Government investment and the European Stability and Growth Pact

Marco Bassetto and Vadym Lepetyuk

Introduction and summary

Since 1999, 13 countries have abandoned their national currency and joined the European Monetary Union, adopting the euro. This new currency regime posed unprecedented challenges in designing institutions that would ensure its success and stability. Particularly important to this endeavor was defining the interaction between fiscal policy and monetary policy. In the case of national currencies, large and persistent fiscal deficits frequently lead to higher levels of inflation (Sargent and Wallace, 1981; and Sargent, 1986). This possibility became an even greater concern when many countries decided to share a single currency. Under the new regime, each country would fully reap any benefits of deficit spending but could potentially force others to face the undesirable consequences of undermining the independence of the newly created European Central Bank or generating instability in the Eurobond market (Chari and Kehoe, 2004). This concern was addressed in the Maastricht Treaty of 1992, which paved the way for the monetary union, and especially in the European Stability and Growth Pact (SGP), which was adopted in 1997. The pact made permanent some of the conditions that the Maastricht Treaty required of entrants at the creation of the single currency.

The cornerstone of the SGP is a cap of 3 percent on the ratio of general government deficit to gross domestic product (GDP) that each country is allowed to run in any given year. In its original form, the pact set the cap to be independent of the mix of government spending (whether transfers, recurrent expenses, investment, or interest payments), and allowed for exceptions only in case of an unusual event outside of the state's control or a severe recession.[1]

From the outset, many criticized the SGP as imposing a straightjacket on fiscal authorities. In this article, we address one specific criticism: the argument in favor of special treatment for public investment (Buiter, 2003; Blanchard and Giavazzi, 2004; and Monti, 2005). The argument starts from the premise that the fiscal authorities have a bias toward projects that yield immediate gains and postpone the costs. Therefore, applying the 3 percent cap to both investment and other expenses would lead governments to neglect their historical role as providers of major infrastructure (such as roads, airports, and schools) in favor of spending that yields more immediate but less long-lasting benefits (for example, social insurance or crime prevention). According to this view, appropriate incentives could be restored if some of the costs of public investment were postponed as well. This would require more borrowing to pay for public investment than to pay for other expenses.

The notion that public investment ought to be treated differently from other government expenses is far from new. In fact, the prescription that the government should only be allowed to borrow to pay for public investment is known in public finance as the "golden rule." Many national governments adopted this rule in the eighteenth and nineteenth centuries (see, for example, the quotations in Bassetto with Sargent, 2005),[2] but the rule fell out of favor at the national level in the twentieth century, and very few countries adopt it nowadays (Germany being a notable exception). By contrast, this rule well approximates the behavior of most U.S. states: Almost all of the states' constitutions provide for very strict borrowing limits, but many

Marco Bassetto is a senior economist in the Economic Research Department at the Federal Reserve Bank of Chicago, and Vadym Lepetyuk is a PhD student in the Department of Economics at the University of Minnesota. The authors thank Gadi Barlevy, Mariacristina De Nardi, Craig Furfine, Leslie McGranahan, and Benoît Mojon for their useful comments; Anna Lööf for help with the data; and the National Science Foundation for its support through a grant (No. 0419771).

allow significant borrowing for public investment (National Association of State Budget Officers, 2002).

In recent years, many countries have struggled to meet the strict deficit cap imposed by the SGP. When the core countries of France and Germany failed to meet it in 2002, 2003, and 2004, it became clear that the pact was unenforceable, at least in its original form. As a result, the pact was reformed in 2005.[3] This reform explicitly acknowledged the role of public investment as well as "policies to foster research and development and innovation" (European Council on the Stability and Growth Pact, 2005, article 1). Such expenses are cited as one of the factors that should be taken into account in evaluating whether a deficit is truly excessive.

In this article, we analyze one rationale for the adoption of the golden rule: the conflict that arises among different generations when the current government policy has the potential to provide both benefits (through investment) and costs (through borrowing) to future, unborn cohorts. Given the low rates of population growth, mobility, and mortality in European countries, we find that including or excluding public investment from the computation of the deficit ceiling has only moderate implications for the allocation chosen by current generations. We also find that the distinction between excluding *gross* or *net* investment from the computation of the deficit is relevant.

In the next section, we describe the model we use to analyze the efficiency of the government spending mix. This model is based upon a paper by Bassetto with Sargent (2006) that analyzed the same issue in the context of the U.S. federal and state governments. Then, we discuss the data that we use to calibrate the key parameters of the model, with particular attention to mobility. We present our main results and contrast the cases of the European countries with the findings in Bassetto with Sargent (2006) for the U.S. federal and state governments.

Model

We describe here the salient features of the model, referring to Bassetto with Sargent (2006) for a complete description.

We consider a country populated by a large number of people of different ages. For simplicity, we abstract from the effects of demographic change, and we assume that the demographics of each country are in a steady state, characterized by a growth rate of the population n and a given distribution of the population by age.[4]

Each person can live at most $N + 1$ periods (years). Conditional on having survived until then, each household faces a probability $1 - \theta_s$ of death in its sth period of life.

People consume a private good and enjoy the services of two public goods, one nondurable ("government consumption"), the other durable ("government capital"). By their nature, the same amounts of public goods are available to everyone, and nobody can be excluded from these services; hence, these goods cannot be paid by user fees, but must instead be produced from tax revenues.

