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Current Account Imbalances: Can Structural Reforms Help to Reduce Them?

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This article explores the impact of structural policies on saving, investment, and current accounts in OECD and non-OECD economies. Since the current account effects of structural reforms are often complex and ambiguous from a theoretical perspective, new OECD empirical analysis is carried out. Reduced-form equations are estimated for a panel of 30 OECD countries as well as for a panel/cross-section of 117 OECD and non-OECD countries that relate saving, investment and current accounts to policy indicators and a set of macroeconomic control variables. This work suggests that structural reforms may influence saving, investment and current accounts through their impact on macroeconomic conditions such as productivity growth or public revenues and expenditures, but also more directly: i) *higher social spending (in particular on health care) is found to lower the saving rate and thereby to weaken the current account, most likely reflecting lower precautionary saving;* ii) *product market liberalisation temporarily boosts investment and thus also weakens the current account;* iii) *financial market deregulation may lower the saving rate, though only in less developed countries;* iv) *stricter employment protection may be associated with lower saving rates if unemployment benefits are low, as well as with higher investment rates possibly due to greater substitution of capital for labour. A scenario analysis indicates that fiscal consolidation and structural reforms in the main world economies could significantly reduce current global imbalances, possibly by about one-third.*

JEL Classification: E21, E22, F41, H55, K31, K20, G18, H23

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Global saving and investment imbalances had widened markedly in the years prior to the crisis, involving both OECD countries and non-OECD countries. Though the crisis brought some reversal of this trend with current account imbalances narrowing from around mid-2007 to mid-2009, the recent upswing was accompanied by a renewed widening of global imbalances. Under unchanged policies the decline in national saving-investment gaps is thus likely to have been at least partially a temporary phenomenon, and the issue of imbalances is set to return in the medium to long run.

Current accounts result from global general equilibrium conditions that are driven by multiple factors, including domestic structural policy settings in financial, product and labour markets as well as tax and social welfare systems.[1] While the primary goal of structural reforms is not to address global saving-investment imbalances, they can have more or less persistent side effects on the saving and investment decisions of households and firms as well as on public saving and investment. Against this background, this paper investigates the relationship between structural policies and saving, investment, and current account balances, focusing on five different policy areas: social welfare systems, labour market policy, product market regulation, financial market regulation, and tax policy. With this focus in mind, the paper does not explore the drivers of global current account imbalances in general, nor does it assess the extent to which they represent disequilibria.

The discussion in this paper is positive in the sense that it assesses the likely impact of structural policies on the saving and investment behaviour of private agents, and thereby on current accounts, without addressing the desirability of policy changes. To the extent that national saving-investment gaps are the result of utility-maximising behaviour in the absence of any distortions – for example, they could reflect a desire by households to smooth consumption over time – the rationale for policy intervention might only be found by assessing whether these gaps cause any global or systemic risk, which is not within the scope of this paper. But it may also be the case that the gaps reflect underlying domestic distortions, which can be narrowed by domestic policy interventions. Even so, the goal of such interventions should be to maximise overall welfare, not to reduce saving-investment gaps *per se*. In fact, removing distortions to increase welfare may narrow or widen national saving-investment gaps, depending on the type of the distortion.

The present study investigates the link between domestic structural policies and the GDP shares of saving, investment and the current account both from a theoretical and an empirical perspective. In the empirical part, a set of reduced-form equations are estimated for a panel of 30 OECD countries as well as for a panel/cross-section of 117 OECD and non-OECD countries that relate the GDP shares of, respectively, saving, investment and the current account balance to policy indicators and a set of control variables. The following main conclusions emerge from the analysis:

- Theoretically, structural policies can influence the saving and investment decisions of firms and households through a variety of different channels. To the extent that households attempt to smooth consumption over time, any reform that affects

temporarily the growth of income or the real rate of interest should temporarily influence the saving rate of households. Moreover, policies may affect the precautionary saving behaviour of households by altering the level of uncertainty they are facing and/or their insurance against adverse events (though the saving rate should change only temporarily as a result, until the new optimal precautionary wealth stock is reached). The investment rate, in turn, should be influenced by all policies that affect the cost of capital and/or the return on investment projects. Due to the wide range of different channels and the complex interactions between them, the sign and the size of the link between structural policies and saving and investment remains largely an empirical question.

- The empirical analysis suggests that structural policy reforms may influence saving and investment by altering macroeconomic conditions. In particular, policies that foster productivity growth are found to lead to a boost in saving and investment ratios in the medium to long run. The relative size of the estimated coefficients on productivity growth hints at a negative net impact of productivity-enhancing reforms on the current account position through this channel. Similarly, policy reforms that involve changes in public revenues and expenditures and are fiscally non-neutral will alter a country's total saving rate and thereby its current account, reflecting evidence that Ricardian equivalence holds only partially.
- There is some evidence that structural policies have an influence on saving and investment on top of any impact that works through changes in these macroeconomic conditions. *First*, there is evidence that higher social spending (in particular on health care) is associated with a lower saving rate and a weaker current account, most likely reflecting lower precautionary saving of households. *Second*, there are some indications that removing competition-unfriendly product market regulation boosts investment, though this effect is likely to be only temporary. *Third*, financial market deregulation tends to lower the saving rate in less developed countries. *Fourth*, stricter employment protection legislation (EPL) may be associated with lower saving rates, but only in countries where unemployment benefits are low. Stricter EPL also appears to raise the investment rate, at least in OECD countries, possibly linked to greater substitution of capital for labour. *Fifth*, while no robust effects of tax reforms on investment rates could be discerned here using aggregate macroeconomic data, existing firm and sector-level evidence suggests that a lower tax burden on firms boosts business investment and thereby weakens the current account.
- The empirical analysis also gives some insight into which potential links between structural policies and saving and investment rates might be less relevant in practice. In particular, while deregulated financial markets could in theory strengthen the current account effects of other reforms by facilitating consumption smoothing, the empirical analysis does not provide any evidence that financial market reforms alter the impact of other policy reforms on the saving and investment behaviour of private agents. Also, there is no evidence that structural policies influence the speed at which firms and households adjust their saving and investment behaviour in response to changes in macroeconomic conditions.

