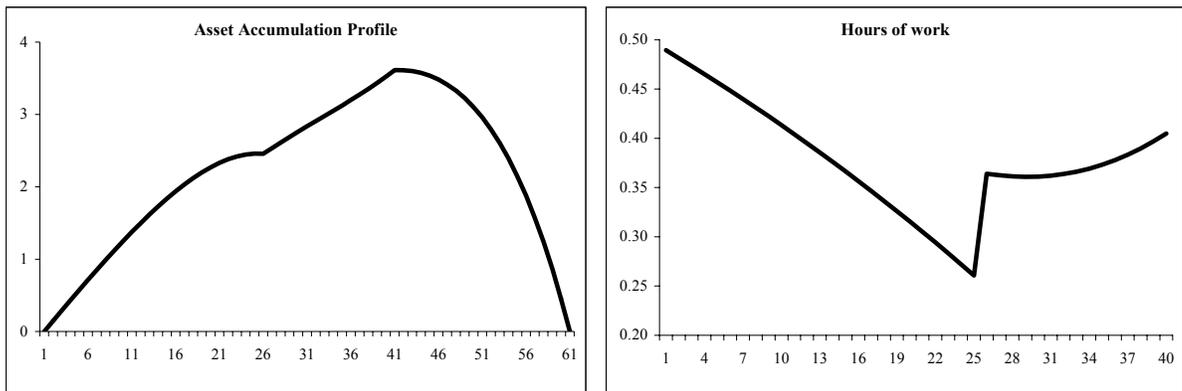
<sup>34</sup> When households retire they face only an inter-temporal condition as they no longer supply labor.

### Box 2. Household's Labor Supply

*The reference period introduces a discrete jump in household's life time supply of labor* (text figure).<sup>1</sup> At the beginning of household's work life ( $s=1$ ), labor supply is high—to accumulate assets that will be consumed during retirement—but declines continuously until the reference period begins ( $T-15$ ). This decline is needed to compensate for households' higher labor during the reference period ( $\mu=15$ ). During the reference period the number of hours worked jumps and increases until retirement.

*This implies that the intertemporal accumulation of assets is not smooth either.* Assets are accumulated at a decreasing rate from the beginning of working life until the last year before the reference period. Afterward, these are accumulated at a higher rate, given the increase in labor income. In retirement, assets are depleted.

Initial Steady State



<sup>1</sup> The figure depicts the initial steady state from the calibration of the model discussed in Appendix I.

behavior following an increase in the tax rate. By raising the tax burden, its ability to consume diminishes and indeed consumption falls. The *negative wealth effect tends to increase labor effort* as households attempt to make up their ability to accumulate assets. But tax increases also induce a *substitution effect which tends to reduce labor effort* (to enjoy more leisure) as consumption becomes more expensive relative to leisure. Thus, the effect on labor effort is indeterminate and will depend on which of the two effects dominates. However, with log preferences an increase in *consumption* taxes, and only for this tax, these opposing effects cancel out. In this sense, the study of the effects of alternative taxes below favors consumption taxes because these do not distort household's labor decision (and consumption falls one-to-one with the added tax burden). By the same token, taking this case as the baseline stacks the cards against the potential benefits of pension reforms.

16. **The demographic shock and immigration are critical exogenous elements in the simulations discussed below.** The time line in the model corresponds to a 300-year period,

with the middle century covering the demographic transition from a high to a low fertility rate. The onset of the transition to low fertility in Spain is taken to be 1975, and since it takes 22 years in the model for the generation born in that year to enter the labor market, the centuries in the analysis begin in 1897, 1997, and 2097 (text table). Note that the

	Model Time Line			
	Century			
	First	Transitional	Third	
Calendar year	1897-1996	1997-2036	2037-2096	2097-2196
Growth of labor force entrants	0.85	variable	0.5	0.5
Population growth	0.85	variable	variable	0.5

population growth in the first and third centuries are constant and set, respectively, to the average for the period 1900-75 and to the average in the decade ending in 2001.<sup>35</sup> In contrast, the population growth in the transitional century is variable and determined by the combined effects of declining births and immigration. Specifically, births follow their historical path and immigration flows are concentrated in the first forty years (1997-2036), which are calibrated to match the data through 2005—implying a short-lived reversal of the demographic shock.<sup>36</sup> Afterward immigration is assumed to follow one of the following scenarios: a baseline (high) scenario with immigration gradually declining from about 483,000 in 2004-05 to 160,000 (250,000) in 2010, and remaining at that level through 2037. In the rest of the transitional century, immigration implicitly grows at the same rate as the native population, that is 0.5 percent per annum.<sup>37</sup>

### Simulations

17. **In the model, the impact of the demographic transition on the social security system is two-fold.** First, a fairly mechanic deterioration in its finances arises from an increase (decrease) in pension expenditures (contributions), as the dependency ratio increases. This deterioration is reinforced by a general equilibrium effect: as the aggregate labor supply shrinks gross wages increase, which in turn increases the average labor income translating into higher pension benefits.

<sup>35</sup> Thus, the population growth in the third century reflects a small rebound from its minimum (0.3 per annum) in the decade ending in 1991.

<sup>36</sup> This reflects the assumption that 75 percent of the immigrant flow enters the labor force, i.e., is older than 20 years of age (see ¶2).

<sup>37</sup> More precisely, the model assumes that the total annual growth rate of entrants is 0.5 percent. However, the actual decomposition between natives and immigrants is left indeterminate. Note that if the rate of growth of newborns and life expectancy are constant, the rate of growth of the total population and that of labor force entrants at age 22 are equal.

18. **Four simulations are used to assess the medium- and long-term consequences of aging on the economy.** As noted at the outset of this study, these involve alternative policy responses, which are solved conditioned on the baseline immigration scenario. In particular:

*Tax-as-you-go*

19. **Taxes are adjusted so that public debt and government consumption remain constant as a percentage of GDP and the budget constraint holds: the macroeconomic consequences are severe** (Figure 1). The simulations suggest that pension expenditures increase between 7 and 8 percentage points of GDP by 2048. Regardless of which tax rate is used to finance these expenditures, the tax rate peaks in that year to finance the social security deficit, resulting in the most severely adverse macroeconomic consequences. Moreover, output deteriorates long before as taxes start rising in 2010, and GDP growth falls below the initial level for about 60 years. Also, consumption per capita increases at the beginning of the demographic transition through 2018, and falls sharply thereafter, bottoming out in 2050. Finally, the capital stock and hours of work per capita start declining in 2007 giving rise to an increasing capital-labor ratio, which remains above the initial level through 2050.

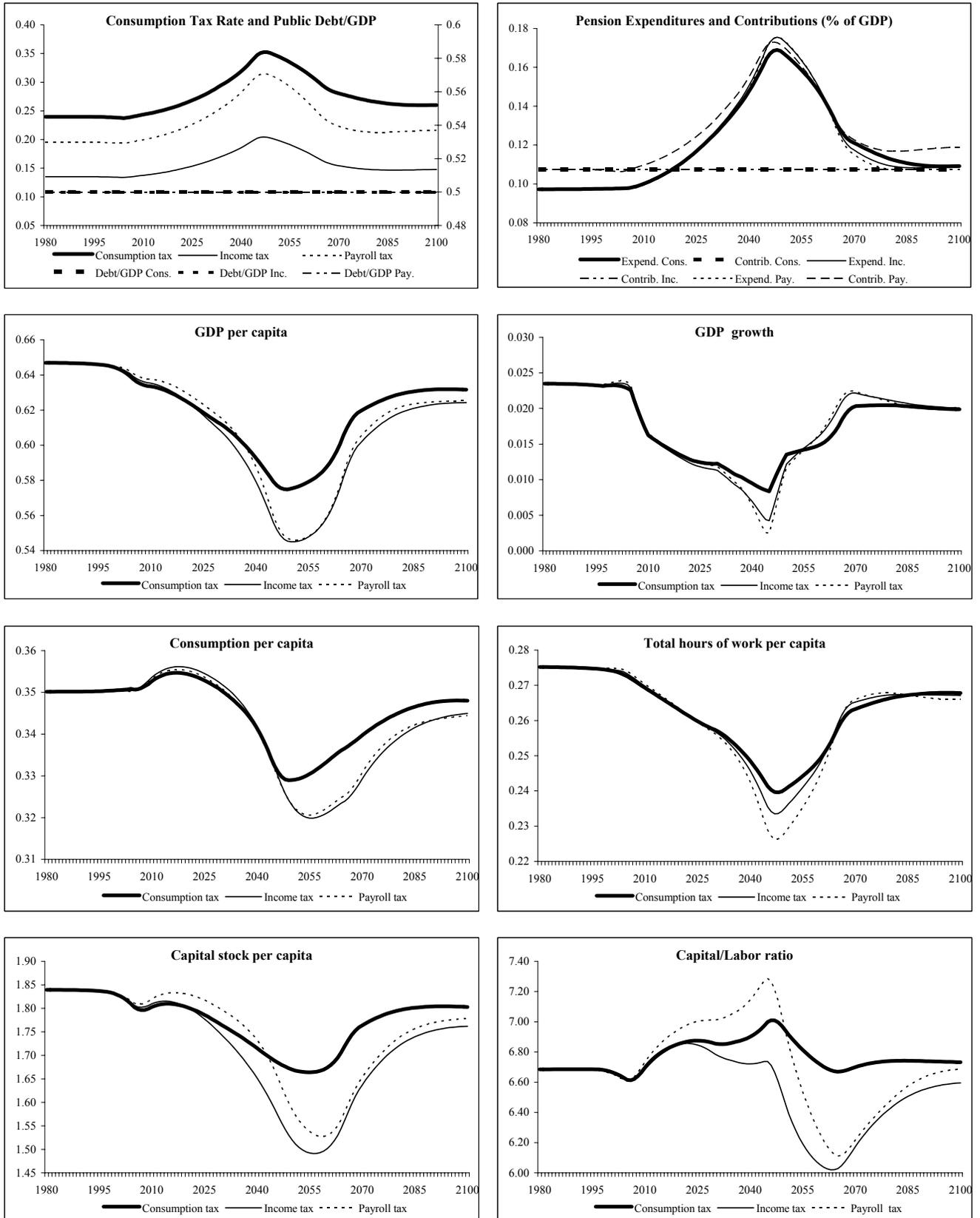
20. **Household's behavior underlies the macroeconomic effects.** In particular, households foresee:

- The consumption tax increases needed to finance increasing pension expenditure. Given factor prices, these have a negative wealth effect (lowering disposable income) and a substitution effect (consumption becomes more expensive relative to leisure). As noted earlier, these cancel out exactly in the case of a consumption tax due to the specific form of the utility function, i.e., labor effort is unchanged. However, for other taxes, the substitution dominates the wealth effect, lowering household's labor supply. Thus, these taxes amplify the decline in labor associated with the demographic transition, and explain why the aggregate hours worked per capita decline more.
- The scarcity of aggregate labor increases wages and pension benefits, i.e., a positive wealth effect. Regardless of the tax, this effect provides an incentive to consume more but work and save less.

The second effect prevails during the beginning of the transition when tax increases are moderate, and explain the initial consumption (per capita) boom. But as the fiscal impact of the demographic transition intensifies, this wealth effect is more than offset by the former. Thus, the sharp increase in taxes drives the impact on consumption, hours of work and asset accumulation.

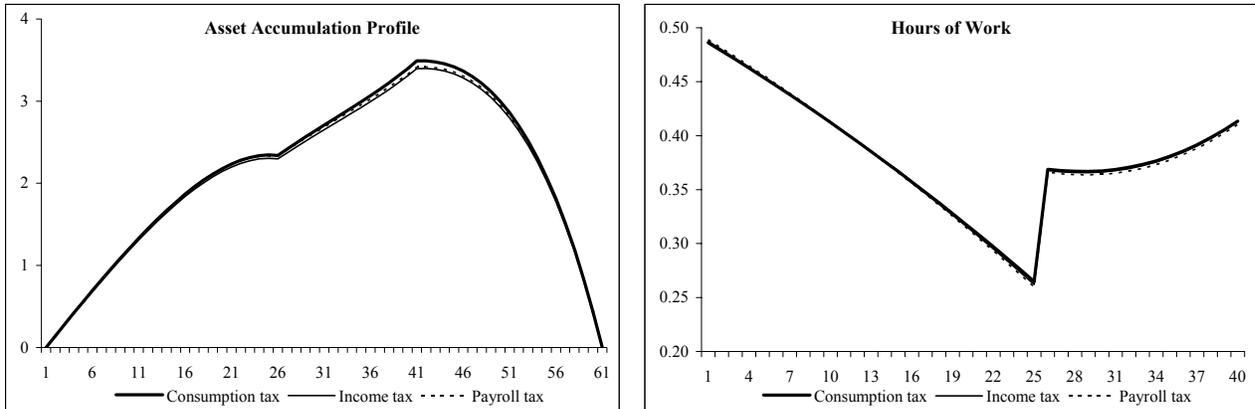
21. **The simulations consistently suggest that the tax with the lesser adverse macroeconomic effects is a consumption tax, not only during the transition but also in the steady state** (Table 2). The incidence of consumption taxes is spread more evenly across generations, falling on both workers and pensioners, while income and payroll taxes place

Figure 1: Tax-as-you-go (TAYG)



most of the burden on workers.<sup>38</sup> In steady state, this implies that households hold more assets and work more hours when the consumption tax rate is adjusted, because other taxes distort labor supply decisions (text figure). (Note that the jump in hours worked in the last 15 years of a household's work life reflects the added utility, in terms of pension benefit, that accrues only during this period.)