A household born in year t has preferences ordered by the following:[5]

$$\sum_{s=t}^{N+t} \beta^{s-t} \left(\prod_{j=0}^{s-t-1} \theta_j \right) \left[c_{s-t,s} + f(G_s) + v(\Gamma_s) \right],$$

where β is a discount factor, $\prod_{j=0}^{s-t-1} \theta_j$ is the probability of survival until age $s - t$, $c_{s-t,s}$ is consumption of the private good in period s by a person aged $s - t$ (born in period t), f and v are strictly concave utility functions, Γ_s is the per capita stock of public capital in period s, and G_s is the amount of public consumption per capita in period s.

Our analysis is greatly simplified by assuming that utility is linear in private consumption. This implies that a person's wealth will not affect that individual's relative preferences for private versus public consumption, and allows us to focus on differences in their survival probabilities as the sole source of political conflict. This assumption is a useful approximation here because we are particularly interested in the decision of *public consumption versus public investment*, a margin that is less directly affected by differences in wealth.[6]

In each period, each person alive produces y units of output, which can be either consumed as a private good or turned into government consumption or investment.[7] Public capital depreciates at a rate δ. The economy-wide resource constraint is thus

1) $C_t + G_t + \gamma_t \leq y,$

where C_t is private consumption per capita and γ_t is government gross investment per capita in period t.[8]

The country has a government that is empowered to levy taxes and produce public goods. Taxes and spending are chosen by majority vote each period, subject to exogenous restrictions on government indebtedness that are described by two parameters:

- d, a deficit ceiling (expressed in per capita terms), and
- x, a fraction of public investment that is not counted for the purposes of the deficit ceiling.

The government budget constraint in period t can thus be written as

$$2) \quad B_t = G_t + \gamma_t - T_t + (1+r)\frac{B_{t-1}}{1+n},$$

$$3) \quad B_t - \frac{B_{t-1}}{1+n} \leq d + x\gamma_t,$$

where B_t is government debt per capita at the end of period t, T_t are taxes per capita in period t, and r is the interest rate.[9]

In the original version of the SGP, d was equal to 3 percent of GDP (y) and public investment was not excluded, so $x = 0$. While the 2005 reform does not explicitly exclude public investment, it does mention it as one of the factors that should be taken into account in assessing any breach of the 3 percent ceiling, suggesting that $x > 0$ (if not equal to 1) under the current interpretation.

Equation 3 assumes that the investment that can be excluded from the deficit computation is gross of capital depreciation. Blanchard and Giavazzi (2004), among others, recommend excluding *net* investment. In our numerical results, we establish the importance of this distinction. We thus also consider a version of equation 3 where net investment is potentially excluded:

$$B_t - \frac{B_{t-1}}{1+n} \leq d + x\left(\gamma_t - \delta\frac{\Gamma_{t-1}}{1+n}\right).$$

We assume that the government finances its operations through lump-sum taxes levied equally on each person alive. We thus abstract from the distortionary effects of taxation analyzed by Barro (1979) and Lucas and Stokey (1983), among many others.

In each period, we assume that the households alive choose the level of public consumption, public investment, and taxes, subject to the deficit ceiling. In all of the numerical simulations that follow, the generations alive will unanimously support running the maximum allowable deficit, since this will shift the burden of taxation to future generations. This means that effectively the generations alive will vote on the amount of public consumption and investment, with the understanding that taxes will be set so as to hit the deficit ceiling exactly in each period. The actual experience of euro countries suggests that this result is less far-fetched than one would expect, since many of them have consistently stayed very close to the upper limit throughout the existence of the pact.[10] If tax distortions were explicitly accounted for, countries would have

an incentive to stay away from the ceiling in favorable periods, but this would not affect the main economic forces analyzed here.

Some general intuition

The environment described in the previous section delivers a particularly simple notion of the efficient size of the government, since all households alive share a common valuation of the public good.

An efficient allocation of public goods (G^*, Γ^*) is given by the solution to the following two equations:[11]

$$4) \quad f'(G_t) = 1,$$

$$5) \quad v'(\Gamma_t) = 1 - \beta(1 - \delta).$$

Consider equation 4 first. We chose units so that producing one unit of public consumption per capita requires sacrificing one unit per capita of the private good (see equation 1). The utility cost of the sacrifice is constant and equal to 1. Equation 4 states that in an efficient allocation, government spending should be set so that the benefit of an additional unit of public consumption is equal to its cost.

Equation 5 looks at the case of government investment. The cost of an extra unit in terms of foregone private consumption is again 1. The benefit is now twofold. First, the additional government capital yields immediate benefits, captured by $v'(\Gamma_t)$. Second, government capital is durable, and $1 - \delta$ units will survive into the next period; these units can be used to save on next year's investment, thereby yielding a utility gain $1 - \delta$ tomorrow. These gains are discounted at the market discount factor, which in equilibrium is $\beta = 1/(1 + r)$.