The analysis suggests that a number of structural reforms that are desirable on efficiency and/or welfare and equity grounds would be associated with a reduction of global imbalances by narrowing the gaps between domestic saving and investment in several major economic areas. In particular:

- Developing social welfare systems in China and other Asian economies would fulfil an important social goal in its own right, and as a side-effect would reduce the need for

precautionary saving. This would moderate current account imbalances in those countries that are running surpluses. The empirical estimates suggest, for example, that all else being equal a financed increase in public social spending on health in China by 1 percentage point of GDP might reduce total saving by as much as 2½ percentage points of GDP (though the standard deviation around this point estimate is 0.9).

- Reforms to improve the sustainability of pension systems will reduce current account surpluses (or raise deficits) if they increase the length of the working life and have the opposite effect if they take the form of cuts in replacement rates.
- Removing competition-unfriendly product market regulation could encourage higher capital spending. The empirical analysis suggests, for example, that aligning the level of economy-wide product market regulation in Japan and Germany with OECD best practice could raise private investment in these countries by respectively 0.6 and 0.7 percentage points of GDP in the short run.
- Financial market reforms that raise the sophistication and/or depth of financial markets may relax borrowing constraints in emerging economies and thus help to reduce the high saving rates observed in some of them. For example, if China implemented reforms that led to a liberalisation of its financial system similar in magnitude to that achieved over 1995-2005, the total saving rate could drop by over 3 percentage points of GDP.
- The removal of policy distortions that encourage consumption, such as tax deduction of interest payments on mortgages in the absence of taxation of imputed rent, might help increase household saving in a number of countries, including the United States.
- While structural reforms can contribute to reducing current account imbalances in countries that are running surpluses, their potential to reduce imbalances in deficit countries is found to be more limited. In the latter group of countries, other policy actions that are desirable *per se*, such as fiscal consolidation, could help achieve a more balanced external position.
- A scenario analysis indicates that the necessary fiscal tightening required to stabilise debt-to-GDP ratios in OECD countries by 2025 could reduce the size of global imbalances – measured as the GDP-weighted sum of countries' absolute saving-investment-gap-to-GDP ratios – by almost one-sixth. If, in addition, Japan, Germany and China were to deregulate their product markets and China were to raise public health spending by 2 percentage points of GDP (in a fiscally neutral way) and liberalise its financial markets, global imbalances could decline by twice as much.
- While the fiscal tightening assumed in the scenario analysis would also contribute to a narrowing of intra-euro-area imbalances, the size of the effect would be more muted. A lowering of employment protection in Spain, Portugal and Greece would also only slightly reduce the *overall* size of intra-euro-area imbalances, but saving-investment gaps of these three countries would fall considerably.

The remainder of this document is structured as follows: Section 1 starts with a brief overview of recent aggregate saving, investment and current account developments, focusing on those countries and regions that have contributed most to global current account imbalances. Section 2 then outlines the main theoretical channels through which structural policies may influence private saving and investment behaviour. Section 3 discusses existing evidence on these channels and presents new empirical results regarding the impact of structural policy changes on saving, investment and

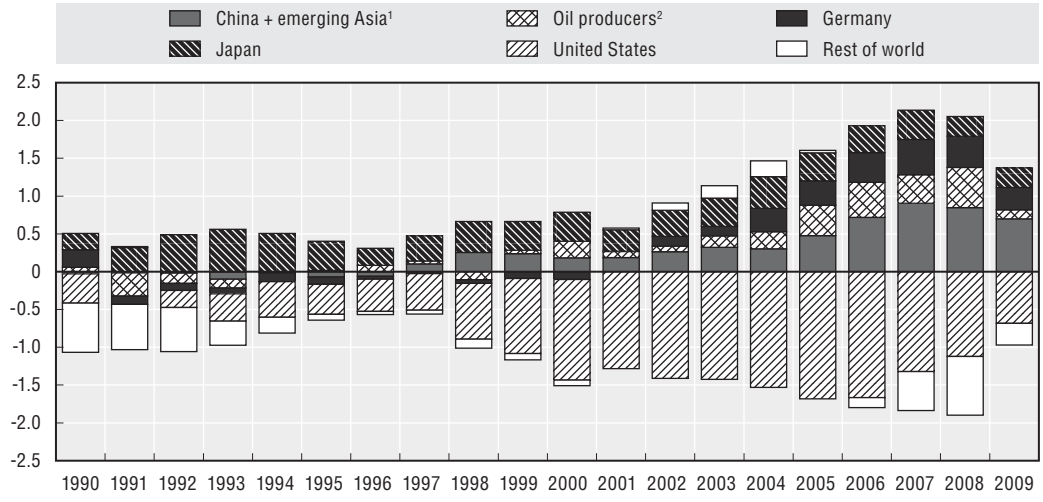
current accounts. These results are then used in Section 4 to simulate the impact of possible policy reform packages on global and intra-euro-area imbalances.