Tax-as-you-go (TAYG): Final Steady State



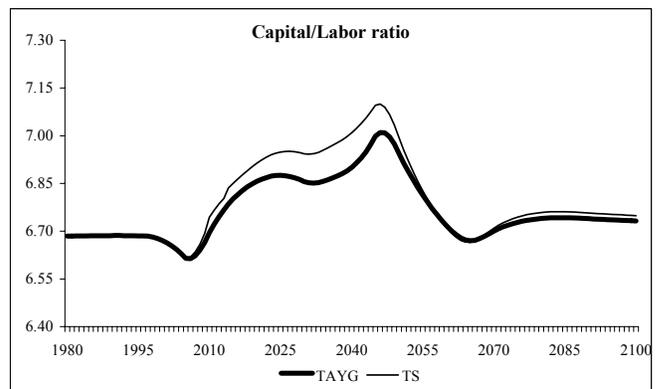
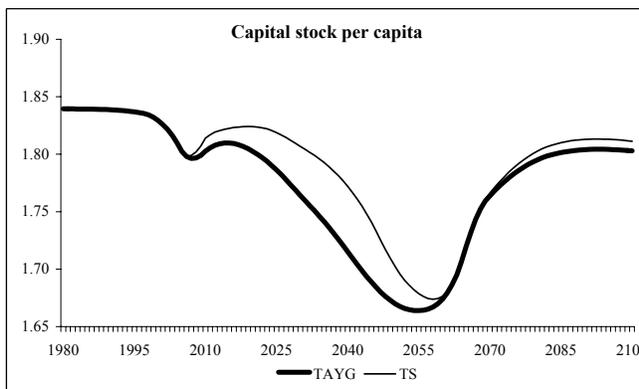
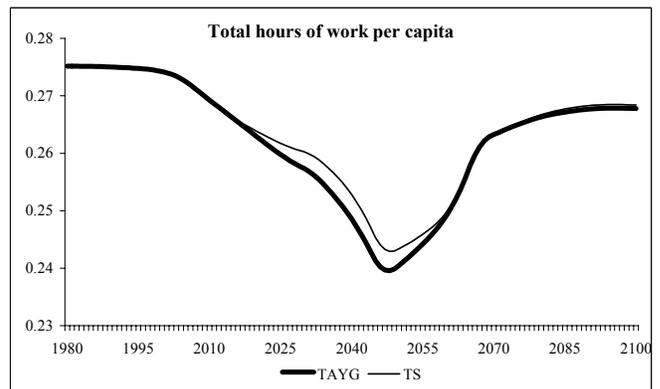
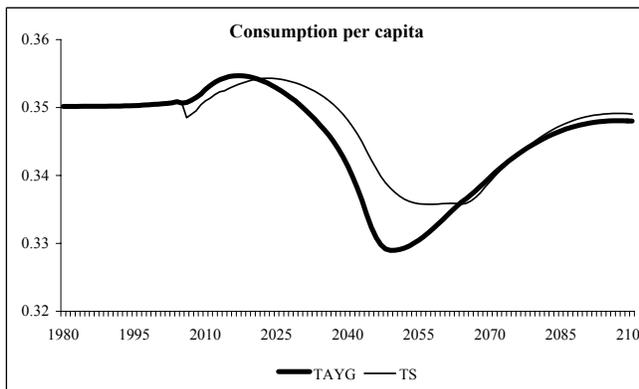
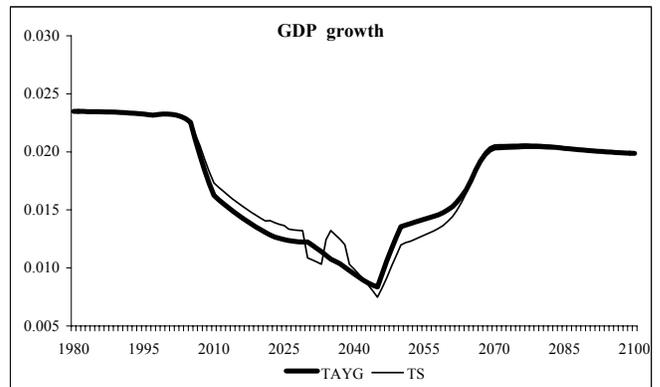
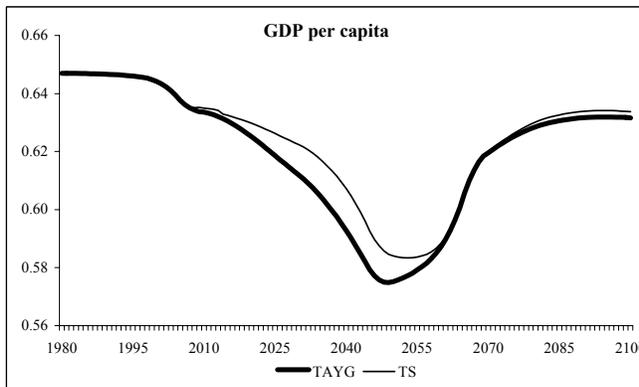
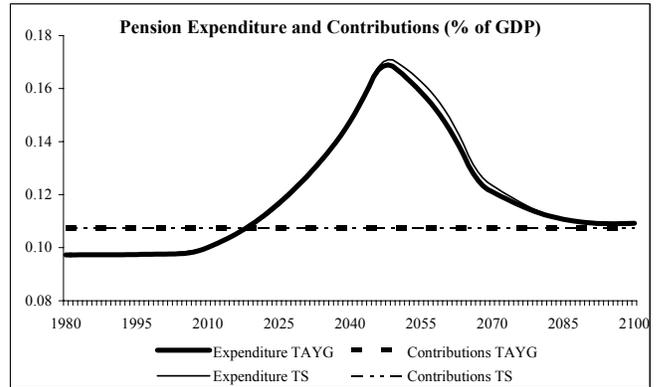
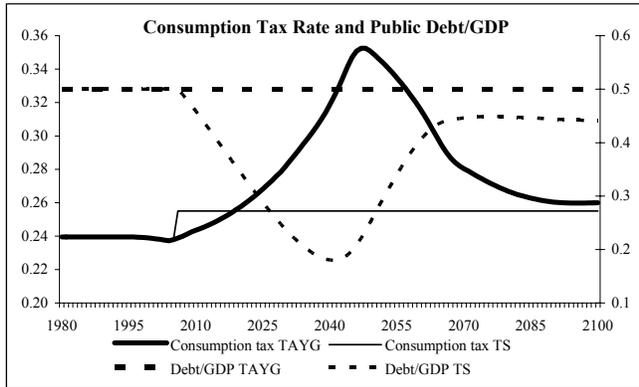
### *Tax smoothing*

22. **Consumption taxes are increased pre-emptively, and once-and-for-all, to ensure that public debt converges to the corresponding steady state level (Figure 2).**<sup>39</sup> The simulations assume that the consumption tax rate changes unexpectedly and permanently in 2006 to a constant level consistent with long-run government solvency. The resulting consumption tax rate is 1.5 percentage points higher from 2006 onward. This gives rise to budget surpluses and declining debt from 2010 through 2040. As the demographic shock

<sup>38</sup> The burden of consumption taxes is particularly heavy on pensioners, because retirement is a “consumption-intensive” stage of life (individuals dis-save rapidly and sustain consumption). Moreover, the pensioners-bias of the consumption tax burden is larger in Spain because most pension benefits are income-tax exempt.

<sup>39</sup> In this, and subsequent simulations, households are assumed to anticipate that, aside from TAYG, the demographic transition is unaddressed (i.e., there is no pension reform). In 2006, however, they are faced with a once-and-for-all regime change and henceforth reoptimize accordingly.

Figure 2: Tax Smoothing (TS)



peaks, debt-financed budget deficits emerge with the debt-to-GDP ratio rising until 2070, and stabilizing thereafter.<sup>40</sup> Note that the different tax paths account for the main macroeconomic outcomes: the levels of output, consumption, capital and hours of work per capita are initially below those in the TAYG, but remain above their counterparts during most of the transition and in the final steady state. These results illustrate the trade-off a government faces: for a future payoff, it can increase taxes in anticipation of the brunt of the fiscal consequences of aging, but at an initial cost in terms of aggregate output and consumption.

**23. Households' behavior—underlying the macroeconomic effects—provides additional insights.**

- As before, given factor prices, tax increases reduce consumption due to the negative wealth effect, but hours worked and capital do not change because wealth and substitution effects cancel out. Thereafter, despite unchanged labor supply and asset accumulation, the capital stock is higher than in the TAYG case as the decline in public debt frees assets that are allocated to capital. Higher capital labor ratios increase gross wages and households' work hours.
- As before, the positive wealth effect due to higher pension benefits increases consumption and decreases work hours and savings.

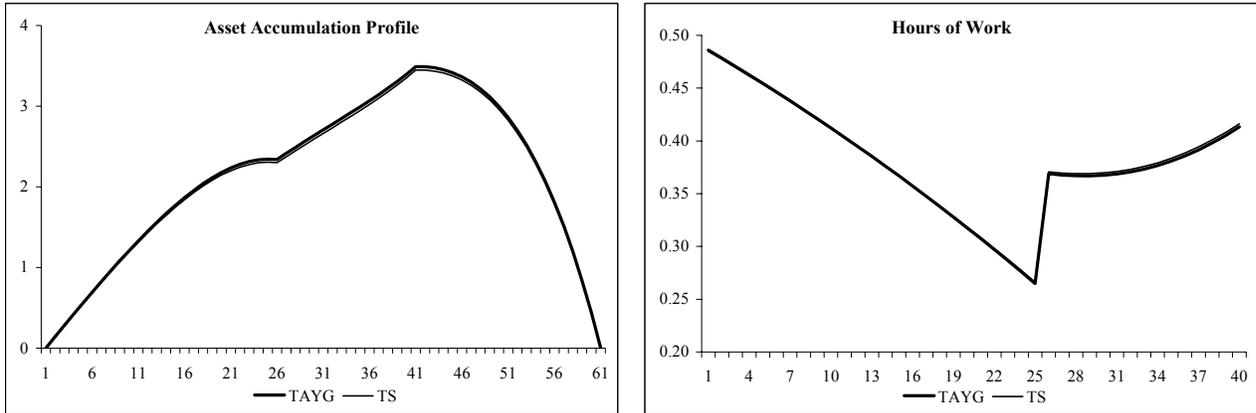
This differs from before because here the second effect does not offset the first. Consumption and work hours fall below TAYG at the beginning of the transition, to rise later as capital stock increases.

**24. The simulations suggest that tax smoothing improves the macroeconomic outcome compared with TAYG in both the transition and the steady state** (Table 2). Smoothing taxes does not distort household's consumption-saving decisions, and results in a less severe (negative) wealth effect, with a corresponding smaller decline in consumption. Also, the lower levels of public debt (as percentage of GDP) in the transition and in the steady state, liberate assets that are devoted to build up the capital stock, increasing the capital-labor ratio, and wages. This induces a higher labor supply, GDP, and consumption per capita. In steady state, households accumulate somewhat less assets and work more than in TAYG (text figure).

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<sup>40</sup> Note that the new steady state debt is lower than in the initial steady state because the one time increase in the tax rate of consumption is more than enough to cover all the cost of the demographic shock.