Throughout this article, the equilibrium features unanimous support for the efficient provision of government consumption; that is, equation 4 will always hold. This happens because all generations alive agree on the benefits of this spending and they also share the costs equally. Furthermore, since there is unanimous agreement for setting taxes so that the deficit constraint d is binding, independent of the level of spending, extra spending must be matched by extra tax revenues to keep the deficit at d, and no costs can be passed to future generations (at the margin). The goal of this article is to discuss whether government consumption and government investment should be treated differently in the design of constitutional deficit restrictions. For this reason, we rely on an environment that abstracts from all the potential distortions that could, in practice, lead to inefficiency

in static decisions (such as the provision of public consumption), and we concentrate instead on the conflict among different generations that arises when the government is called upon to make choices that have dynamic implications.

To further illustrate the conflict among people of different ages over the provision of public investment, consider the simple case in which government investment cannot be excluded from the computation of the deficit, so that $x = 0$. In this case, an extra unit of public investment generates in equilibrium the following costs and benefits:

1. The utility from consuming public capital increases in period t by $v'(\Gamma_t)$;

2. To pay for the investment, taxes increase in period t by 1; and

3. In period $t + 1$, additional $(1 - \delta)/(1 + n)$ units of capital per capita are available: This is smaller than 1 both because capital depreciates and because the same capital is spread over a larger population; the political equilibrium is such that investment will decrease by exactly $(1 - \delta)/(1 + n)$, so taxes decrease by this amount as well.[12]

While the first two effects accrue to all generations alive equally, the last one will depend on the probability of being alive and present in the same country in period $t + 1$. A person of age s will support public investment up to the point at which

6) $\quad v'(\Gamma_t) = 1 - \dfrac{\theta_s}{1+n}\, \beta(1-\delta).$

Comparing equations 5 and 6, we see that they coincide in the special case in which people are infinitely lived and immobile and there is no population growth. These conditions lead to what is known more generally as *Ricardian equivalence*—the principle of irrelevance of the debt and deficit policy.[13] In this case, borrowing shifts costs into the future, but the same people will be alive and paying taxes into the future; thus, sooner or later, they will have to pay for the government spending. Since it will always be the same people who benefit from the public investment and pay the taxes, and those people agree in each period on costs and benefits, the case of Ricardian equivalence yields the efficient level of investment, independent of x.

In general, we see that $x = 0$ always leads people to favor underinvestment.[14] The magnitude of the underinvestment is related to three factors:[15]

■ Population growth. The more new people are born (or immigrate), the more it is possible to shift

costs to them by borrowing. This effect leads (alive) cohorts of all ages to discount future benefits excessively.

■ Survival probabilities. The smaller the probability of surviving, the more people discount future benefits. Since the probability of dying in a given year is very small at most ages, this channel will not be as important except for the very old.

■ Mobility. When people move from one country to another, they leave behind that country's public capital. At the same time, they stop paying that country's taxes and thus leave behind debt as well.[16] For the purpose of the model, moving to a different country is identical to dying in the first country and being "reborn" (at an age greater than 0) in the new one. Since the young are more mobile than the middle aged and the old, mobility will lead the young to discount future benefits and costs relatively more. As a consequence, when $x = 0$, the voting pattern will usually pit the relatively impatient young and old against the relatively patient middle aged.

When some borrowing for public investment is allowed ($x > 0$), current investment bears consequences for more than two periods, and the preferences of each cohort depend on its entire prospects for mobility and survival over a longer period. In principle, this could generate very complicated patterns of voting by age. In practice, the simple intuition of the case with $x = 0$ carries over to the specific parameters of our numerical simulations.

The big countries of the eurozone are characterized by very low population growth and low (international) mobility. These factors suggest that their demographics will be close to Ricardian equivalence; therefore, according special treatment to government investment in the SGP is unlikely to generate large efficiency gains, as our numerical analysis confirms.

Our previous discussion focused entirely on the parameter x, which measures the amount of public investment that is not counted in the computation of the deficit subject to the ceiling. The budget rule in equation 3 contains a second parameter, d, the maximal deficit level allowed. As it turns out, the deficit level has no effect on government efficiency in our model economy. The intuition for this result is straightforward. We already observed that current generations will set taxes so as to hit d exactly. Combining equations 2 and 3, we get

7) $\quad T_t = G_t + r\dfrac{B_{t-1}}{1+n} + (1-x)\gamma_t - d.$

Raising the ceiling is equivalent to a pure transfer of resources from future generations to the current ones: It allows current generations to cut their tax payments, leaving more debt to be repaid in the future. However, this does not affect the trade-offs that current generations face at the margin. As an example, consider the trade-off between taxes and public consumption. While the current generations can now afford lower taxes or higher public consumption, even under the new ceiling they still need to trade off one fewer dollar of taxes for one more dollar spent on the public good. This will lead them to choose G_t according to equation 4, exactly as before. A similar argument holds for government investment; while its level in general will not be efficient, it will not change with d.

Efficiency wedge

Given a level of public capital Γ_t, we measure departures from efficiency by an efficiency wedge τ defined as follows:

$$\tau = \frac{v'(\Gamma_t) - v'(\Gamma^*)}{v'(\Gamma^*)}.$$

Here, the wedge τ measures the percentage deviation of the value of the marginal public investment project from what it would be in the efficient allocation. As an example, if $\tau = 30$ percent, it means that the government will only undertake projects whose benefits exceed $1.30 per $1 of cost.[17] Hence, positive values of τ indicate underprovision, and negative values indicate overprovision, of public capital. As discussed in Bassetto with Sargent (2006), we choose this measure because it is particularly robust to changes in assumptions on the preferences, and it does not require us to take a stand on the specific form of the utility function v.