1. Recent current account developments and their explanations

Global current account imbalances had widened markedly in the years preceding the crisis with the United States the main contributor on the deficit side and several of the fast-growing Asian and oil-producing countries as well as Japan and Germany the main contributors on the surplus side (Figures 1 and 2). While the euro area's current account balance with the rest of the world was relatively small, a number of individual member countries recorded sizeable and growing deficits (in particular Greece, Portugal and Spain) or surpluses (next to Germany, mainly the Netherlands). Examining changes in saving and investment patterns highlights that rising saving rates in surplus countries and falling saving rates in deficit countries were the dominant driver behind the divergence in current account positions. In the United States, total saving dropped by around 3½ percentage points between the mid-1990s and 2007, while in China and oil-producing countries the total saving rate rose by about 15 percentage points of GDP over the same period. A few countries have also experienced sizable changes in investment rates. These include in particular Japan, where total investment has fallen by about 10 percentage points of GDP over the past two decades, and Spain, where it has risen by the same amount between the mid-1990s and 2007, before beginning to fall back sharply.

Figure 1. **Global imbalances 1990-2009**

Current account balances, % of world GDP

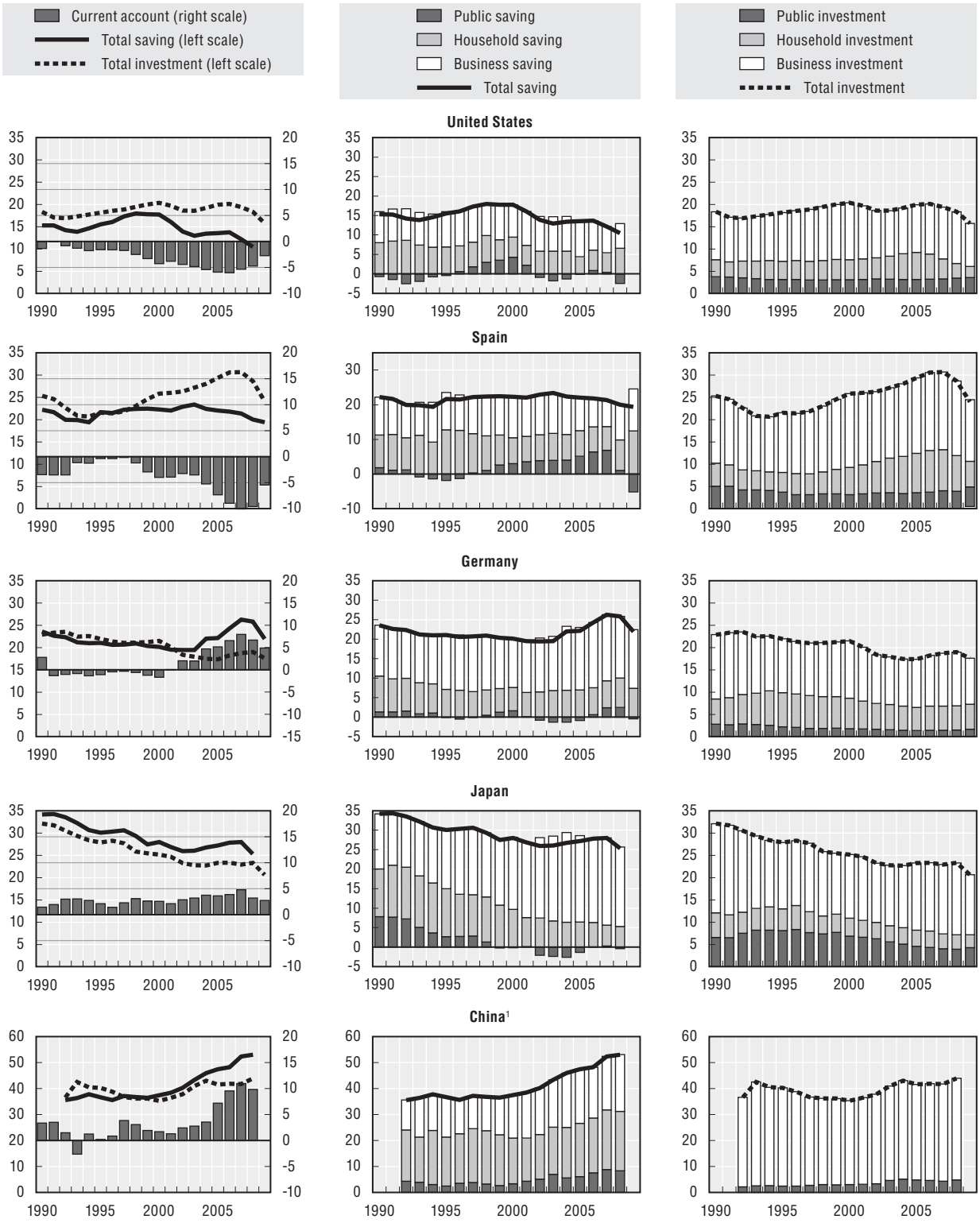


1. Hong Kong (SAR China), Malaysia, Philippines, Singapore, Vietnam, Thailand, India, Indonesia.
2. Azerbaijan, Kazakhstan, Brunei Darussalam, Bahrain, Iran, Kuwait, Oman, Libya, Yemen, Ecuador, Trinidad and Tobago, Venezuela, Angola, Congo, Gabon, Sudan, Saudi Arabia.