**Tax Smoothing (TS): Final Steady State**



***Reforming the pension system***

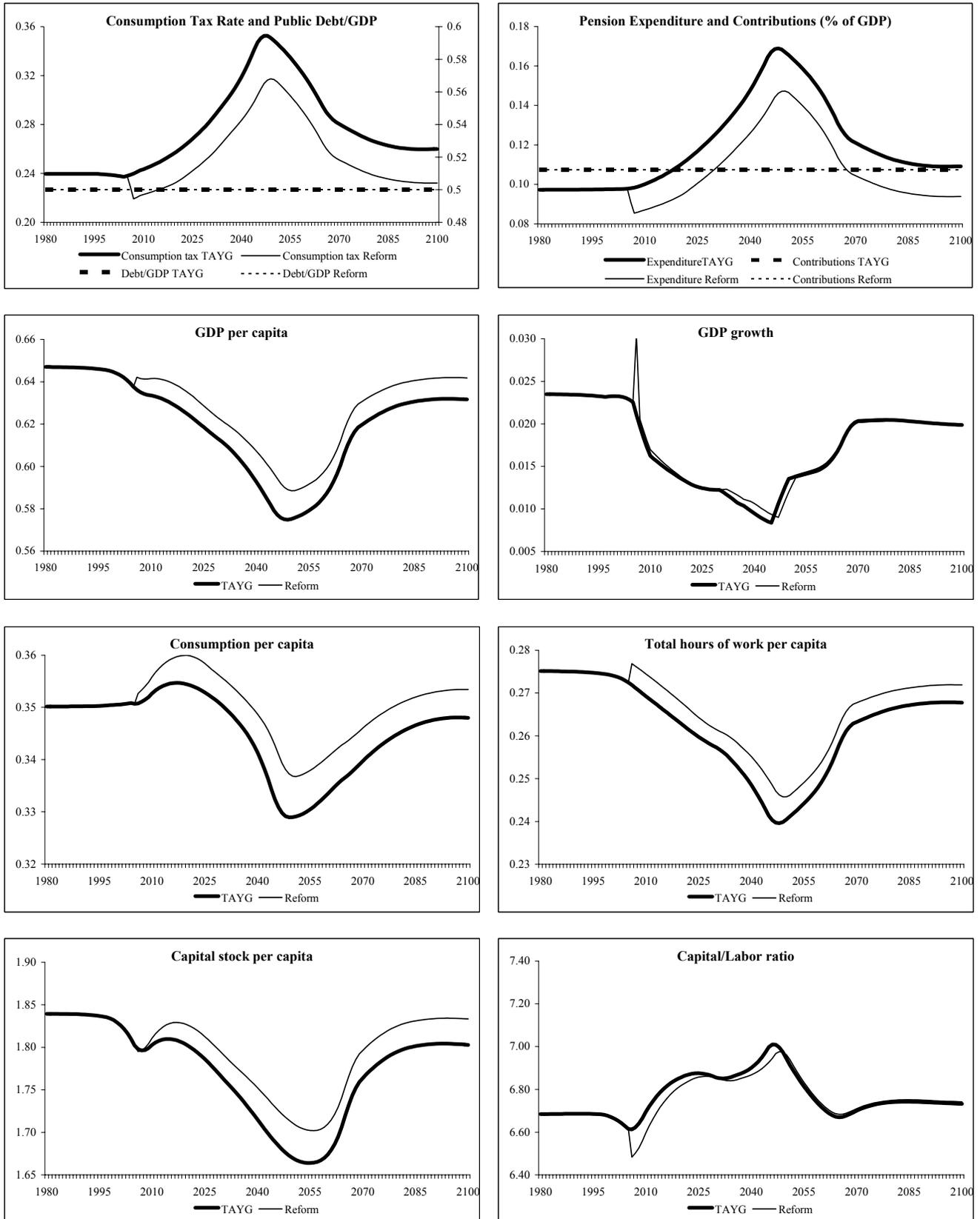
25. **The following exercises consist of modifying two key parameters of the pension rule: the retirement age and the reference period.** To illustrate the macroeconomic effects associated with the potential savings in pension expenditures, these simulations make a simplifying assumption regarding the reforms’ implementation, i.e., they are assumed to enter into force in a given year (2006), without phasing in or grandfathering. This is unrealistic and to the extent that actual reforms are gradually phased in—as indeed would be more plausible—and recognize workers’ acquired rights, pension savings would build more gradually over time. Thus, reproducing the macroeconomic outcomes illustrated below, will require cutting public consumption to offset the smaller savings in pension expenditures. The simulations consider the reforms separately to isolate their impact; synergies are explored in a joint simulation. As before, reforms are unanticipated but once implemented are credible. To the extent needed, consumption taxes adjust to keep public debt constant as a percent of GDP. The results are compared with the TAYG scenario.

*Increasing the retirement age*

26. **The retirement age increases by two years in 2006** (Figure 3 A). As noted before there is no grandfathering, so that reforms apply to all generations working in the previous year and all those to come. Thus, households working in 2005 are required to work an additional two years and thus retire at age 64.<sup>41</sup> Individuals already retired are assumed to receive unchanged benefits until death. In any case, pension benefits are calculated as before ( $\mu=15$ ). The reform leads to a large reduction in pension expenditure because households that would have retired in 2006 forgo pension benefits for two years; analogous savings accrue in

<sup>41</sup> Specifically,  $T=42$  and since life expectancy is constant retirement is two years shorter,  $T^R=18$ . Considering that individual enters the work force at age 22, this implies increasing the (effective) retirement age to 64.

Figure 3.A: Increasing The Retirement Age

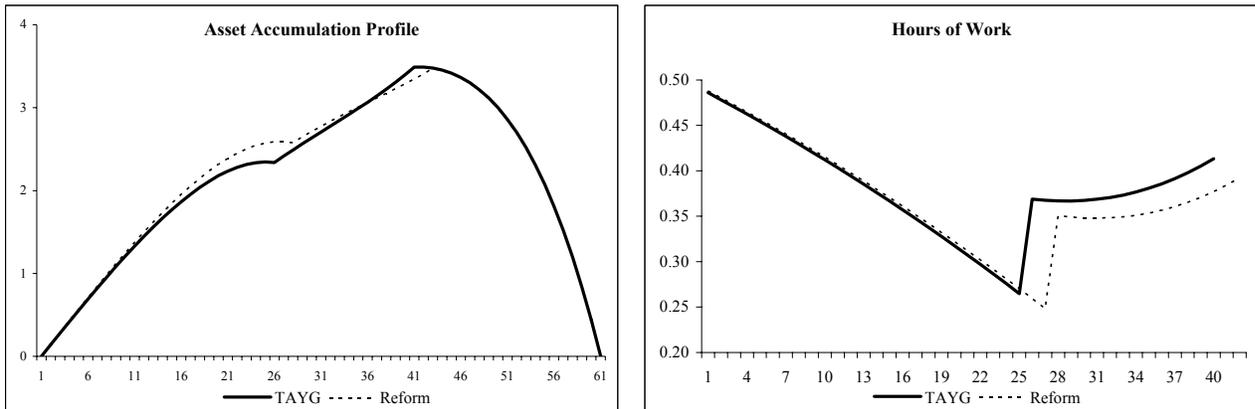


subsequent years as there is no grandfathering. In addition, since life expectancy is constant, savings also stem from the two-year reduction in the period over which benefits are paid. These savings drive the reduction in taxes, which remain below the initial level for about 18 years. And although taxes increase sharply at the peak of the demographic shock, these remain consistently below those in TAYG. As before, the evolution of taxes and demography determines the macroeconomic outcome: output and consumption are higher than in TAYG thanks to the beneficial effect on the supply of labor and capital stock.

27. **Household's behavior underlies the macroeconomic effects.** In particular:

- Households lower work hours in the new reference period and two years earlier. This is because the shorter retirement period means that the utility of added consumption during retirement work is lower. And since the reference period is unchanged, work hours continue falling for two more years. Still, the lifetime labor supply increases because the two additional years of work exceeds the reductions associated with the change in incentives (text figure). The shorter retirement period also induces households to save less for retirement, increasing consumption in each period.

**Increasing The Retirement Age: Final Steady State**



- The reduction in taxes boosts consumption: the positive wealth effect is reinforced by a substitution effect associated with a decline in the relative price of consumption vs. leisure. As before, this does not change the household's labor supply and asset accumulation. But since (aggregate) labor supply increases, the profitability of capital rises and induces higher asset accumulation. This effect more than offsets the fall in asset accumulation associated with the changes in the incentive due to the reform. Finally the positive wealth effect associated with higher pension benefits is lower than in TAYG, reducing its positive (negative) effect on consumption (work hours and savings).

28. **The simulations suggest that extending the working age improves the macroeconomic outcomes compared with TAYG during the transition and in the steady state** (Table 2). The flipside of the reduction in pension expenditure is an increase in aggregate labor supply, as the number of households working increases—42 generations are

in the workforce, not 40 as before—providing a small boost to social security contributions. The increased labor supply raises the profitability of capital, and thus households adjust to accumulate more capital (per capita). However, this effect is partially offset since the shorter retirement period means that less assets are required to “finance” retirement, and thus consumption increases somewhat during work life.

*Increasing the reference period*

29. **The reference period is extended to the entire work life in 2006** (Figure 3 B). As before, reforms apply to all generations working in the previous year and all those to come. In particular, the pension benefits of households working in 2005 that are set to retire in 2006 will be computed using the entire work life as the reference period; the retirement age is unchanged.<sup>42</sup> Individuals already retired are assumed to receive unchanged benefits. This reform delays the increase in pension expenditure as it leads to a fall in pension benefits, because more recent wages exceed those at the beginning of work life due to productivity growth.<sup>43</sup> In sharp contrast with the previous simulation, labor supply declines after the extension because work—in the new reference period—accrues a lower pension benefit. This adverse incentive drives the reduction in output and consumption compared with TAYG. Note that this occurs even as the capital stock increases.

30. **Households’ behavior—underlying the macroeconomic effects—provides additional insights.**

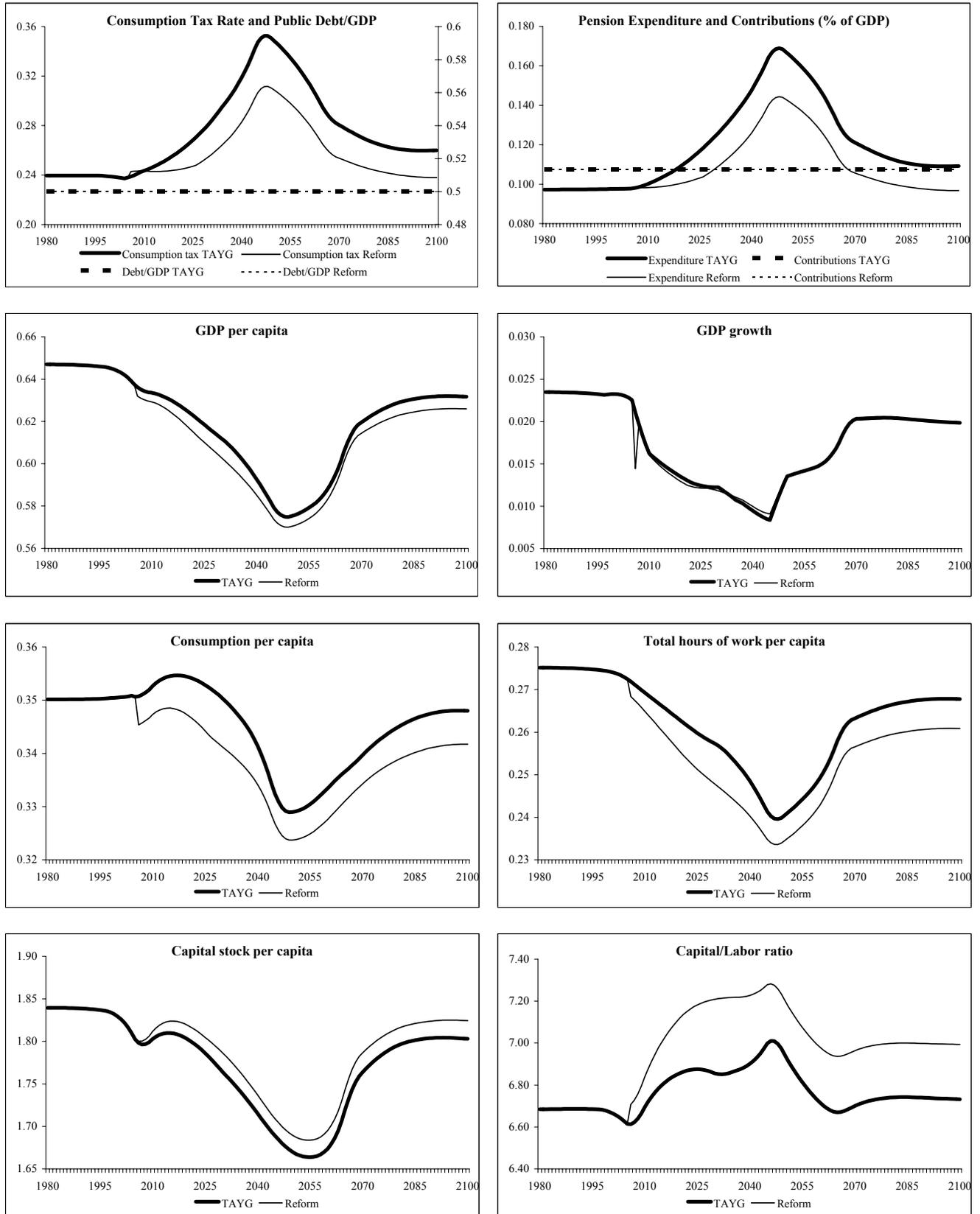
- The distortions in households’ intertemporal allocation of labor and assets are removed, as individuals no longer have incentives to increase labor supply in the last fifteen years of working life (text figure). Lifetime labor supply falls with respect to TAYG, as the reform lowers the retribution to work (in retirement). Lower pension benefits also induce households to increase savings to finance consumption when retired, reducing consumption in each period and increasing the capital stock.

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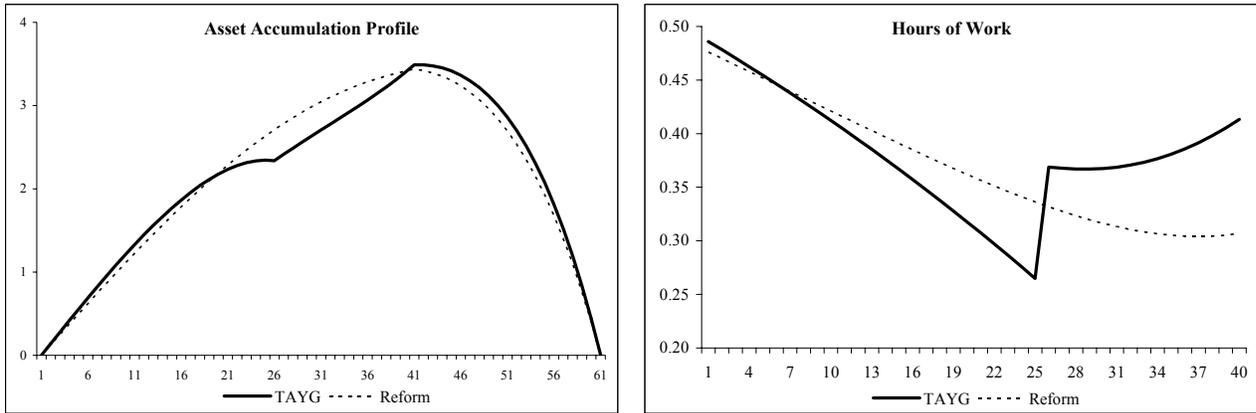
<sup>42</sup> In other words,  $\mu=40$ , but the retirement age is unchanged:  $T=40$  and  $T^R=20$ .