Data

We set a period in the model to be one year, in line with the budgeting cycle of all the countries considered here. The model has two parameters that we set the same for all countries:

■ The agents' discount factor. We set β to the most commonly used number of 0.96, which yields a yearly discount factor of approximately 4 percent.

■ The depreciation rate of capital (δ). We use two values; we set it at 6 percent in line with commonly used estimates of the depreciation of private capital (we call this case "generic capital"), and we also experiment with the lower depreciation rate of 3 percent to capture investment in major infrastructure.

For each country,[18] we need four additional inputs:

1. The population growth rate;

2. The distribution by age of the population;

3. The mortality rate by age; and

4. The gross mobility out of the country by age, that is, the probability that a person of a given age will emigrate to a different country within the next year.

A slight complication lies in the distinction between a country's taxpayers and its citizens. The growth rate of the population matters for tax receipts, and is thus related to taxpayers (a population that would include noncitizens), while the other variables enter into the model because they affect the distribution of voters (only citizens).

Our baseline calibration is based on data from the Statistical Office of the European Communities. Unfortunately, we do not have data on the number of citizens and the number of emigrant citizens (those who move to other countries) by age for the same year. We thus rely on data for the total population of the country. This is not a quantitatively important issue.[19]

As pointed out by the Statistical Office of the European Communities (2002), "frontier and immigration controls are often minimal or non-existent for persons leaving a country, and there is a tendency for persons to remain recorded in administrative systems even after they have left the country."[20] It is thus likely that these data are somewhat underestimated, which is why we use an alternative source for a robustness check. The extent of the underestimation is mitigated by the fact that the data include people that move only temporarily. This is especially common among the young. When a person plans to reenter the country within a short time (such as a couple of years), she will reap most of the benefits of public investment currently undertaken and will be responsible for paying most of the taxes to cover currently issued debt, so she should not be counted for our purposes. Our emigration rates are also significantly higher than those reported by the Commission of the European Communities (2002, annex II), which states that only 0.1 percent of the European Union (EU) population moves from one country to another in any given year.[21] This further reassures us that we are not relying on grossly understated emigration rates.

To check for robustness, we use the 2005 Eurobarometer survey (Papacostas, 2007) as an alternative. The survey covers a representative sample of EU residents aged 15 and above. One of the questions in the

survey asks whether the interviewee is likely to move to a different country within the next five years.[22] The survey also contains information about citizenship, so we can restrict our sample to citizens residing in their home country. To strive for an upper bound, we assume that anyone that answers yes will move, even though some express intent to move both within the country and abroad; we attribute one-fifth of this fraction to mobility in each given year (to account for the five-year window). This measure yields larger numbers for most countries.[23]

Table 1 presents summary statistics about population growth and mobility rates (averaged across all age groups). For comparison with Bassetto with Sargent (2006), we also include some U.S. data. This table shows that emigration rates from European countries are higher than those for the whole of the U.S., but much lower than they are for individual U.S. states. Population growth also tends to be lower in Europe.[24]

TABLE 1

Descriptive statistics

Region	Population growth rate	Emigration rate	
		Baseline	Eurobarometer
	(------------------- percent -------------------)		
Austria	0.5	0.9	0.5
Belgium	0.4	0.4	0.7
Finland	0.5	0.2	1.0
France	0.7	n.a.	1.0
Germany	0.3	0.8	0.5
Greece	1.0	n.a.	0.6
Ireland	2.1	n.a.	1.5
Italy	0.4	0.1	0.6
Luxembourg	1.1	2.6	0.7
Netherlands	0.5	0.5	0.9
Portugal	0.9	n.a.	0.8
Spain	1.4	0.2	0.5
Median of the countries above	0.6	0.5	0.7
Median of U.S. states	1.0	2.1	
United States	1.2	0.1	
Illinois	0.8	2.0	

Note: n.a. means not available.

Sources: Authors' calculations based on data from the 1990 and 2000 U.S. Censuses, Papacostas (2007), and the Statistical Office of the European Communities.

Numerical results

Table 2 shows our numerical results for the baseline calibration. We also include the values that apply to the U.S. federal government, to the median of the U.S. states, and to the state of Illinois.[25]

First, we consider what happens under a strict interpretation of the SGP, which does not allow exclusion of public investment. With the exception of Luxembourg, the magnitude of the distortion is limited. In the worst-case scenario, the predicted benefit of the marginal public investment in Austria and Spain is $1.24 for $1 in costs. Comparing the magnitude of the predicted wedge across countries, we confirm that it is bigger for countries with higher population growth (such as Spain) or higher emigration rates (Luxembourg and Austria), whereas it looks particularly small for Italy, a country with very low population growth and mobility. Most of the variation across countries is driven by aggregate forces that shift up and down the incentives of all generations at the same time; a much less prominent role is played by differences in the nature of the conflict among generations, stemming from a different age structure or a differential mobility by age. The efficiency wedges are somewhat similar to those predicted for the U.S. federal government. The similarity comes from two forces that roughly compensate each other. First, lower population growth in Europe relative to the U.S. decreases the distortion that is

coming from the anticipation of lower future per capita taxes with higher population growth. Second, small but nonetheless somewhat higher emigration from the European countries than from the U.S. increases the wedge, as voters discount the future more heavily. Table 2 also shows that the magnitude of distortions is much bigger in the case of individual U.S. states. This happens because the migration across U.S. states is significantly higher than across European countries. The case for treating public investment differently is thus much stronger at the U.S. state level (where this is standard practice) than at the European national level.