These persistent saving-investment gaps are reflected in international capital flowing mainly from emerging markets in Asia and oil-producing countries towards advanced economies, in particular the United States. This direction of capital flows is surprising at first glance since higher expected (marginal) rates of return would imply that emerging markets should instead attract capital from advanced countries. A number of explanations have been put forward to explain the global widening of saving-investment imbalances as

Figure 2. **Saving and investment developments in selected countries and regions**

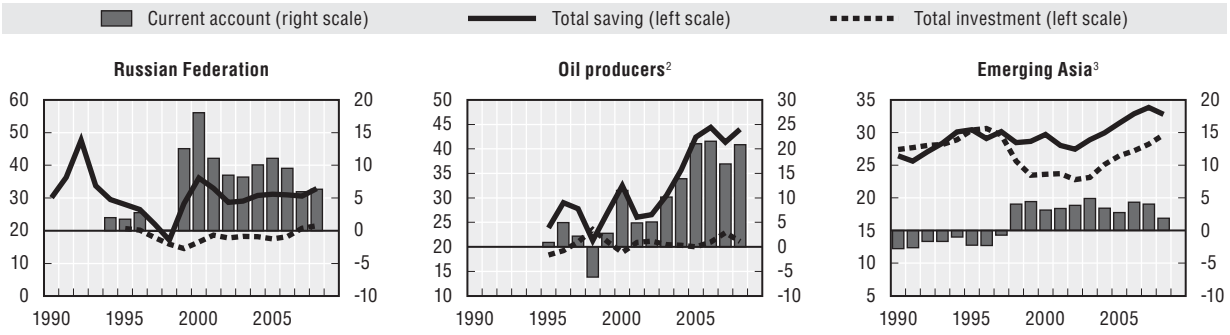
% of GDP



1. Only private (white) and public (shaded) investment rates are shown.
2. Azerbaijan, Kazakhstan, Brunei Darussalam, Bahrain, Iran, Kuwait, Oman, Libya, Yemen, Ecuador, Trinidad and Tobago, Venezuela, Angola, Congo, Gabon, Sudan, Saudi Arabia.
3. Hong Kong (SAR China), Malaysia, Philippines, Singapore, Vietnam, Thailand, India, Indonesia.

Figure 2. **Saving and investment developments in selected countries and regions** *(cont.)*

% of GDP



1. Only private (white) and public (shaded) investment rates are shown.
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3. Hong Kong (SAR China), Malaysia, Philippines, Singapore, Vietnam, Thailand, India, Indonesia.

well as the implied direction of capital flows (see *e.g.* Bracke *et al.*, 2008, for an overview). Most of these explanations take a macroeconomic perspective and do not allow for a major role of structural policy settings – with the exception of financial market regulation. The main arguments put forward include the following:

- *The series of financial crises that struck some emerging and developing countries in the late 1990s and early 2000s:* In the aftermath of these crises, most emerging countries – including those that had escaped crisis like China – began to build up large foreign exchange reserves as an insurance device against the risk of balance-of-payments crises (Bernanke, 2005; Gruber and Kamin, 2007; Jeanne and Ranciere, 2008).
- *The surge in oil prices which boosted income in oil-exporting countries:* To the extent that oil-exporting countries attempt to smooth consumption over time, this rise in their income may explain the pick-up in total saving, in particular since these countries are extracting a finite resource.[2] Together with the lack of domestic investment opportunities, this surge in saving resulted in net capital outflows.
- *Insufficient financial market development in many fast-growing emerging countries:* Regional financial market imperfections, together with an increasing demand for a store of value, may have resulted in an insufficient supply of safe assets and triggered net capital flows to regions where safe assets were perceived to be produced, notably the United States (Caballero *et al.*, 2008; Caballero and Krishnamurthy, 2009). By creating borrowing constraints, the financial market imperfections may also have prevented households in emerging markets from borrowing against future income (Ju and Wei, 2006).
- "*Dark matter*": Official statistics may overstate the US net foreign debt by not properly accounting for US intangible assets such as insurance services (safe investments) and knowledge services (organisational knowledge and brand recognition). The argument is based on the observation that US net interest income from abroad has remained positive, meaning that US foreign investments, properly measured at their income-generating capacity, must exceed US foreign investors' claims on the United States (Hausmann and Sturzenneger, 2005).
- *Other factors* that are likely to have played at least some role include: *i)* the decline in business cycle volatility in many developed countries prior to the crisis, which might have been perceived as permanent by households thus inducing them to reduce their

precautionary savings (Fogli and Perri, 2006); *ii)* asset price booms, partly related to low interest rates against a background of low business cycle and inflation volatility,[3] which may have pushed down saving rates in several advanced countries such as the United States and the United Kingdom by raising perceived wealth and relaxing credit constraints; *iii)* population ageing that may have contributed to a decline in the saving rates of some advanced economies (Bernanke, 2005); *iv)* polices by several fast-growing Asian economies aimed at keeping exchange rates undervalued so as to promote exports; and *v)* the creation of the European Economic and Monetary Union and the introduction of the euro which may have contributed to intra-euro area imbalances by driving real interests rates down substantially in some of the periphery countries.

The economic crisis was accompanied by a substantial narrowing of global saving-investment gaps as well as by a change in their composition. *As for saving*, household saving rates in developed countries rose from their pre-crisis levels on account of tighter credit conditions, rising labour market uncertainty and efforts to make up for the sudden wealth losses. The increase in household saving was particularly large in several deficit countries such as the United States, the United Kingdom, and Spain. In most OECD countries, higher household saving was, however, more than offset by lower government saving, implying that changes in saving behaviour contributed to a narrowing of imbalances foremost in surplus countries. The latter also applies to oil-exporting countries, where the high saving rates dropped on account of collapsing oil prices, thus reducing current account surpluses. *As for investment*, total investment rates fell substantially in the majority of countries, driven by falling business investment and, at least in those countries that had experienced house price and construction booms in the run-up to the crisis, falling residential investment. By contrast, the total investment rate rose noticeably in China, owing largely to the sizeable policy stimulus, thereby reducing the current account surplus. As argued by OECD (2010a), the narrowing of global saving-investment gaps is unlikely to be permanent; as the recovery unfolds and output gaps close, saving-investment gaps are widening again.