<sup>43</sup> In the simulations, this loss is partially compensated by increasing the replacement ratio,  $\psi$ , so that pension benefits decline by 12 percent (instead of 18 percent) compared with TAYG steady state.

Figure 3.B: Increasing The Reference Period



**Increasing The Reference Period: Final Steady State**



- As before, lower taxes increase consumption through the wealth and substitution effects, leaving labor supply and asset accumulation unchanged. On the other hand, the positive wealth effect associated with higher pension benefits is lower than in TAYG, reducing its positive (negative) effect on consumption (work hours and savings). Overall, the effects of the reform dominate these effects, leading to a decline in total hours of work that is not fully offset by a higher capital stock, i.e., GDP and consumption per capita decline.

31. **Extending the reference period reduces pension expenditures, but does not improve the macroeconomic outcome during the transition and in steady state** (Table 2). This reform reduces the pension benefits, adversely affecting aggregate labor supply. In turn, this is accompanied by the need to accumulate more assets to finance consumption at retirement, which increases the capital stock but reduces consumption and GDP.

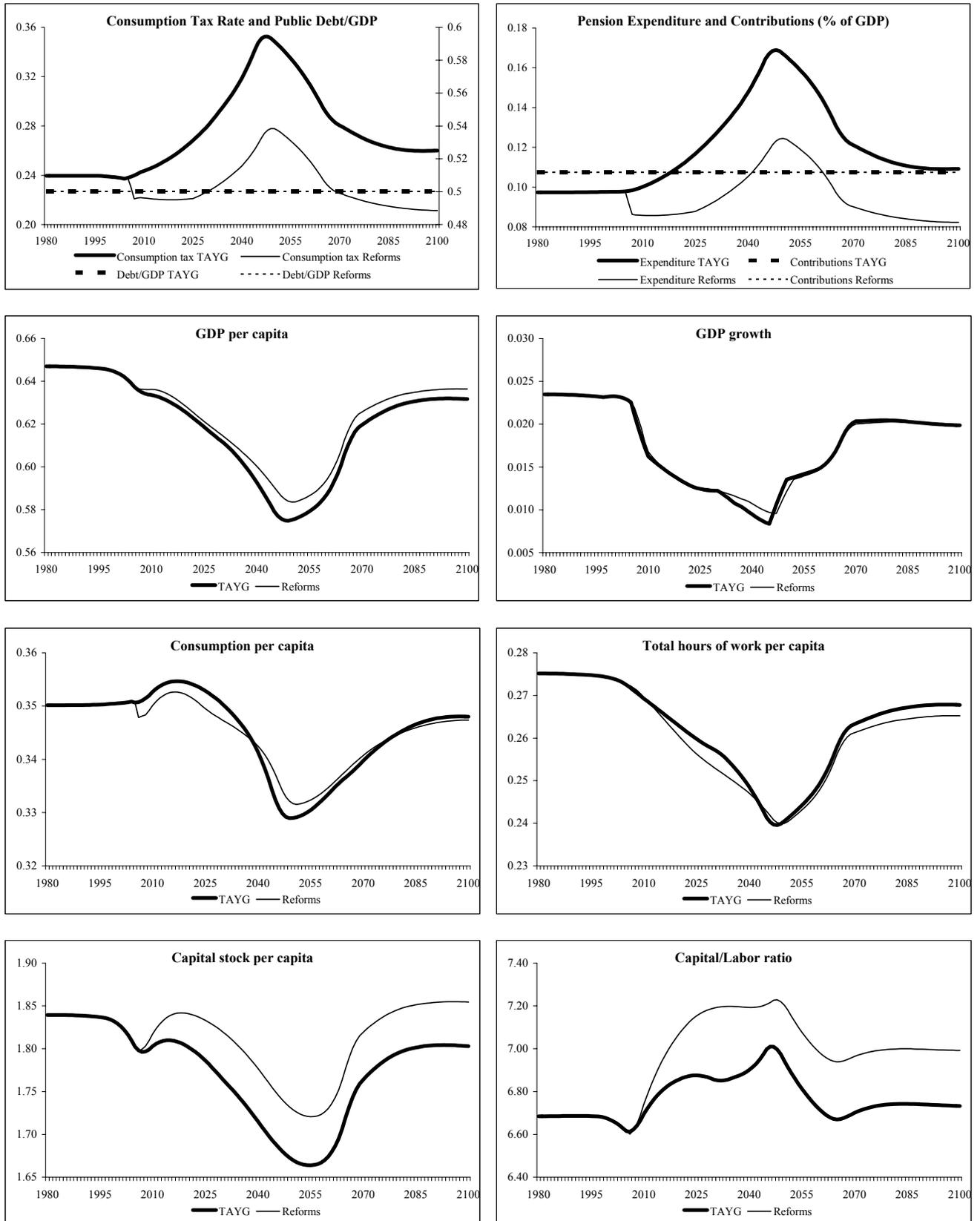
*Increasing the retirement age and the reference period*

32. **Both reforms take place simultaneously at the beginning of 2006** (Figure 3 C). As before, reforms apply to all generations working in the previous year and all those to come. Households working in 2005 are required to work an additional two years and thus retire at age 64. Also, pension benefits are computed using the entire work life as the reference period.<sup>44</sup> Individuals already retired are assumed to receive unchanged benefits. As a result, a large reduction in pension expenditure follows: all households forgo pension benefits for two years, and the average wage to compute benefits falls.<sup>45</sup> Thus, taxes are low during the first two decades following the reform, and result in dramatically smaller increases (less than 4 percentage points) at the peak. Also, the combined effect avoids the increases (decreases) in work hours compared with TAYG scenario that follow an increase in the retirement age

<sup>44</sup> In other words,  $\mu=42$ , and the retirement age has been raised:  $T=42$  and  $T^R=18$ .

<sup>45</sup> Pension benefits are now 16 percent lower than in the TAYG steady state.

Figure 3.C: Increasing The Retirement Age and The Reference Period

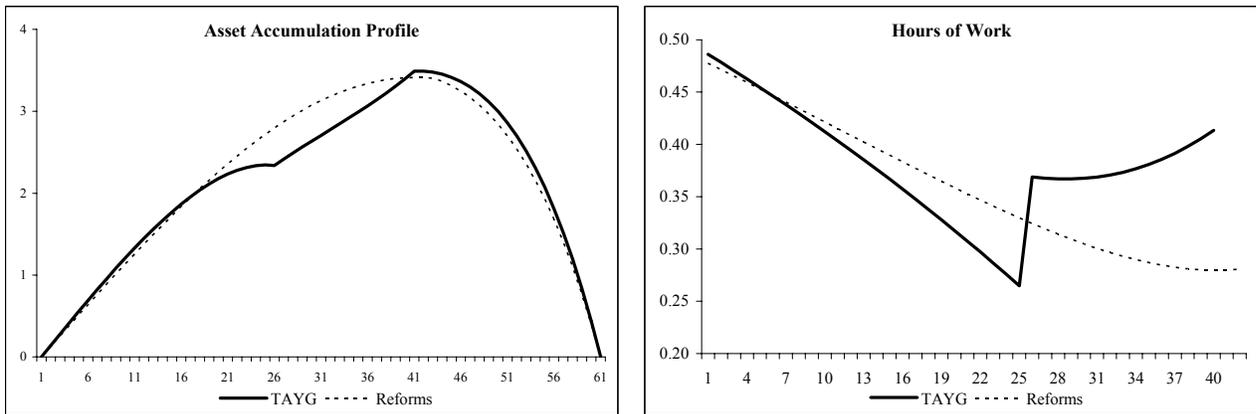


(reference period). Output per capita is a bit higher than in the TAYG scenario, but consumption is lower through 2040.

**33. Household's behavior underlies the macroeconomic effects.**

- The households' intertemporal allocation of labor and assets is smooth (text figure). Lifetime hours of work lie between those observed when these reforms are implemented separately. Specifically, the two-year increase in work life is partially offset by the decline associated with lower pension benefits. Asset accumulation increases, as both reforms reinforce each other. These effects result in (aggregate) labor supply and consumption similar to TAYG, but with higher capital and GDP per capita.

**Increasing The Retirement Age and The Reference Period: Final Steady State**



- For given prices, the further reduction in consumption taxes made possible by combining reforms increases consumption through the corresponding wealth and substitution effects, but does not alter (individual) labor supply nor savings. Relative to TAYG, the decline in pension benefits reduce the incentives to increase consumption and to lower work hours and savings; these effects complement those induced by the pension system reforms.

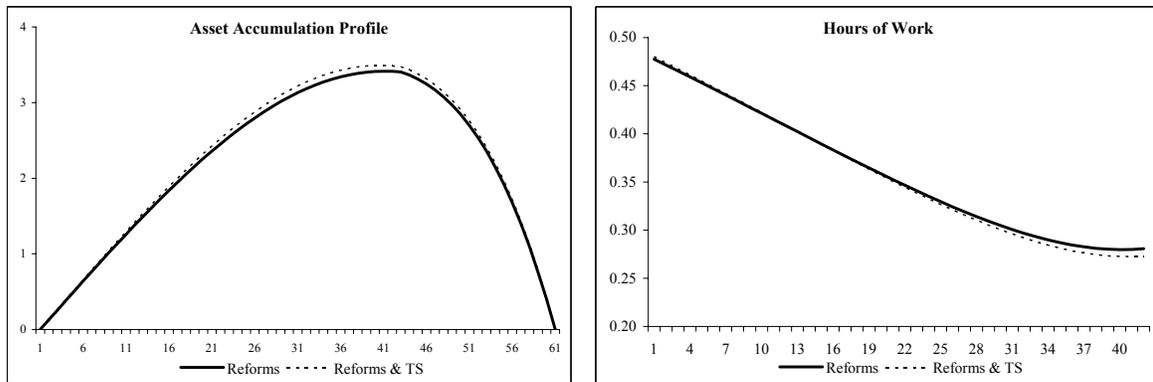
**34. Applying both reforms together reduces pension expenditures, and improves the macroeconomic outcome in some dimensions in the transition as well as in the steady state** (Table 2). The combined effects of these reforms operate to reduce the burden of the demographic transition—on the benefit and contribution sides. They also complement each other to increase the capital stock per capita, but have opposing effects on GDP, consumption, and labor supply. Regarding the latter, the lower retribution of labor effort and the shorter period of retirement, reduce hours of work. But the (aggregate) labor supply does not decline as much due to the increased number of generations working. Also, the lower pension benefits, and the increased profitability of capital, induce households to accumulate more assets, increasing the aggregate capital stock.

### *Reforming the Pension System and Tax Smoothing*

35. **Both reforms and tax smoothing take place simultaneously in 2006** (Figure 4). As before, reforms apply to all generations working in the previous year and all those to come. These reforms generate a decline in pension expenditures that enables a permanent tax cut of 1.3 percentage points. In this case, the main macroeconomic variables—output, consumption, capital, and work hours per capita—decline less during most of the transition than in the absence of tax smoothing. This improvement, however, is at the cost of somewhat lower values at the outset of the demographic transition and in steady state.