A second important observation arises from looking at the effect of excluding gross investment from the computation of the deficit. The distortions in this case are mostly as large as or larger than those in the original interpretation of the SGP, albeit in the opposite direction: Countries are encouraged to significantly overspend, particularly when borrowing is allowed for investments that are not as long-lived, such as equipment. This result stands in stark contrast to Bassetto with Sargent (2006), who find that the golden rule achieves a desirable allocation. The key difference is the repayment schedule of debt. In Bassetto with Sargent (2006), states are required to repay a fraction of the debt each period. This is meant to capture the practice of U.S. states, where debt issued to pay for capital improvements is gradually repaid and not rolled over indefinitely. The SGP does not contain a provision that

ensures such gradual repayment; from equation 7, we see that the government is only raising taxes to repay interest on its past debt and it is rolling over the principal.[26] This strategy moves costs too far into the future compared with the dates at which the bulk of the benefits of investment will be reaped; hence, current generations will be tempted to overspend. One possible solution is to set $x < 1$, that is, to allow only a portion of investment to be excluded from the deficit computation. Alternatively, excluding *net* investment from the deficit subject to the ceiling performs really well. Table 2 shows that the value of the marginal investment is very close to efficiency in this case, supporting Blanchard and Giavazzi's (2004) recommendation. Excluding net investment is equivalent to setting a schedule to repay the debt that is used in financing investment. To see why, consider what happens if people raise public investment by $1 in period t and do not change gross investment in the future. In period t, the government is allowed to issue an extra dollar of debt. In period $t + 1$, government capital is now higher, and the same level of gross investment as before leads to a smaller net investment, by $\delta/(1 + n)$ dollars per capita; this in turn forces the government to reduce its deficit in period $t + 1$ by the same amount, which contributes to reducing the debt contracted at period t. A similar process would continue in all subsequent periods, since public capital would only gradually converge back to the level that would prevail without the extra dollar of investment.[27] In practice, excluding net investment is significantly more complicated than excluding gross investment, since it requires knowledge of the appropriate depreciation rate of public capital. Each additional complication generates new opportunities for governments to game the accounting,[28] and such a complication is only justified when the magnitude of the distortions involved is sufficiently large.

For figure 1, we have chosen Germany as an example to illustrate how the political decision emerges from the conflict across different generations alive in the case of generic capital. The figure plots the wedge τ that would be preferred by each cohort; a larger (more positive) τ means that the cohort favors more severe underinvestment, whereas a more negative τ implies that the cohort favors more severe overinvestment.

|	TABLE 2		
Efficiency wedge τ in the baseline calibration			
Region	SGP, no exclusions	Excluding gross investment	Excluding net investment
	(- - - - - - - - - - - - - percent - - - - - - - - - - - - -)		
Generic capital			
Austria	16	−24	−1.8
Belgium	11	−22	−1.2
Finland	10	−22	−1.1
Germany	14	−23	−1.5
Italy	6	−20	−0.7
Luxembourg	35	−34	−3.8
Netherlands	13	−22	−1.4
Spain	16	−25	−1.7
Median of the countries above	14	−22	−1.5
Median of U.S. states	33	−32	−3.5
United States	14	−24	−1.5
Illinois	30	−30	−3.2
Major infrastructure			
Austria	24	−17	−1.8
Belgium	16	−16	−1.2
Finland	15	−16	−1.1
Germany	21	−16	−1.5
Italy	9	−14	−0.7
Luxembourg	51	−25	−3.8
Netherlands	19	−16	−1.4
Spain	24	−18	−1.7
Median of the countries above	20	−16	−1.5
Median of U.S. states	48	−24	−3.5
United States	20	−18	−1.5
Illinois	43	−22	−3.2

Notes: SGP means European Stability and Growth Pact. See the text for further details on the efficiency wedge τ.
Sources: Authors' calculations based on data from the 1990 and 2000 U.S. Censuses and the Statistical Office of the European Communities.

In figure 1, the median voter line indicates the policy that is chosen under majority voting: Exactly 50 percent of the voters would prefer larger overprovision (or smaller underprovision) and 50 percent smaller overprovision (or larger underprovision). We can see that all people alive unanimously support underinvestment if no exclusion is allowed ($x = 0$) and overinvestment when gross investment is excluded from the deficit ceiling. When net investment is excluded, most generations favor an allocation that is extremely close to efficient. In two of the three cases (panels A and C of figure 1), the vote pits the young and old against the middle aged, as we remarked earlier. In the case of excluding gross investment, the prospect of pushing taxes further into the future becomes particularly relevant, and a different split emerges, with the young on the patient side against the old on the impatient side (see panel B of figure 1).
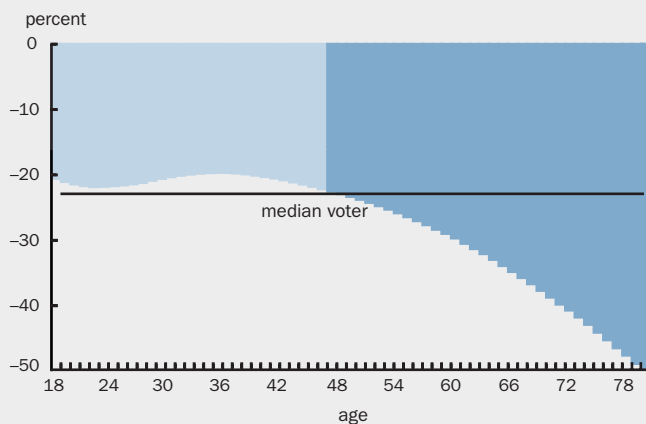
FIGURE 1