2. Structural policy reforms and current accounts: some theoretical links

Any reform that influences aggregate saving or investment will likely also alter a country's current account position. This section discusses the broad channels through which structural policies could influence the saving and investment behaviour of firms and households (more specific discussion of each individual reform area is provided in Section 3 when presenting the results of the empirical analysis). Current account constellations are the outcome of a global general equilibrium and thus do not only depend on domestic economic conditions but also on the conditions abroad. For simplicity, the discussion below assumes that no reforms take place in the rest of the world or at least that any such reforms are smaller in the magnitude of their effects than those in the domestic economy. Moreover, the focus mainly is on structural policies that affect domestic settings rather than on policies that directly affect capital flows (*e.g.* corporate tax reforms, removal of restrictions on trade and foreign direct investment). Partly for this reason, the discussion abstracts from the fact that any change in the domestic saving-investment gap must be accompanied by a corresponding change in net capital inflows/outflows and thus a change in the saving-investment gap in the rest of the world.[4] The discussion below also abstracts from adjustment mechanisms that ensure that changes in

the saving-investment balance are matched by corresponding changes in the current account balance, not least real exchange rate adjustments.[5]

2.1. *Theoretical linkages between structural reforms and saving*

Structural policy reforms may influence the saving behaviour of private agents through a variety of channels. In particular, to the extent that households attempt to smooth consumption over time, structural policies may influence private saving rates by changing income patterns over the lifecycle, the uncertainty of these income streams, or the real rate of interest. In turn, reforms may change income patterns by affecting either productivity growth (*e.g.* product market reforms) or the age-income profile (*e.g.* pension reforms):

- *The productivity growth channel:* Structural reforms that raise productivity may affect the overall private saving rate through both a composition effect and changes in the saving rates of individual households. The *composition effect* emerges because the income gain from higher productivity is likely to benefit workers more than retirees and the former tend to have a higher propensity to save (Modigliani, 1966).[6] *Individual saving rates may also change* as households smooth consumption over time (Friedman, 1957). The direction and size of the impact will depend on whether the change in permanent income reflects an increase in current or future income and on whether income changes temporarily or permanently (see Box 1 and Fournier and Koske, 2010, for a more thorough discussion).[7] Structural reforms such as product or labour market deregulation or reforms that increase financial market efficiency are usually thought to be associated with a temporary rise in the growth rate of income and thus a permanent shift in its future level, which sets in some time after the reform is implemented. This should lead to a temporary fall in the household saving rate, which, if large enough, may dominate the composition effect and the aggregate saving rate may actually decline in the aftermath of a reform before rising again once the income effects of the reform set in.
- *The age-income profile channel:* Structural reforms can also affect individual households' saving rates by altering the lifecycle pattern of income streams. For example, a pension reform that unexpectedly reduces the benefit replacement rate should increase the saving rates of the working-age population as households attempt to accumulate more wealth in order to offset the effect of lower future pensions on consumption in retirement.[8] By contrast, unexpected increases in the statutory retirement age should reduce the saving rates of workers as they have more years to accumulate wealth and fewer years during which to spend this wealth.[9] At an aggregate level the saving impact of pension reforms would be expected to show up only temporarily, as in the long run, the amount saved during the working period should broadly match the amount spent during retirement, in line with unchanged individual preferences.[10]
- *The uncertainty channel:* Households hold a certain amount of precautionary wealth as a cushion against unexpected adverse events such as unemployment, sickness or disability. This amount of precautionary wealth, and with it the level of precautionary saving, depends on the risk aversion of the household, the probability of adverse events and their expected severity. While policy is unlikely to affect the risk aversion of households, it may well affect the other two factors. For example, a lowering of employment protection has an ambiguous effect on the saving rate, since the higher likelihood of dismissal should increase precautionary saving, while the higher labour turnover should lower it by reducing the expected length of unemployment spells.

Box 1. **The theoretical impact of productivity shocks on saving and the current account***

Structural reforms such as product or financial market deregulation typically lead to a gradual, but ultimately permanent, rise in the level of productivity. The size and even the sign of the associated impact on the saving behaviour of private agents, and thereby on a country's current account position, are theoretically ambiguous and depend on many factors. These include, in particular, consumers' preferences for consumption smoothing, their beliefs in whether the rise in the level of productivity is permanent or temporary, and the productivity effects of the reforms in tradable *versus* non-tradable sectors. To illustrate these channels, Fournier and Koske (2010) simulate a number of productivity shocks in a simple two-country DSGE model that distinguishes between tradable and non-tradable goods. For simplicity, the model features flexible prices and abstracts from capital accumulation, thereby focusing solely on the links between productivity and saving. Consumers live infinitely and have perfect foresight, so that they anticipate the consequences of a shock and adjust their consumption and labour supply accordingly. Also, the issue of precautionary saving behaviour is not dealt with in the model. The following main conclusions emerge from the analysis:

- The immediate current account impact of a gradual and ultimately permanent rise – and correctly interpreted as such by households – in overall productivity hinges crucially on whether consumers are more concerned about inter-temporal consumption smoothing (*i.e.* keeping overall consumption stable over time) or intra-temporal consumption smoothing (*i.e.* keeping the composition of the consumption basket stable). If households have a high propensity to smooth consumption over time, a reform that boosts aggregate productivity will be associated with a weakening of the current account position in the short run as consumers try to benefit from the future rise in income to consume more already today. This temporary deterioration in the current account is then gradually reversed as productivity rises towards its new level. By contrast, the current account may strengthen in the immediate aftermath of a reform if consumers have a low propensity for inter-temporal consumption smoothing, because households postpone their consumption increase to benefit from lower prices in the future as productivity rises (all else being equal, the fall in prices leads to a higher real rate of interest; see also Dornbusch, 1983).
- Reforms that boost productivity solely in the tradable goods sector unambiguously lead to a weakening of the current account in the short run, which is gradually reversed once the productivity increase sets in. The short-run current account reaction is driven by two factors: *First*, consumers try to benefit from the future rise in income by consuming more already today and *second*, they frontload consumption since the relative price of non-tradable goods is seen as rising over time. Since both effects work in the same direction the magnitude of the current account reaction is larger than in the case of an economy wide shock (where the second effect partially offsets the first or even outweighs it if consumers have a low propensity to smooth consumption over time). For structural reforms that boost productivity only in the non-tradable goods sector, the direction of the short-run current account reaction is ambiguous and depends on consumers' preferences for intra-temporal *vs*. inter-temporal consumption smoothing, similarly to the consequences of an economy-wide shock.
- If a reform boosts the level of productivity only temporarily – or if economic agents perceive the impact of the reform as such – and consumers have a strong preference for consumption smoothing, the current account temporarily strengthens as households save part of the higher income for the future: they foresee a decrease of income and save accordingly.

* This box is based on Fournier and Koske (2010), "A Simple Model of the Relationship between Productivity, Saving and the Current Account", *OECD Economics Department Working Paper,* No. 816.

Reforms that alter the sectoral specialisation of economies may also influence precautionary saving by changing the volatility of GDP growth (a lowering of product market regulation in services sectors may raise their share of output which may in turn lower overall output volatility and precautionary saving).

- *The interest rate channel:* Structural reforms may also affect the saving behaviour of households through changes in the real rate of interest that they face. For example, a strengthening of competition in the banking sector should reduce the spread between borrowing and lending rates by squeezing the profit margins of banks (and reduce the shadow real borrowing rate even more by relaxing quantitative constraints). Likewise, tax reforms should affect the saving decisions of firms and households through their impact on the after-tax rate of return on saving and interest expenses on loans. The ultimate impact on the saving rate is ambiguous, however, and depends on the relative sizes of the substitution, income and wealth effects (with the latter depending again on whether households are net lenders or net borrowers).

2.2. Theoretical linkages between structural reforms and investment

Since firms weigh the returns on an investment project against its cost when making their investment decisions (Jorgenson, 1963; Hall and Jorgenson, 1967), structural reforms can influence the investment rate by altering the cost of the investment good, the revenue that the investment will generate and/or the uncertainty of that revenue stream:

- *The cost channel:* Structural reforms that reduce the cost of an investment project – *e.g.* by lowering the price of investment goods or the cost of financial capital – should increase the investment rate by raising the profitability of marginal investment projects. Examples include financial reforms that reduce lending margins, tax reforms that increase depreciation allowances, or the relaxation of competition-unfriendly regulation in capital goods sectors that lowers the price of investment goods.[11]
- *The revenue channel:* Reforms that boost the expected revenues from investment projects stimulate investment. Therefore, reforms that boost total factor productivity (TFP) growth on a long-lasting basis (*e.g.* improvements in innovation frameworks that address innovation failures and durably raise overall R&D spending) or temporarily (*e.g.* efficiency-enhancing tax reforms) should have permanent and temporary positive effects on overall investment, respectively.[12] While product market deregulation should push up the investment rate through temporarily higher TFP growth, this effect may be counteracted, at least in the short run, by the reduction in rates of return on capital for incumbent firms associated with the squeeze in profit margins (Alesina *et al.*, 2005).
- *The uncertainty channel:* Relaxing the assumption of certainty that underpins the cost of capital theory, structural reforms may also influence the investment rate by altering the level of uncertainty in a context where investment is at least partly irreversible (Abel and Eberly, 1994).[13] In this sense reforms that reduce uncertainty (*e.g.* by broadening prudential regulation or by strengthening property rights) should raise the investment rate.

2.3. Further channels of influence of structural reforms

A number of additional channels may shape the impact of structural reforms on saving, investment and current accounts:

- *Expectations of future structural policy settings:* The magnitude and, potentially, the direction of the saving/investment response to a structural policy change may depend on the credibility of the reform. For example, while a productivity-enhancing reform would usually reduce the saving rate if the reform is considered as permanent, it could instead induce households to save more if they expect the reform to be fully taken back in the future (see the discussion in Box 1). By the same token, firms and households might change their behaviour even in the absence of a reform if they believe that the status quo cannot be maintained. For example, if households believe that the national pension system is unsustainable, they might increase their saving even before the government actually decides to undertake reforms that cut into pension wealth. Moreover, uncertainty about a structural reform should boost saving and lower investment through the uncertainty channel discussed above.
- *Financial market imperfections and the interdependence between saving and investment decisions:* In imperfect financial markets, the saving and investment decisions of households and firms may not be independent from each other. For example, if information asymmetries drive a wedge between the internal and external cost of finance, companies might be reluctant to pay out dividends and instead use the funds to finance investment projects.[14] Similarly, households are likely to accumulate a certain amount of wealth before purchasing property. Consequently, policies that influence the investment decisions of economic agents are likely to also alter their saving decisions, with ambiguous effects on the current account position. Similarly, international financial market imperfections and/or home bias in consumption may reduce the mobility of capital across countries, thereby causing aggregate saving and investment rates to be correlated, the so-called Feldstein-Horioka puzzle. Policy settings such as financial market regulation (*e.g.* barriers to entry in the banking sector, or macro-prudential regulatory settings such as maximum housing loan-to-value ratios) may impact the degree of interdependence between saving and investment decisions.
- *The speed of shock transmission:* The influence of structural policy changes on saving, investment and current accounts might be mediated by certain factors. In particular, the exchange rate regime may affect the speed at which actual saving and investment adjust to this new equilibrium – though it is unlikely to affect this new equilibrium itself – following a reform. Under a fixed exchange rate regime and sticky prices, the lack of an external adjustment mechanism should slow down adjustment, implying more persistent real exchange rate and current account disequilibria.[15] Similarly, structural policies themselves may influence the speed of shock transmission. For example, a reduction in regulatory burdens may enhance the ability of firms to adjust their capital stock to productivity shocks, and thus the speed at which investment reacts to such shocks.
- *Interactions between policies and between policies and macroeconomic conditions:* Structural policies may interact with other policies or with macroeconomic conditions to influence the saving and investment behaviour of firms and households. For example, the impact of lower employment protection on the precautionary saving behaviour of households might be smaller where high unemployment benefits already provide some insurance

against the risk of job loss. Likewise, wealth effects on saving could be larger in countries with more developed financial markets (Boone *et al*., 2001). Also, housing policy reforms such as removing land-use restrictions, raising taxes on vacant undeveloped lands, or relaxing competition-unfriendly regulation in the construction industry may amplify the reaction of housing investment to changes in demand (OECD, 2010b).

3. Empirical analysis of the effect of structural policies on saving, investment and current accounts

3.1. The empirical set-up

Given the theoretical complexities and ambiguities discussed in the previous section, the impact of structural reforms on saving, investment and current accounts ultimately remains an empirical issue. It is explored here by estimating a series of reduced-form equations that relate the GDP shares of, respectively, saving, investment and the current account balance to policy indicators and a set of control variables. The policy indicators span five different policy areas: social welfare systems, regulation in labour, product and financial markets, and taxation.[16, 17] The systematic analysis of the link between policies and saving, investment and current accounts is to be seen as the main novelty of this paper. The data limitations associated with the use of policy indicators imply a number of costs in terms of the methodology (for example, endogeneity issues cannot fully be addressed in the estimation procedure).

Taking a macroeconomic perspective allows examining a large set of countries simultaneously and exploiting a broad range of reform experiences. However, the discussion of the empirical results and their implications will also draw on recent microeconomic evidence on the link between structural policies and saving and investment, which tends to be narrower in scope but more robust to variations in, for example, the samples or the econometric methods than macroeconomic cross-country time-series analysis. The empirical analysis consists of two main parts:

- *Cross-country/time-series regressions* in the form of error correction models (ECMs) for an unbalanced panel data set covering 30 OECD countries.[18] By using an error correction specification the response of the dependent variable to a changes in one of the explanatory variables may be stronger in the short run than in the long run and also differ in its sign. The latter could, for example, be important for the saving rate response since households smooth consumption over time and reforms typically trigger through the economy only gradually. As it is likely that structural policy reforms have a different impact on public and private saving and investment – with some reforms likely to have virtually no impact on public saving/investment – the error correction models are estimated for both total and private saving and investment. Baseline equations are first estimated that only feature the control variables as explanatory factors, and in a second step, the policy indicators are introduced separately in the baseline specification. Since the real interest rate may be endogenous, robustness tests are carried out to verify whether the results are sensitive to dropping the real interest rate from the set of control variables. Unless explicitly mentioned in the text, this modification did not alter the conclusions of the analysis. Some of the policy variables are also interacted with the error correction parameter to investigate whether structural reforms affect the speed of adjustment to long-term equilibrium, and with some of the control or other policy variables to test for policy interactions (see Box 2 for details on the specifications). As

this analysis did not provide strong evidence of such interaction effects, the discussion below only briefly touches upon these results.

- *Cross-section and cross-country/time-series regressions* for a total of 117 OECD and non-OECD economies over the period 1993 to 2008.[19] While this second dataset is more limited in its time dimension and in the range of policies, it allows studying a broader set of countries and also facilitates the analysis of policies with little time variation. In a first step, baseline equations are estimated that relate the GDP shares of saving, investment and current account balances to a set of macroeconomic control variables, and in a second step these baseline equations are augmented by structural policy indicators (see Box 2 for details).[20] To look beyond short-term fluctuations and limit the possibility of measurement error, the regressions are carried out on non-overlapping five-year averages of the data.[21] For some of the policy variables data are only available for a single five-year time window (or even for just a single year), in which case the analysis is reduced to a pure cross-section regression. To deal with the potential endogeneity of the real interest rate, all specifications are also estimated without this variable (results not shown).