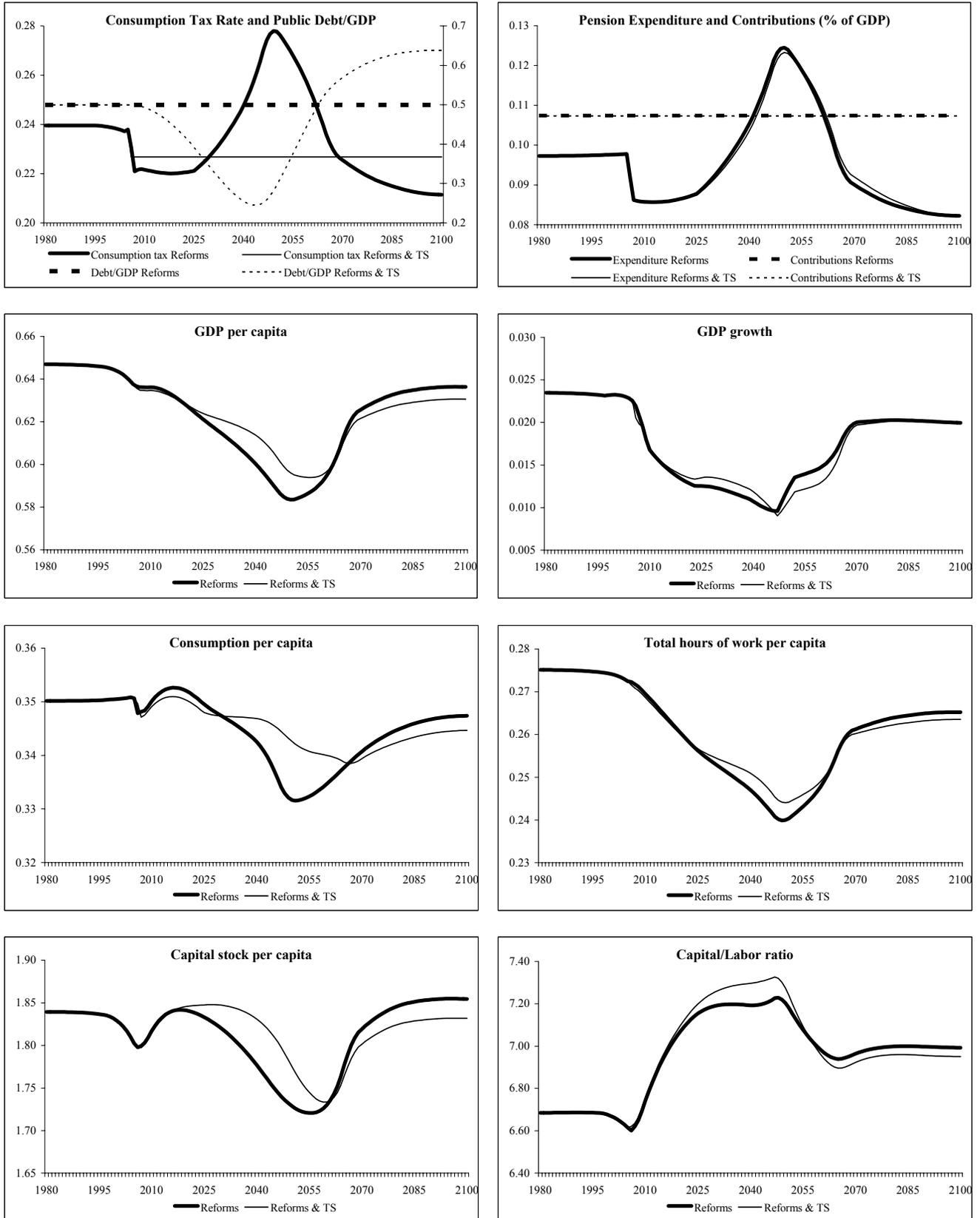
36. **Households’ behavior—underlying the macroeconomic effects—provides additional insights.** As before, pension reforms eliminate the distortions on households’ intertemporal allocation of work hours and savings. Smoothing the tax increase implies higher tax rates between 2006 and 2029, which reduces household consumption with respect to the case when taxes are not smoothed, but does not affect work hours nor savings for given prices. As public debt decreases, a larger share of households’ assets is allocated to capital, increasing gross wages. Households react by increasing work hours and consumption between 2023 and 2064, which in turn increases aggregate labor supply and consumption, as well as GDP. In the new steady state, households save more and reduce marginally hours of work relative to the case when reforms are implemented with TAYG (text figure).

**Tax Smoothing (TS) and Pension Reforms: Final Steady State**



37. **Applying both reforms and a permanent tax cut improves the macroeconomic outcome during most of the transition, but at a cost in the medium term and in the steady state** (Table 2). The combined effect of the reforms reduces the impact on social security due to the demographic transition—both the benefit and contribution sides—and thus lower financing needs. This enables the pre-emptive tax cut and eliminates the impact induced by the variability of tax rates. In the end, compared with the TAYG, GDP and capital increase throughout the transition, and consumption and labor supply are higher during most of the period, at the cost of lower consumption and employment at the beginning and in the steady state.

Figure 4: Tax Smoothing (TS) and Pension Reforms



## **Immigration and Health Care**

38. **Higher immigration moderates the fiscal impact of the demographic transition.** In this scenario, immigration flows decline more gradually and level off at a higher level, than in the baseline case considered up to now. The new demographic profile and growth of labor force thus curb the rise in the dependency ratio. Also, the initial increase in aggregate labor supply from immigration boosts asset profitability and capital accumulation, thereby increasing wages, and the non-immigrant labor supply. These effects lower the peak fiscal impact to about 5½ percent of GDP, or roughly 1¾ percentage points of GDP less than in the baseline scenario (Figure 5 A). Accordingly, the tax rate increase needed in the TAYG scenario would be about 3 percentage points lower, diminishing the adverse macroeconomic effects. Moreover, in the scenario considering pension reforms and tax smoothing, higher immigration enhances the “pre-emptive” tax cut possible at the outset by 0.6 percentage points, with the corresponding macroeconomic improvement vis-à-vis the baseline immigration flows (Figure 5 B).

39. **Adding health care expenditures magnifies the fiscal impact of aging.** Health care expenditures are modeled as additional public consumption that varies with the demographic profile. In particular, health care expenditure by age group (as a share of GDP) is scaled by the share of the population of that ages in each year during the model’s time line. This increases the peak fiscal impact by about 1 percent of GDP (Figure 6 A), resulting in tax rates peaking about 2 percentage points higher than when these expenditures were ignored. Also, the “pre-emptive” tax cut is about 0.5 percentage points smaller than otherwise in the pension reforms-tax smooth case; macroeconomic performance weakens as a result (Figure 6 B).

### **D. Summary of Results and Policy Implications**

40. **Spain’s aging population will place a substantial burden on the fiscal accounts.** Rising life expectancy and the sharp decline in birth rates are combining to whittle away and reverse the social security surplus. Immigration can ameliorate and delay the impact on public finances, but its ability to rejuvenate the population is limited and temporary. Spending pressures will also arise from health care as Spain’s income continues to rise and an aging population demands more medical services. Even though estimates vary, the fiscal impact is considerable.