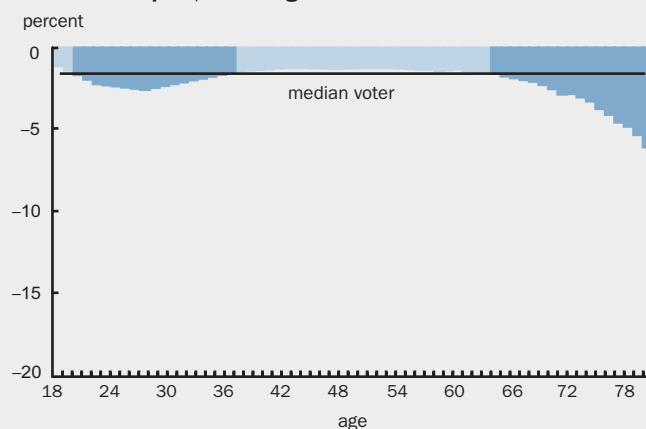### Efficiency wedge profiles for Germany, baseline scenario

A. SGP, generic capital, no exclusions from deficit count

percent
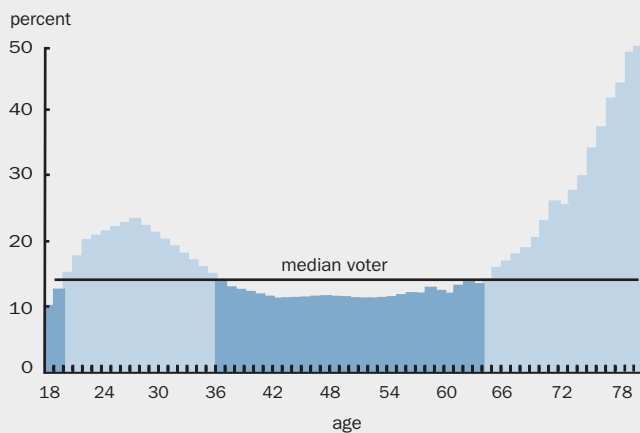
median voter

B. Generic capital, excluding gross investment from deficit count

percent

median voter

C. Generic capital, excluding net investment from deficit count

percent

median voter

Notes: SGP means European Stability and Growth Pact. The median voter line indicates the policy that is chosen under majority voting: Exactly 50 percent of the voters would prefer larger overprovision (or smaller underprovision) and 50 percent smaller overprovision (or larger underprovision). See the text for further details on the efficiency wedge τ.
Source: Authors' calculations based on data from the Statistical Office of the European Communities.

Table 3 shows the results when emigration is calibrated to the intentions revealed in the Eurobarometer survey.[29] For the large countries with low population growth and mobility, notably Germany and Italy, the results are similar to those of the baseline calibration. The distortion arising from treating government consumption and investment in the same way (that is, no exclusions) is not very large, albeit not entirely trivial. Distortions are bigger in the case of some of the smaller countries, although the same countries are likely to suffer from more upward bias from temporary mobility. This is particularly the case for Ireland, where 16 percent of the citizens currently residing in Ireland report having lived abroad in the past.

Conclusion

Two main conclusions stand out from the analysis we carried out.

- The demographics and mobility rates for European countries do not justify drawing a sharp distinction between the financing of government consumption and investment in the same way those factors for the U.S. states do.

- To the extent that a distinction is approved, it is important to exclude only net investment from the deficit count, since excluding gross investment could actually worsen distortions.

We analyzed the efficiency implications of the SGP from the perspective of an individual country. For this article, it does not matter whether the deficit restrictions follow from a multilateral agreement, such as the SGP, or are self-imposed by the constitutions of individual entities, as is the case for U.S. states. Many authors have discussed the externalities that justify the adoption of a multilateral pact that covers fiscal policy in a monetary union; among them are Beetsma and Uhlig (1999), Dixit and Lambertini (2001), Chari and Kehoe (2004), and Lindbeck and Niepelt (2004). Their insights provide conditions under which it is desirable to restrict the independence of an individual government in running its fiscal affairs, but they do not bear implications for setting common

	TABLE 3		
Efficiency wedge τ in the Eurobarometer calibration			
Country	**SGP, no exclusions**	**Excluding gross investment**	**Excluding net investment**
	(- - - - - - - - - - - - - percent - - - - - - - - - - - - -)		
	Generic capital		
Austria	12	–22	–1.3
Belgium	14	–23	–1.6
Finland	21	–24	–2.2
France	17	–25	–1.9
Germany	14	–22	–1.5
Greece	19	–24	–2.1
Ireland	34	–32	–3.6
Italy	13	–23	–1.4
Luxembourg	19	–25	–2.1
Netherlands	18	–24	–1.9
Portugal	21	–26	–2.3
Spain	21	–25	–2.3
	Major infrastructure		
Austria	17	–16	–1.3
Belgium	21	–17	–1.6
Finland	30	–18	–2.2
France	25	–18	–1.9
Germany	21	–16	–1.5
Greece	28	–18	–2.1
Ireland	49	–24	–3.6
Italy	20	–16	–1.4
Luxembourg	28	–18	–2.1
Netherlands	26	–18	–1.9
Portugal	31	–19	–2.3
Spain	31	–18	–2.3

Notes: SGP means European Stability and Growth Pact. See the text for further details on the efficiency wedge τ.
Sources: Authors' calculations based on data from Papacostas (2007) and the Statistical Office of the European Communities.

or different rules for government consumption and investment.

Our model captures some forces that lead voters to discount future costs and benefits excessively, but it does not entertain the possibility that elected politicians may act as if they were even more short-sighted than voters. Some of these alternatives are briefly discussed in Bassetto with Sargent (2006); while it is easy to generate reasons why the current government might be tempted to overspend if deficit restrictions are not imposed, it is harder to devise environments where overspending would affect public consumption more than investment, at least without appealing to myopic behavior on the part of the voters.

NOTES

[1] The pact defines an economic downturn as severe if there is an annual fall of real GDP of at least 2 percent.

[2] Most of the early provisions distinguished between "extraordinary" and "ordinary" expenses, rather than between public improvements and other expenses. This distinction is relevant, since the largest extraordinary expenses were wars, rather than major infrastructures.

[3] This reform is widely considered to have significantly watered down the pact (see, for example, Calmfors, 2005) by giving leeway to postpone sanctions under a wide array of attenuating circumstances.

[4] The model could be solved by taking into account demographic changes as well, but the results would not be affected significantly.

[5] We adopt the convention $\left(\prod_{j=0}^{-1} \theta_j \right) \equiv 1$.

[6] Simulations with more general preferences are discussed in the appendix of Bassetto with Sargent (2006).

[7] Private capital and a more complete description of production could be introduced with no effect on the results.

[8] We thus have $\gamma_t = \Gamma_t - (1 - \delta)\Gamma_{t-1}/(1 + n)$.

[9] In equilibrium, if a market for annuities exists, as we assume, $r = (1 - \beta)/\beta$.

[10] In principle, the SGP provides that countries should strive for a budget "close to balance or in surplus" over the medium term (European Council on the Stability and Growth Pact, 1997). However, this provision is effectively not enforced.

[11] For a formal derivation, see Bassetto with Sargent (2006).

[12] For a proof, see Bassetto with Sargent (2006).

[13] Barro (1974) explains that the result survives if people are part of dynasties where different generations are connected by altruism and intergenerational transfers. We assume this is not the case, although in our environment, international mobility would generate a separate channel that breaks down Ricardian equivalence.

[14] This is true as long as the population is not shrinking.

[15]As pointed out by Weil (1989), the main driver behind all three factors is the influx of new people into the economy. As an example, for a given level of population growth, higher mortality also implies that more people must either be born or immigrate. Nonetheless, distinguishing between the influx of people and mortality/emigration is important when considering the conflict among different cohorts that are alive at the same time: The old will discount future benefits much more heavily than the young because they have a lower probability of survival.

[16]Even in countries that tax their citizens on income earned worldwide regardless of residence (for example, the U.S.), a credit for taxes paid to foreign governments is allowed, so that in many instances no tax is due.

[17]The cost is measured netting out the undepreciated value left for the subsequent period.

[18]We consider the 12 countries that were part of the eurozone as of 2006. Those countries were Austria, Belgium, Finland, France, Germany, Greece, the Republic of Ireland, Italy, Luxembourg, the Netherlands, Portugal, and Spain.

[19]We use the average annual population growth rate between 1995 and 2005. We use the latest available year for emigration rates: This is 2005 except for Belgium (1999) and Italy (2003). The population distribution by age is for the same year. We do not have data for four of the countries. We use piecewise linear interpolation of five-year aggregated migration numbers to obtain the emigration rate for each year of age. We thank Anna Lööf for assistance in getting more updated data than those in the Statistical Office of the European Communities (2002); this also allowed us to include Germany and Spain. All of these statistics are computed on the population aged 18–90.

[20]If immigration data were reliably estimated, we could use data about changes in population combined with data on deaths and immigration to infer emigration. However, this procedure yields negative numbers in several cases, presumably because immigration is underestimated as well.

[21]Martí and Ródenas (2007) discuss why this number is severely underestimated.

[22]Specifically, the question asks: "Do you think that in the next five years you are likely to move ... ?" The possible answers are: 1. In the same city/town/village; 2. To another city/town/village but in the same region; 3. To another region but in the same country; 4. To another country in the European Union; 5. To another country outside the European Union; 6. You don't think you will move; and 7. Don't know. Interviewees are allowed multiple responses, and we sum up all people that include options 4 or 5, according to their population weights.

[23]A notable exception is Luxembourg, where the discrepancy between citizens and other nationals plays an important role.