Figure 5.A: High Immigration (HI) and TAYG

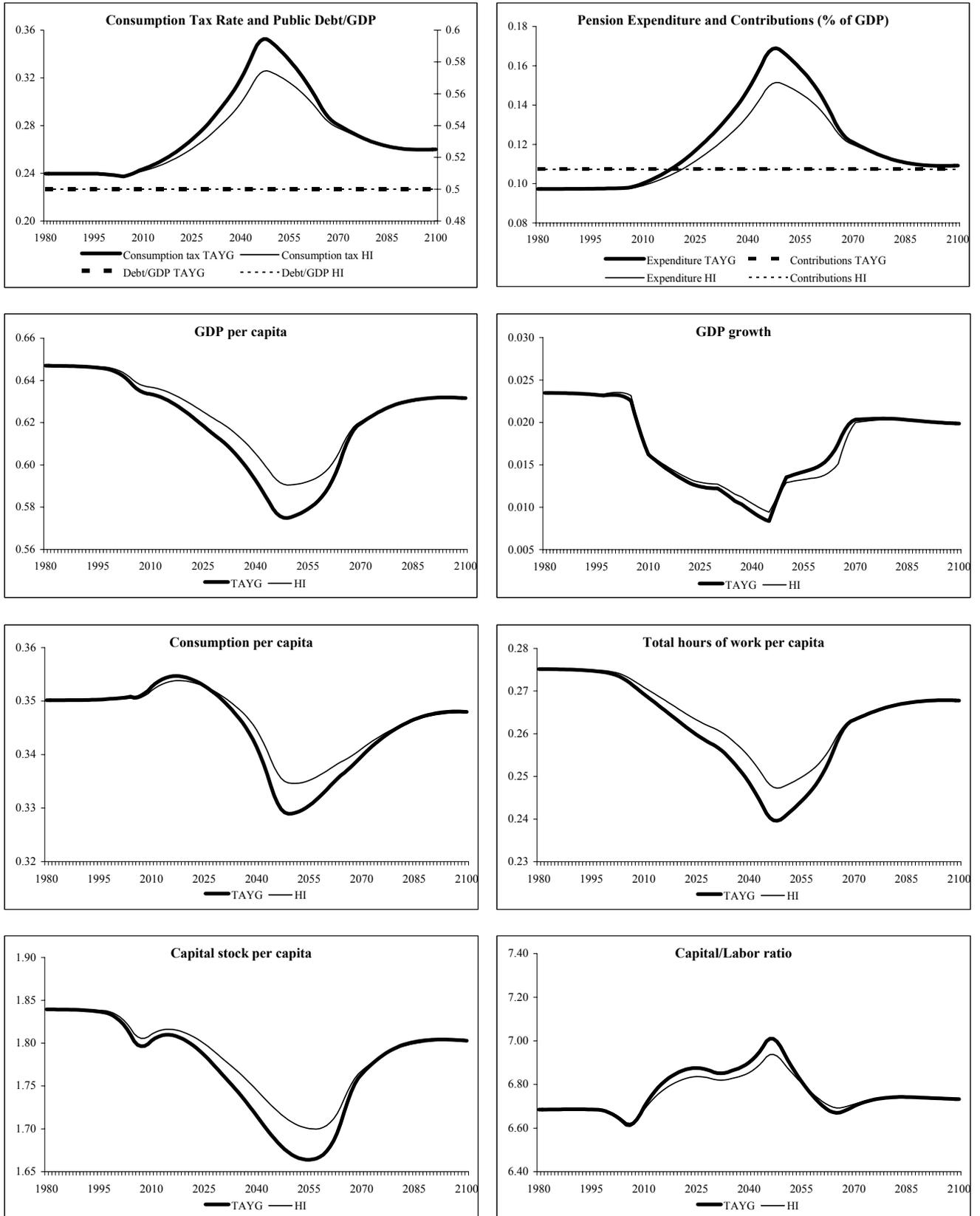


Figure 5.B: High Immigration (HI), Tax Smoothing and Pension Reforms

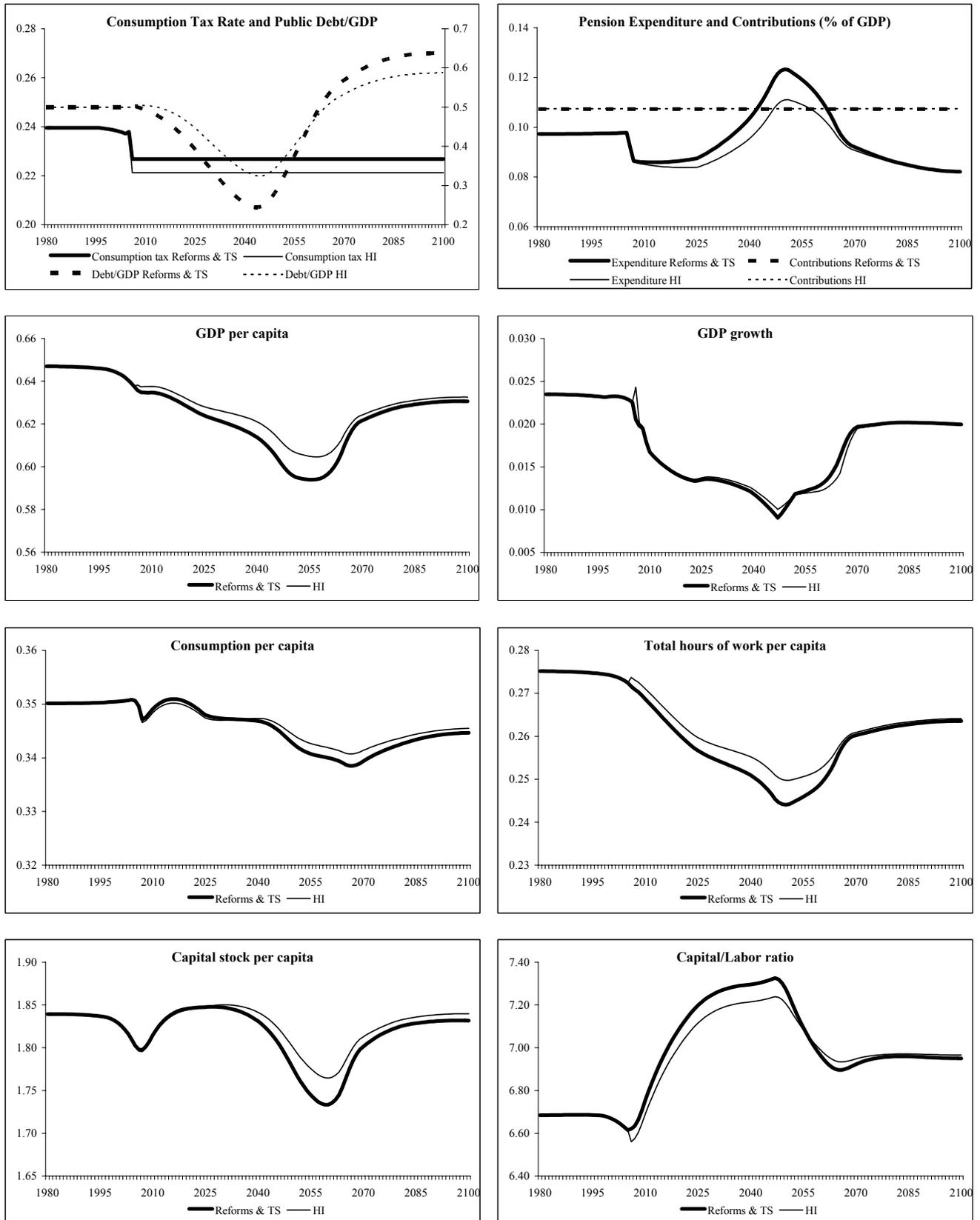


Figure 6.A: Health Care (HC) and TAYG

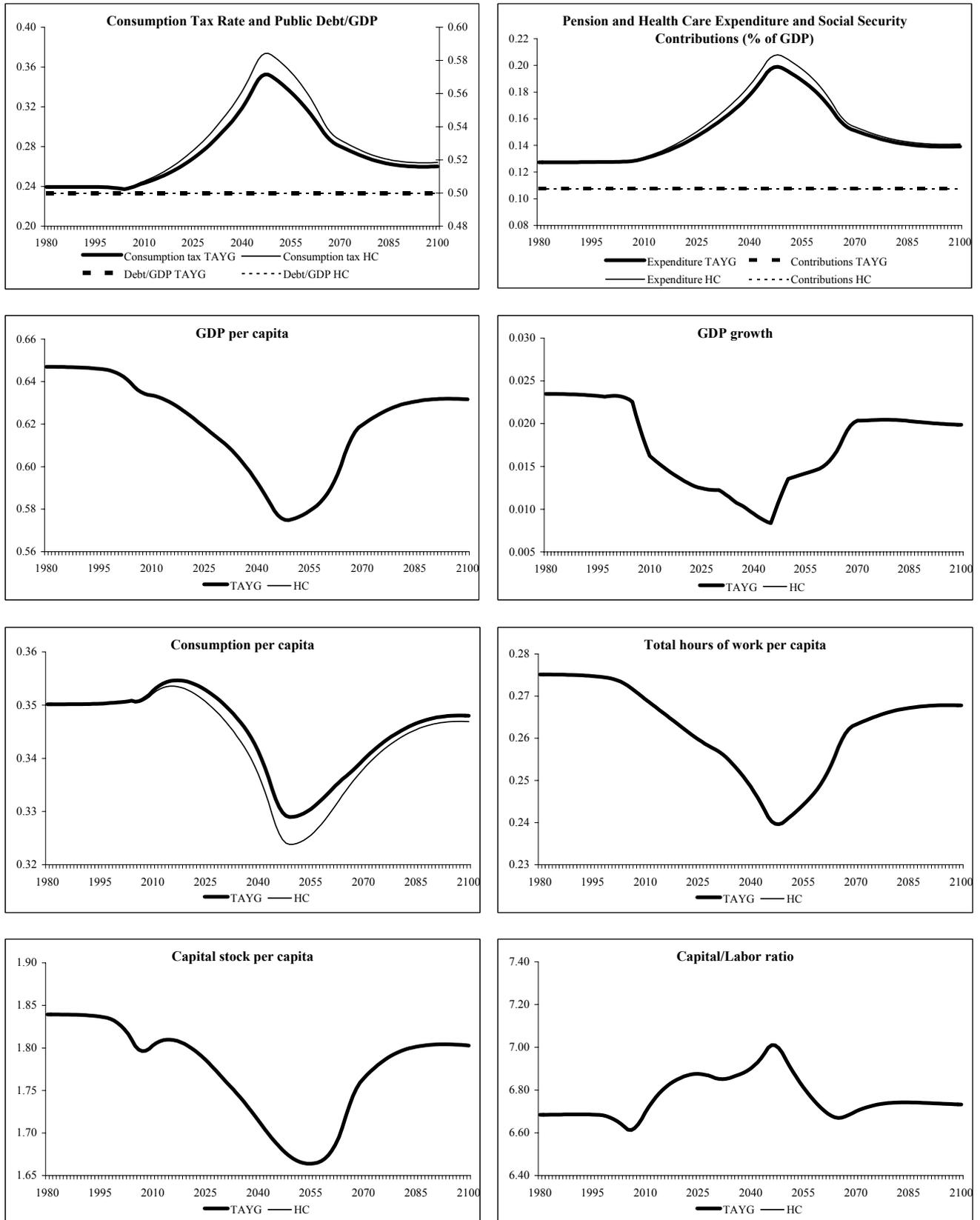
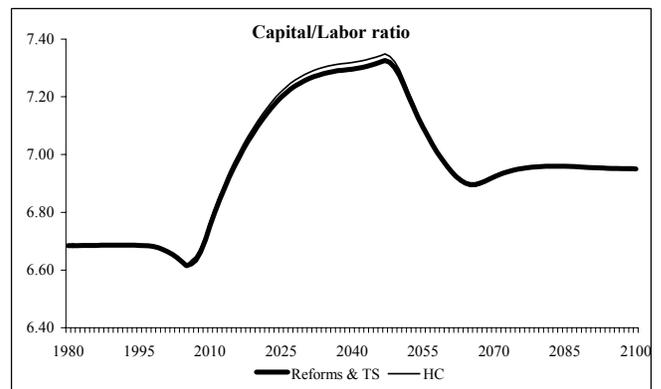
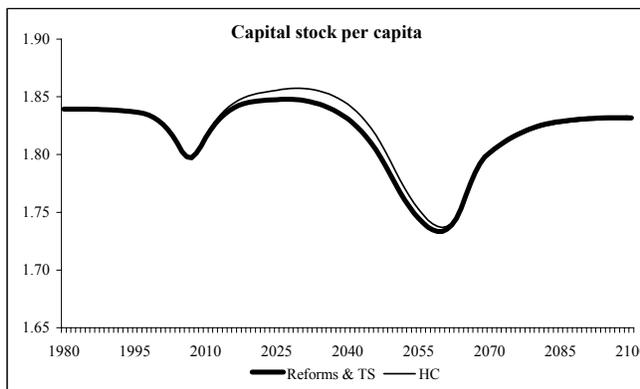
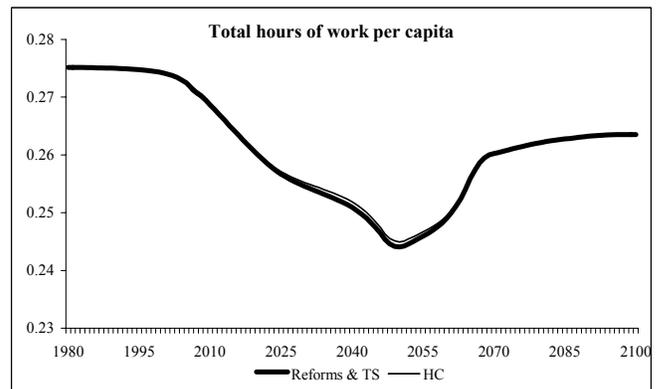
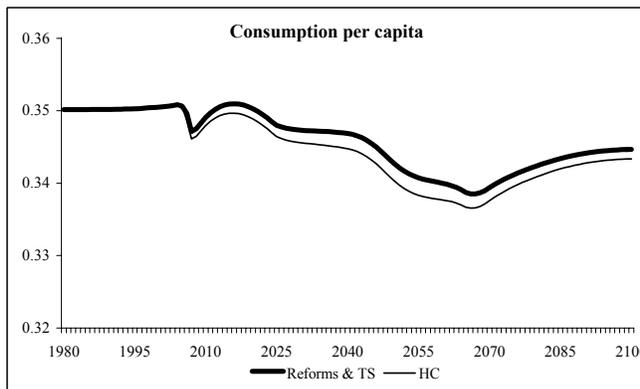
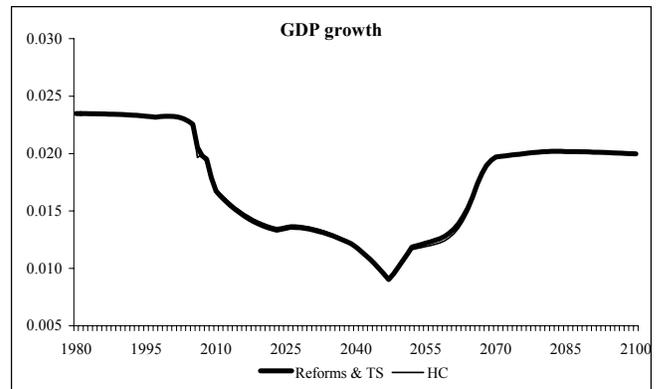
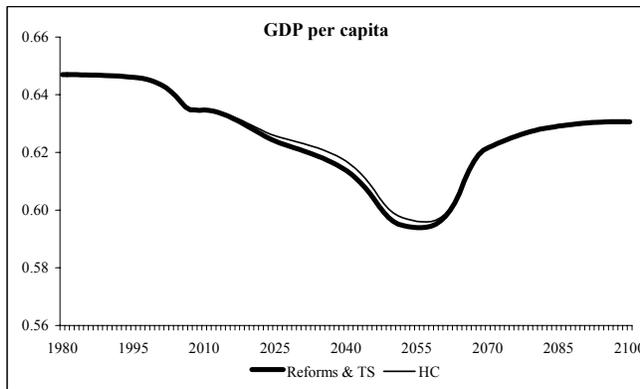
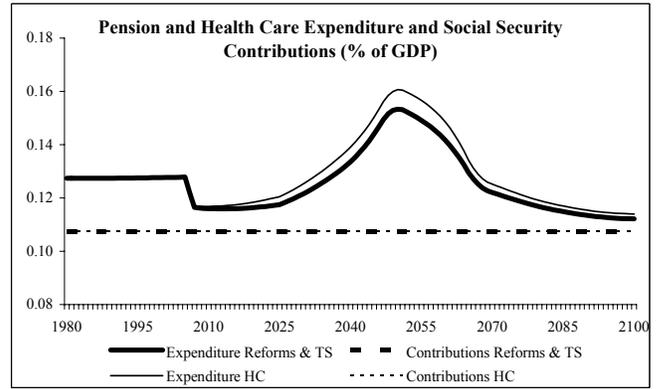
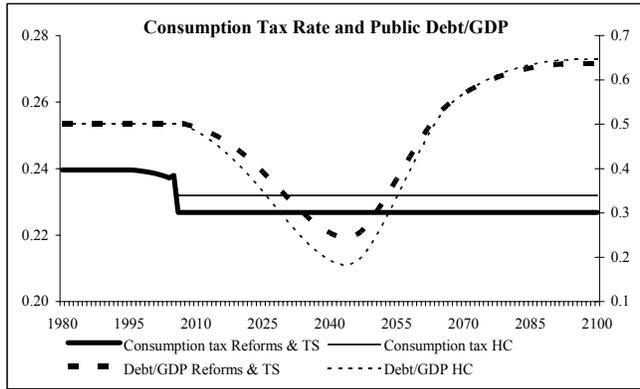


Figure 6.B: Health Care (HC), Tax Smoothing and Pension Reforms



41. **Addressing the demographic shock presents trade-offs for the economy.** In an effort to understand the potential macroeconomic consequences of alternative policies, this study has developed a general equilibrium model in the tradition of Auerbach-Kotlikoff. Thus, the analysis has gone beyond a mechanical extrapolation and fully characterizes the economy and agents' optimizing behavior in determining labor supply and making investment decisions. A number of alternative policies were examined, and the simulation results suggest the following:

- ***Left unaddressed, the impact of the demographic shock will be severe.*** The taxing-as-you-go strategy would generate a sharp and persistent output and consumption decline and, taken literally, the model suggests that output growth could remain low for several decades. This is because inaction on the reform front will require substantial increases in tax rates to finance growing pension expenditures. Using consumption taxes to finance the transition is the least costly alternative—as the burden is shared by all generations; however, these taxes cannot be adjusted arbitrarily in the EU, and even with their use the adverse macroeconomic effects would still be large.
- ***Pre-funding the demographic transition by running down public debt will moderate the macroeconomic consequences, but these will remain large.*** Pre-emptively increasing taxes will generate comparative benefits, as the smaller increases in tax rates and a declining public debt at the outset would free resources that could be devoted to increasing the capital stock. But the advantages of this policy accrue only after a number of years, illustrating the trade-off that a government faces: the long-term benefits of pre-funding in anticipation of the brunt of the fiscal consequences of aging imply some short-term costs.
- ***Pension reforms—specifically increasing the retirement age and extending the reference period—are best implemented jointly.*** Either will lessen the macroeconomic consequences as they both moderate the need to increase tax rates while lowering pension expenditures—workers contribute longer to social security and enjoy a shorter retirement, and/or the pension base determining benefits shrinks. However, extending the reference period in isolation lowers a household's incentive to work because the average wage income used to determine the pension benefit will reflect lower wages at the outset of its career. In principle, this problem could be addressed by tinkering with the replacement rate, but this effect remains going forward.
- ***Combining a tax-smoothing strategy with pension reforms has obvious advantages.*** A credible reform that effectively moderates the sharp increase in old-age pension expenditures will enable a “preemptive” tax cut, thus moving the macroeconomic benefits of reform forward by several years. This combination of policies captures not only the fiscal and macroeconomic benefits of implementing the reforms, but also the transitional gains obtained from smoothing the tax increase. Moreover, this strategy provides benefits early on that partially offset the costs of reforming pensions.

- ***Although the severity of the fiscal impact of aging can be lessened with higher immigration, the macroeconomic consequences remain important.*** Even under the most optimistic immigration scenarios currently envisaged, the population will continue aging for a number of years, and pension expenditure—reflecting the corresponding increases in the dependency ratios—will continue rising. In short, immigration does not avert the need for comprehensive pension reform.
- ***Health care expenditures heighten the fiscal impact of aging.*** Even within the limited confines through which this issue was examined in this study, the effect is large. Moreover, left unchecked, the demographic transition will compound the secular increase in health care expenditure associated with advances in medical technology, and the peculiarities of the Spanish health care system, i.e., free medicines for senior citizens. Thus, addressing the fiscal consequences of aging will also require revisiting the cost structure of the health care system with a view to increasing the share of the cost borne by households.