[24]U.S. data are from the 2000 U.S. Census; for details, see Bassetto with Sargent (2006).

[25]Details of the calibration are contained in Bassetto with Sargent (2006). Note that the federal data used do not take into account emigration from the U.S., so that the magnitude of the distortions is very slightly understated (emigration from the U.S. is exceedingly small).

[26]The SGP also contains a separate provision stating that the debt-to-GDP ratio of a country should be below 60 percent or moving toward that goal. This provision is weakly enforced, and it would also not be sufficient to generate the repayment schedule that is needed for distortions to vanish.

[27]While intuition is simpler when thinking that gross investment is changed only once, the political–economic equilibrium of this economy would imply that any additional investment in period t would be reversed in period $t + 1$. Although this modifies the exact sequence of tax changes over time, it yields a similar intuition. When net investment is excluded from the deficit count, in equilibrium the wedge is given by the simple expression $\text{median}(\theta_s)/(1 + n) - 1$, which is independent of the depreciation rate of capital. This is apparent in tables 2 and 3.

[28]See also the discussion in Balassone and Franco (2000).

[29]For the countries for which we had no data on emigration rates from the Statistical Office of the European Communities, we use the population structure by age as of 2005, with the exception of France (as of 2004).

REFERENCES

Balassone, Fabrizio, and Daniele Franco, 2000, "Public investment, the stability pact, and the 'golden rule'," *Fiscal Studies*, Vol. 21, No. 2, June, pp. 207–229.

Barro, Robert J., 1979, "On the determination of the public debt," *Journal of Political Economy*, Vol. 87, No. 5, October, pp. 940–971.

_____, 1974, "Are government bonds net wealth?," *Journal of Political Economy*, Vol. 82, No. 6, November–December, pp. 1095–1117.

Bassetto, Marco, with Thomas J. Sargent, 2006, "Politics and efficiency of separating capital and ordinary government budgets," *Quarterly Journal of Economics*, Vol. 121, No. 4, November, pp. 1167–1210.

_____, 2005, "Politics and efficiency of separating capital and ordinary government budgets," National Bureau of Economic Research, working paper, No. 11030, January.

Beetsma, Roel, and Harald Uhlig, 1999, "An analysis of the Stability and Growth Pact," *Economic Journal*, Vol. 109, No. 458, October, pp. 546–571.

Blanchard, Olivier J., and Francesco Giavazzi, 2004, "Improving the SGP through a proper accounting of public investment," Center for Economic Policy Research, discussion paper, No. DP4220, February.

Buiter, Willem H., 2003, "How to reform the Stability and Growth Pact," *Central Banking*, Vol. 13, No. 3, pp. 49–58.

Calmfors, Lars, 2005, "What remains of the stability pact and what next?," Swedish Institute for European Policy Studies, report, No. 8, November.

Chari, V. V., and Patrick J. Kehoe, 2004, "On the desirability of fiscal constraints in a monetary union," National Bureau of Economic Research, working paper, No. 10232, January.

Commission of the European Communities, 2002, *Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee, and the Committee of the Regions—Commission's Action Plan for Skills and Mobility*, report, Luxembourg: Office for Official Publications of the European Communities.

Dixit, Avinash, and Luisa Lambertini, 2001, "Monetary–fiscal policy interactions and commitment versus discretion in a monetary union," *European Economic Review*, Vol. 45, No. 4–6, May, pp. 977–987.

European Council on the Stability and Growth Pact, 2005, *Council Regulation*, No. 1056/2005.

_____, 1997, *Council Regulation*, No. 1466/1997.

Lindbeck, Assar, and Dirk Niepelt, 2004, "Improving the SGP: Taxes and delegation rather than fines," Research Institute of Industrial Economics, working paper, No. 633.

Lucas, Robert E., Jr., and Nancy L. Stokey, 1983, "Optimal fiscal and monetary policy in an economy without capital," *Journal of Monetary Economics*, Vol. 12, No. 1, pp. 55–93.

Martí, Mónica, and Carmen Ródenas, 2007, "Migration estimation based on the labor force survey: An EU-15 perspective," *International Migration Review*, Vol. 41, No. 1, Spring, pp. 101–126.

Monti, Mario, 2005, "Toughen up the reform agenda and make it count," *Financial Times*, March 22, p. 17.

National Association of State Budget Officers, 2002, *Budget Processes in the States*, report, Washington, DC, January.

Papacostas, Antonis, 2007, "Eurobarometer 64.1: Mobility, food risk, smoking, AIDS prevention, and medical errors, September–October 2005," Eurobarometer Survey Series, Inter-university Consortium for Political and Social Research, study, No. 4641, February 28.

Sargent, Thomas J., 1986, *Rational Expectations and Inflation*, New York: Harper and Row.

Sargent, Thomas J., and Neil Wallace, 1981, "Some unpleasant monetarist arithmetic," *Quarterly Review*, Federal Reserve Bank of Minneapolis, Vol. 5, No. 3, Fall, pp. 1–17.

Statistical Office of the European Communities, 2002, *European Social Statistics—Migration*, report, Luxembourg: Office for Official Publications of the European Communities.

Weil, Philippe, 1989, "Overlapping families of infinitely lived agents," *Journal of Public Economics*, Vol. 38, No. 2, March, pp. 183–198.