42. **Delays in implementing reforms could require reducing public consumption.** The implementation calendar, and particularly the assumption of no grandfathering were designed to provide the potential savings in (the path of) pension expenditures. However, realistically, the acquired rights of those working when reforms are implemented must be respected. This, and/or a more gradual implementation is feasible as long as reforms move ahead without further delay. But this implies that the savings in pension expenditures will build up more gradually, and thus public consumption will need to be scaled back accordingly so that the economy can recoup some of the gains associated with a more radical reform approach.

43. **The question that Spain, and many other countries, face is not whether reforms are needed, but rather how best to address the adverse consequences of an aging population.** This study suggests that strategies consisting of piecemeal or “corner-solutions” have the potential to increase costs—if not in the short run, certainly in the longer run. The preferred strategies are those that (credibly) address various fronts simultaneously, and delays in the implementation of such strategies require a more severe set of policies going forward. Although beyond the scope of this study, structural reforms enhancing productivity and potential growth would clearly facilitate the adjustment process and related costs.

Table 1. Health System Indicators, Spain and Europe (2002)

	France	Germany	Italy	Spain
<b>Health Indicators</b>				
Practising physicians (per density/1000)	3.3	3.3	4.4	2.9
Acute care beds (per 1000 population) 1/	4.0	9.0	4.6	2.8
Life expectancy at birth (years)	79.7	78.7	79.7	79.6
Child mortality (under 5 years, per 1000)				
Male	5.0	5.0	5.0	5.0
Female	4.0	4.0	5.0	5.0
Expectation of lost healthy years at birth due to poor health (years) 2/				
Male	6.6	5.9	6.0	6.2
Female	8.8	7.6	7.8	7.7
Average length of stay in acute care, days 1/	5.7	11.6	6.9	7.1
<b>Health Expenditure</b>				
Total health spending				
Per capita (PPP \$)	2,736.0	2,817.0	2,166.0	1,646.0
Share of GDP	9.7	10.9	8.5	7.6
Share of general government expenditure	13.7	16.6	13.0	13.6
Share of public expenditure on health	76.0	78.5	75.6	71.4
Share of private expenditure on health	24.0	21.5	24.4	28.6
Private insurance	13.2	8.6	0.9	4.1
Out-of-pocket health expenditure	10.8	12.9	23.5	24.5
Total expenditure on pharmaceuticals	20.8	14.5	22.4	21.5
Public share	67.0	74.8	52.1	73.6

Source: *OECD Health Data 2004* and *World Health Organization, Core Health Indicators 2004*.

1/ Corresponds to 2001 except for Spain.

2/ Measures the number of years in full health that a newborn child can lose because of poor health.

Table 2: Initial and Final Steady States

	Initial Steady State	Final Steady States								
		TAYG		Reforms and TAYG		Tax		Tax Smoothing		
		Consumption	Income	Payroll	Consumption	Retirement	Rule 40	Retirement & Rule 42	Consumption	Retir. & Rule 42
	(1)	(1)	(1)	(2)	(3)	(3)	(3)	(3)	(4)	
<b>Fiscal Policy</b>										
Consumption tax rate	0.240	<b>0.261</b>	0.240	0.240	<b>0.255</b>	<b>0.231</b>	<b>0.238</b>	<b>0.212</b>	<b>0.227</b>	
Income tax rate	0.135	0.135	<b>0.148</b>	0.135	0.135	0.135	0.135	0.135	0.135	
Payroll tax rate	0.195	0.195	0.195	<b>0.216</b>	0.195	0.195	0.195	0.195	0.195	
Public debt/GDP	0.500	0.500	0.500	0.500	<b>0.440</b>	0.500	0.500	0.500	<b>0.636</b>	
<b>Pension System</b>										
Number of working years	40	40	40	40	40	<b>42</b>	40	<b>42</b>	<b>42</b>	
Number of years on pension base	15	15	15	15	15	15	<b>40</b>	<b>42</b>	<b>42</b>	
<b>Social Security</b>										
Pension expenditure per capita	0.063	0.069	0.068	0.068	0.070	0.060	0.061	0.052	0.052	
Pension contribution per capita	0.069	0.068	0.067	0.074	0.068	0.069	0.067	0.068	0.068	
Individual pension benefit	0.258	0.264	0.261	0.261	0.266	0.250	0.231	0.220	0.218	
<b>Macroeconomic Aggregates</b>										
GDP per capita	0.647	0.631	0.624	0.626	0.633	0.642	0.625	0.636	0.630	
Consumption per capita	0.350	0.347	0.345	0.345	0.348	0.353	0.341	0.347	0.344	
Hours of work per capita	0.275	0.268	0.267	0.266	0.268	0.272	0.261	0.265	0.263	
Capital stock per capita	1.839	1.802	1.761	1.781	1.810	1.835	1.823	1.853	1.831	

## The Model

**The overlapping-generations model used in this study captures the effect of the Spanish pension rule.** As noted in the text, the (closed) economy is populated by overlapping generations of households, atomistic firms, and the government. The general equilibrium structure is standard, but the model incorporates a stylized version of the pension rule whereby the old-age benefit is calculated based on wage earning in the last 15 years in the workforce. Details of the model follow.

### Households<sup>46</sup>

**The household's objective is to maximize lifetime utility.** A household does so by choosing consumption ( $c$ ), leisure ( $l$ ), and asset ( $A$ ) accumulation optimally during its lifetime, which is characterized by two distinct phases: an active work life lasting  $T$  periods or years and a mandatory retirement lasting  $T^R$  years.<sup>47</sup> The utility function of a household born at time  $t$  can be expressed as follows:

$$\sum_{s=1}^{T+T^R} \beta^{s-1} \cdot U(c_{t+s-1}^s, l_{t+s-1}^s);$$

where subscripts (superscripts) refer to the time period (age of the household). During their work life, utility is optimized subject to the budget constraint:

$$A_{t+s}^{s+1} = [1 + r_{t+s-1} \cdot (1 - \tau_{t+s-1}^l)] \cdot A_{t+s-1}^s + [(1 - \tau_{t+s-1} - \tau_{t+s-1}^l) \cdot W_{t+s-1} \cdot n_{t+s-1}^s - (1 + \tau_{t+s-1}^c) \cdot c_{t+s-1}^s]$$

where assets next year are determined by adding to this year's assets this year's net return (first term) and savings (net wage income minus consumption); payroll ( $\tau$ ), income ( $\tau^l$ ), and consumption taxes ( $\tau^c$ ), and interest rates ( $r$ ), and wages ( $W$ ) are given.<sup>48</sup> The total number of hours is normalized so that the sum of work ( $n$ ) and leisure ( $l$ ) equals one, that is  $l_t^s = 1 - n_t^s$ .

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<sup>46</sup> Table 2 provides definitions for the notation used in this section.

<sup>47</sup> Specifically,  $T = 40$  and  $T^R = 20$ . Considering that individuals enter the labor force when they are on average 22 years old, this implies retirement at age 62. Households live 82 years with certainty, which is the implicit "life expectancy" at birth. This is a bit higher than Spain's life expectancy, but given the time line of the model, this assumption anticipates that gains will continue converging to the highest levels in Europe.

<sup>48</sup> The income tax is levied on labor income and asset earnings, and, for simplicity, these are assumed to be taxed at the same rate.

In retirement  $l_t^s = 1$  and wage income is replaced by an old-age pension ( $b$ ) in the budget constraint

$$A_{t+s}^{s+1} = [1 + r_{t+s-1} \cdot (1 - \tau_{t+s-1}^l)] \cdot A_{t+s-1}^s + [b_{t+s-1}^s - (1 + \tau_{t+s-1}^c) \cdot c_{t+s-1}^s]$$

Note that the old-age pension for a household retiring at time  $t$  can be expressed as

$$b_t^{T+1} = \psi \cdot \frac{1}{\mu} \cdot \sum_{j=1}^{\mu} W_{t-j} \cdot n_{t-j}$$

where the average (gross) wage in the reference period (covering the last  $\mu$  years before retirement) is “scaled down” by the replacement ratio ( $\psi$ ).<sup>49</sup>

**Two sets of conditions solve household’s problem under standard dynamic optimization techniques.** As discussed in the main text, these are the a household’s consumption-leisure choice in a specific year (intra-temporal first order conditions), and its consumption-savings decisions over time (inter-temporal first order conditions or Euler equation).<sup>50</sup> Spain’s pension rule introduces three subperiods in the household’s work life, the first—comprising of the initial  $T-\mu$  years prior to the reference period—corresponds to the standard conditions (Table 2). The second corresponds to the first  $\mu-1$  years of the reference period, when the consumption-leisure choice (intra-temporal first-order conditions) also reflects the fact that wage earnings accrued in this subperiod provide additional utility during retirement because of their effect on the pension benefit, and explains the jump in work hours at the outset of this period.<sup>51</sup> The consumption-saving decision remains unchanged. In the final year of the

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<sup>49</sup> Consistent with the majority of old-age pensions in Spain, pensions are taken as not taxed. Moreover, the pension benefit is determined upon retirement and remains constant in real terms throughout retirement, that is  $b_t^{T+1} = b_{t+s-T-1}^s$  for  $s = T + 2, \dots, T + T^R$ . Also, there are no intergenerational bequests or inheritances: households are born (“enter the labor force,”  $s=1$ ) and die ( $s=T + T^R + 1$ ) with no assets, i.e.,  $A_t^1 = A_t^{T+T^R+1} = 0$ .

<sup>50</sup> When households retire they face only an inter-temporal condition as they no longer supply labor.

<sup>51</sup> Upon retirement, the household’s optimization problem can be expressed recursively, and using a log utility assumption allows us to obtain a closed-form solution for the individual’s value function at the retirement age. Specifically,  $V_{t+T}^{T+1}$  is the household’s discounted indirect utility or continuation value when it is  $T+1$  years old and retires at time  $t+T$ . This function depends on its stock of assets at retirement,  $A_{t+T}^{T+1}$ , future annual pension benefits  $b_{t+T}^{T+1}$ , future interest rates, and income tax rates. A forthcoming IMF Working Paper will provide details

(continued...)

reference period, the consumption-saving decision reflects, nonetheless, the retirement of the individual in the following period ( $l_{t+T}^{T+1} = 1$ ). Finally, when the household retires, there is no labor supply choice by definition, and only the consumption-saving decision remains.<sup>52</sup>

**The model poses a log utility function.** To simplify an already complex model, a log utility function is specified,

$$U(c_{t+s-1}^s, l_{t+s-1}^s) = \log(c_{t+s-1}^s) + \gamma \cdot \log(l_{t+s-1}^s), \quad s = 1, 2, \dots, T + T^R,$$

in this study. As explained, in the main text this specification favor policies based on adjustments in consumption taxes over other taxes, because these do not distort household's labor decision. In other words, following an increase in consumption taxes—but not for income or payroll taxes—the *negative wealth effect that tends to increase labor effort* as households attempt to recoup their ability to accumulate assets, exactly offsets the *substitution effect which tends to reduce labor effort* (to enjoy more leisure) because consumption becomes more expensive relative to leisure.

**To define the macroeconomic equilibrium, aggregate household consumption ( $C_t^h$ ), supply of labor ( $N_t^h$ ), and assets ( $A_t^h$ ) are needed at each point in time.** These are obtained by aggregating an individual household's optimal choices, as follows:

$$N_t^h = \sum_{s=1}^T n_t^s \cdot P_t^s, \quad A_t^h = \sum_{s=1}^{T+T^R} A_t^s \cdot P_t^s, \quad C_t^h = \sum_{s=1}^{T+T^R} c_t^s \cdot P_t^s,$$

where the summation is over the population of all ages ( $P_t^s$ ), except for aggregate labor supply, which excludes the retired population that by definition no longer supplies labor.

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of the derivation of the value function ( $V$ ). Note that  $V_{A,t+T}^{T+1}$  ( $V_{b,t+T}^{T+1}$ ) denotes the partial derivative of  $V$  with respect to  $A_{t+T}^{T+1}$  ( $b_{t+T}^{T+1}$ ).

<sup>52</sup> The analysis starts with a full set of generations,  $T + T^R$ , at time  $t = 0$ . Thus, during the first  $T + T^R$  years a number of “truncated” optimization problems are associated with those households of ages  $\tilde{s} = 2, \dots, T + T^R$  that were notionally born before  $t = 0$ . These “truncated” optimization problems are defined in the forthcoming IMF Working Paper.

## Firms

**Firms maximize profits net of capital depreciation.** They do so subject to a constant-returns-to-scale Cobb-Douglas production function with labor-augmenting technological progress,

$$\Pi_t^f = (K_t^f)^\alpha \cdot [(1 + \xi)^t \cdot N_t^f]^{1-\alpha} - \delta \cdot K_t^f - W_t \cdot N_t^f - r_t \cdot K_t^f,$$

where both output and factor markets are perfectly competitive, i.e., they face a given wage rate ( $W_t$ ) and rental rate ( $r_t$ ).<sup>53</sup> The first order conditions require that  $W_t$  ( $r_t$ ) equal the marginal product of labor (capital):

$$W_t = (1 - \alpha) \cdot (1 + \xi)^t \cdot \left[ \frac{K_t^f}{(1 + \xi)^t \cdot N_t^f} \right]^\alpha, \quad r_t = \alpha \cdot \left[ \frac{K_t^f}{(1 + \xi)^t \cdot N_t^f} \right]^{-(1-\alpha)} - \delta,$$

where  $\delta$  is the rate of capital depreciation.

## The Government

**The government sets taxes to ensure long-run fiscal stability.** The government collects payroll, income, and consumption taxes from households. Tax revenues are used to finance public consumption ( $G$ )—whose path remains unchanged as a share of GDP—and pension benefits, and to redeem government debt ( $D$ ) according to the following budget constraint:

$$D_{t+1} = (1 + r_t) \cdot D_t + [G_t - \tau_t^l \cdot (r_t \cdot A_t^h + W_t \cdot N_t^h) - \tau_t^c \cdot C_t^h] + \sum_{s=T+1}^{T+T^R} b_t^s \cdot P_t^s - \tau_t \cdot W_t \cdot N_t^h,$$

where the (non-social security) primary deficit (term in brackets), and the social security deficit (last two terms) have been separated for clarity.

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<sup>53</sup> Perfect competition in output and product markets, and the constant-returns-to-scale assumption imposed on the production technology imply that, in general equilibrium, the number and the size of individual firms are indeterminate. Therefore,  $Y_t^f$ ,  $K_t^f$ ,  $N_t^f$  can be interpreted as aggregate variables.

## Equilibrium

**Equilibrium is defined as a situation that simultaneously places all households and firms on their maximizing paths, establishes the solvency of the government, and clears markets.** Consider an initial government debt  $D_0 \geq 0$ , capital stock  $K_0 > 0$ , and distribution

of assets  $\{A_0^s\}_{s=1}^{T+T^R}$ , such that  $D_0 + K_0 = A_0^h = \sum_{s=1}^{T+T^R} A_0^s \cdot P_0^s$ . The equilibrium is a collection of lifetime plans for both households born during the period of analysis ( $t \geq 0$ ),

$$\{c_{t+s-1}^s, l_{t+s-1}^s, A_{t+s}^{s+1}\}_{s=1}^{T+T^R}, \text{ for } t = 0, 1, \dots, \infty,$$

and those born before then ( $t < 0$ )—households of ages 2 through  $T + T^R$  at  $t = 0$ —and thus face “truncated” lifetime plans

$$\{c_{s-\tilde{s}}^s, l_{s-\tilde{s}}^s, A_{1+s-\tilde{s}}^{s+1}\}_{s=\tilde{s}}^{T+T^R}, \text{ for } \tilde{s} = 2, \dots, T + T^R,$$

a sequence of allocations for the firms  $\{K_t^f, N_t^f\}_{t=0}^{\infty}$ ,

and a sequence of relative prices of labor and capital and payroll, income, and consumption tax rates  $\{\tau_t, \tau_t^l, \tau_t^c, W_t, r_t\}_{t=0}^{\infty}$  such that

- the government budget constraint is satisfied for  $t \geq 0$ , and for a given government consumption plan  $\{G_t\}_{t=0}^{\infty}$ ;
- the sequence of allocations  $\{K_t^f, N_t^f\}_{t=0}^{\infty}$  solves the firm’s optimization problem;
- the lifetime plans for households born during the period of analysis  $\{c_{t+s-1}^s, l_{t+s-1}^s, A_{t+s}^{s+1}\}_{s=1}^{T+T^R}$ ;  $t = 0, 1, \dots, \infty$  solve their optimization problems, and the lifetime plans for households of ages  $\tilde{s} = 2, \dots, T + T^R$  at time  $t = 0$   $\{c_{s-\tilde{s}}^s, l_{s-\tilde{s}}^s, A_{1+s-\tilde{s}}^{s+1}\}_{s=\tilde{s}}^{T+T^R}$  solve their truncated optimization problems;
- the labor market clears,  $N_t = N_t^f = N_t^h$ , for  $t \geq 0$ ;
- the asset market clears,  $A_t = D_t + K_t^f = A_t^h$ , for  $t \geq 0$ ; and
- the output market clears,  $K_{t+1} = (1 - \delta) \cdot K_t + Y_t - C_t - G_t$  for all  $t \geq 0$ , where  $Y_t = Y_t^f$  and  $C_t = C_t^h$  are the equilibrium aggregate output and consumption levels.<sup>54</sup>

<sup>54</sup> The economy’s aggregate constraint  $K_{t+1} = (1 - \delta) \cdot K_t + Y_t - C_t - G_t$  is obtained from the aggregate constraint of the household sector, the first-order conditions of firms, the market

(continued...)

**A balanced-growth equilibrium is defined to calibrate the model.** The economy exhibits a balanced-growth equilibrium—assuming a constant population growth rate ( $p$ )—when the government implements a fiscal policy characterized by a constant government expenditure to GDP ratio and constant tax rates (and thus a constant debt to output ratio). Along this balanced growth equilibrium path of the economy, all endogenous variables grow at constant rates (text table). The balanced-growth equilibrium can be represented as a steady state in “detrended” variables by transforming aggregate variables so as to eliminate the effects of technological progress and population growth.

**Balanced Growth Path**

Variable	Growth Rate	Stationary Transformation
$Y_t, C_t, K_t, I_t, D_t, G_t, \sum_{s=T+1}^{T+T^R} b_t^s \cdot P_t^s$	$p + \xi + p \cdot \xi$	$\hat{Y}_t = \frac{Y_t}{(1 + \xi)^t \cdot P_t}$
$W_t, b_t^{T+1}, (c_t^1, \dots, c_t^{T+T^R}), (A_t^1, \dots, A_t^{T+T^R})$	$\xi$	$\hat{W}_t = \frac{W_t}{(1 + \xi)^t}$
$N_t$	$p$	$\hat{N}_t = \frac{N_t}{P_t}$
$r_t, (n_t^1, \dots, n_t^T)$	$0$	$r_t$

**The model is calibrated to match the stylized facts of the Spanish economy** (Table 3). This is done for the relevant features along an initial balanced growth equilibrium path, which constitutes the starting point of the analysis:

- Standard parameter values in the real business cycle literature are used for the share of capital in production, and the discount and capital depreciation rates.
- The leisure parameter is calibrated so that the fraction of time worked by a representative individual in the population is 0.275. Assuming that this individual sleeps 8 hours per day, the leisure-work decision is made for the remaining 16 hours. This translates into a total of 112 (=7x16) hours per week. Assuming that households work 40 hours per week, individual’s work 35.7 (=40/112) percent of time he/she is awake. Adjusting the fraction

equilibrium conditions, and the government budget constraint. The aggregate constraint of the household sector at time  $t$  is given by

$$A_{t+1}^h = [1 + r_t \cdot (1 - \tau_t^l)] \cdot A_t^h + (1 - \tau_t^l - \tau_t) \cdot W_t \cdot N_t^h + \sum_{s=T+1}^{T+T^R} b_t^s \cdot P_t^s - (1 + \tau_t^c) \cdot C_t^h .$$

of time work by labor force participation—about 77 percent for those between the ages of 16-64—yields 0.275.<sup>55</sup>

- The tax rates are calibrated so as to match effective rates observed in 1994-2004. Specifically, the payroll tax rate ( $\tau$ ) matches the observed ratio of social security contributions to wage income, and the consumption ( $\tau^c$ ) and income tax rates ( $\tau^l$ ) match, respectively, the ratios of indirect tax revenues to private consumption and direct tax revenues to GDP.
- The value of the population growth rate ( $p$ ) matches the average population growth rate for 1900-70.
- The replacement ratio value is set at 0.60. Because of recent changes to the social security system in Spain, the replacement ratios for new pensioners differ from those retired under previous regimes. The parameter choice matches the ratios observed in the most recent pensioners' cohorts.

Given these values, the calibration exercise verifies that the resulting values of the endogenous variables in the initial steady state and the fiscal data ratios closely resemble those observed in the Spanish data.

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<sup>55</sup> The labor participation rate assumption anticipates that it will continue—particularly in female participation—converging with EU levels.

Table 1. Variable Definition and Notation

Variable	Notation
$c_t^s$	consumption
$n_t^s$	labor effort
$A_t^s$	asset holdings
$b_t^s$	household's annual pension benefit
$C_t^h$	households' aggregate consumption
$N_t^h$	households' aggregate labor supply
$A_t^h$	households' aggregate asset demand
$P_t^s$	$s$ -year old population
$P_t$	total population
$r_t$	gross rate of return on assets
$W_t$	wage rate
$\tau_t$	social security contribution rate
$\tau_t^l$	income tax rate
$\tau_t^c$	consumption tax rate
$D_t$	government debt
$G_t$	government expenditure
$\beta$	discount factor (utility)
$\gamma$	leisure preference (utility)
$\alpha$	capital share (production)
$\delta$	annual capital depreciation rate
$\xi$	annual rate of labor augmenting technological progress
$\psi$	coefficient of reference base (pension rule)
$\mu$	reference period (pension rule)
$\rho$	constant annual rate of population growth (balance growth)

Note: Superscripts (subscripts) indicates the age of the household (time period); stock variables are dated at the beginning of the corresponding year.

Table 2. First Order Conditions—Household’s Optimization Problem

	Consumption-Leisure Decision (Intra-temporal condition)	Consumption-Saving Decision (Inter-temporal condition)
<b>Working Age</b>		
1) Before reference period ( $s = 1, \dots, T - \mu$ )	$U_j(c_{t+s-1}^s, l_{t+s-1}^s) = W_{t+s-1} \cdot (1 - \tau_{t+s-1} - \tau^l) \cdot \frac{U_c(c_{t+s-1}^s, l_{t+s-1}^s)}{(1 + \tau^c)}$	$\frac{U_c(c_{t+s-1}^s, l_{t+s-1}^s)}{(1 + \tau^c)} = \beta \cdot [1 + r_{t+s} \cdot (1 - \tau_{t+s}^l)] \cdot \frac{U_c(c_{t+s}^{s+1}, l_{t+s}^{s+1})}{(1 + \tau^c)}$
2) During reference period ( $s = T - \mu + 1, \dots, T - 1$ )	$U_j(c_{t+s-1}^s, l_{t+s-1}^s) = W_{t+s-1} \cdot (1 - \tau_{t+s-1} - \tau^l) \cdot \frac{U_c(c_{t+s-1}^s, l_{t+s-1}^s)}{(1 + \tau^c)} + W_{t+s-1} \cdot \frac{\psi}{\mu} \cdot \beta^{s+1} \cdot V_{b,t+s}^{T+1} \cdot V_{b,t+s}^{T+1} (A_{t+T}^{T+1}, b_{t+T}^{T+1})$	$\frac{U_c(c_{t+s-1}^s, l_{t+s-1}^s)}{(1 + \tau^c)} = \beta \cdot [1 + r_{t+s} \cdot (1 - \tau_{t+s}^l)] \cdot \frac{U_c(c_{t+s}^{s+1}, l_{t+s}^{s+1})}{(1 + \tau^c)}$
3) Last year before retirement ( $s = T$ )	$U_j(c_{t+T-1}^T, l_{t+T-1}^T) = W_{t+T-1} \cdot (1 - \tau_{t+T-1} - \tau^l) \cdot \frac{U_c(c_{t+T-1}^T, l_{t+T-1}^T)}{(1 + \tau^c)} + W_{t+T-1} \cdot \frac{\psi}{\mu} \cdot \beta \cdot V_{b,t+T}^{T+1} \cdot V_{b,t+T}^{T+1} (A_{t+T}^{T+1}, b_{t+T}^{T+1})$	$\frac{U_c(c_{t+T-1}^T, l_{t+T-1}^T)}{(1 + \tau^c)} = \beta \cdot V_{A,t+T}^{T+1} (A_{t+T}^{T+1}, b_{t+T}^{T+1})$
<b>Retirement</b> ( $s = T + 1, \dots, T + T^R - 1$ )		$\frac{U_c(c_{t+s-1}^s, l_{t+s-1}^s)}{(1 + \tau^c)} = \beta \cdot [1 + r_{t+s} \cdot (1 - \tau_{t+s}^l)] \cdot \frac{U_c(c_{t+s}^{s+1}, l_{t+s}^{s+1})}{(1 + \tau^c)}$

Table 3. Calibration of the Baseline Model (Initial Steady State)

Symbol	Definition	Value	Source
$\alpha$	Share of capital	0.4500	Hoffmaister and Cespedes (2003).
$\gamma$	Leisure preference	1.6000	Value set so that the fraction of working time for the representative household is 0.275.
$\beta$	Discount factor	0.9500	From the real business cycle literature.
$\delta$	Depreciation rate	0.0600	From the real business cycle literature.
$\tau$	Social security payroll tax rate	0.1950	Social security contributions over wage income.
$\tau^c$	Consumption tax rate	0.2400	Indirect tax revenues as percentage of private consumption (average 1994-2004).
$\tau^l$	Capital-income tax rate	0.1350	Direct tax revenues as percentage of GDP (average 1994-2004).
$P$	Rate of population growth	0.0085	Average 1900-1970.
$G/Y$	Government consumption (fraction of total output)	0.2210	Average 1994-2004.
$D/Y$	Government debt (fraction of total output)	0.5000	General government (includes regional governments), 2004.
$\psi$	Replacement ratio	0.6000	Average replacement ratio in 2002 was 0.625 (0.517) for new (old) pensioners.
$\mu$	Reference period	15.0000	15 years is the reference period since the reform of 1997.
$\xi$	Rate of labor-augmenting technological progress	0.0150	Set to result in a 1.5 percent annual rate of output per capita growth (average).

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