Box 2. **Details on the empirical set-up**

The baseline dynamic panel regressions for the OECD sample take the following general form:

$$\Delta Y_{it} = \alpha(Y_{it-1} - \delta_i - \lambda_t - \tau_i t - \beta X_{it-1}) + \sum_{j=1}^{3} \Phi_j \Delta Y_{it-j} + \sum_{j=0}^{3} \mathrm{B}_j \Delta X_{it-j} + \varepsilon_{it} \quad (1)$$

where the dependent variable Y is alternatively the saving or investment to GDP ratio for the overall economy (public plus private) or the private sector, or the current account balance as a share of GDP. X is a vector of control variables, ε is an error term, and the indices i and t denote country and year.[1] Insignificant short-run dynamic terms are dropped from the specification to obtain a parsimonious model.[2] Equation (1) is estimated using the ordinary least squares estimator with standard errors that are robust to contemporaneous correlation and heteroskedasticity.[3, 4] All variables included in the ECMs are either stationary around a constant mean or trend-stationary (see Kerdrain *et al.*, 2010, Table A1.4). In the current account equations, all explanatory variables are converted into deviations from a GDP-weighted cross-country average to emphasize that current accounts are influenced both by domestic and foreign economic conditions. The average is calculated across all countries for which data are available for a given year.[5] The saving and investment equations, by contrast, feature the absolute values of all explanatory variables.[6]

Since the results may be sensitive to the choice of deterministic regressors, all specifications are estimated including: *i*) only country fixed effects (to control for unobserved cross-country heterogeneity such as differences in institutions, non-economic factors and differences in national accounting rules); *ii*) country and period fixed effects (the latter controlling for unobserved shocks that affect all countries simultaneously); and *iii*) country fixed effects and country-specific time trends (the latter capturing *e.g.* policy reforms or trending macroeconomic variables such as inflation).[7] While the inclusion of these deterministic regressors increases the number of coefficients to be estimated, thus rendering the model less parsimonious, not controlling for them could potentially lead to a sizeable omitted variable bias.[8] Furthermore, standard tests for the significance of the deterministic regressors generally reject the hypothesis that they are jointly equal to zero across countries. The discussion of the results mainly focuses on the specifications that feature both country and period fixed effects. While the results for specifications with country fixed effects only are very similar and therefore not shown in the paper, the results for the specifications with country fixed effects and country-specific time trends can be found in Kerdrain *et al.* (2010).

Box 2. **Details on the empirical set-up** *(cont.)*

Three different analyses are carried out to investigate the impact of structural policies on saving, investment, and the current account. The first analysis investigates whether structural policies have an impact on top of any impact that works through changes in the macroeconomic variables that are already included in the baselines. This is done by including the structural policy indicators as separate explanatory variables both in the short run and in the long run of the baseline specification (1):

$$\Delta Y_{it} = \alpha(Y_{it-1} - \delta_i - \lambda_t - \tau_i t - \beta X_{it-1} - \gamma P_{it-1}) + \sum_{j=1}^{3} \Phi_j \Delta Y_{it-j} + \sum_{j=0}^{3} \mathrm{B}_j \Delta X_{it-j} + \sum_{j=0}^{3} \Gamma_j \Delta P_{it-j} + \varepsilon_{it} \quad (2)$$

where P is a policy indicator.[9] The policy indicators are introduced one-by-one into the baseline specification and also simultaneously (taking a single indicator from each policy area). While the latter approach has the advantage of reducing the risk of omitted variable bias, it reduces the size of the sample. Introducing indicators from different policy areas simultaneously does in general not affect the conclusions compared with a one-by-one approach. Sensitivity analysis is carried out to verify whether the results are robust to sample variations, namely to: *i*) exclusion of influential data points; and *ii*) exclusion of individual countries from the sample (see Kerdrain *et al*., 2010, for details on the results).

Some of the policy variables change only slowly over time, in which case a fixed effects estimation of equation (2) is likely to produce inaccurate point estimates (Beck, 2001; Beck and Katz 2001). To circumvent this problem while keeping the fixed effects approach, a special estimator is applied that essentially relies on a random effects model for the almost-time-invariant explanatory variables and a fixed-effects model for the remaining ones (further details on this estimator can be found in the Annex). This estimator is used for all policy variables, for which the share of the cross-country variance in the total variance exceeds 75%, a threshold inspired by the rules of thumb of Plümper and Troeger (2007). These are employment protection legislation (and its sub-components), public social spending (total, old-age and health) and the statutory retirement age (see Kerdrain *et al*., 2010, Table A1.3). In practice, however, the use of the special estimator leads to results that are very close to those of a simple fixed-effects estimator (indicating that also the choice of the threshold is not crucial).[10]

The second type of analysis explores whether structural policies have an impact on the speed of adjustment to long-term equilibrium. For example, by reducing capital stock adjustment costs, product market deregulation could speed up the adjustment of the investment-to-GDP ratio to its new equilibrium level following an exogenous shock (Alesina *et al*., 2005). This is done by interacting the error correction parameter α with a policy indicator P (measured as deviation from the sample average to facilitate interpretation):

$$\Delta Y_{it} = -(\alpha + \varphi(P_{it} - \overline{\overline{P}}))(Y_{it-1} - \delta_i - \lambda_t - \tau_i t - \beta X_{it-1}) + \sum_{j=1}^{3} \Phi_j \Delta Y_{it-j} + \sum_{j=0}^{3} \mathrm{B}_j \Delta X_{it-j} + \varepsilon_{it} \quad (3)$$

A positive (negative) sign of φ means that a higher value/score on a certain policy indicator is associated with a faster (slower) convergence to the new equilibrium. Specification (3) relies on the long run of the baseline specification and thus ignores any permanent effects of policies on saving and investment rates.

The third type of analysis explores the extent to which interactions across different policies, as well as across policies and macroeconomic conditions, matter. For example, the link between employment protection and precautionary saving may be expected to vary depending on the generosity of unemployment benefits. To this end, specification (2) which estimates only average effects of policies is extended to allow for interactions between two different policy indicators P^1 and P^2 [specification (4)] or between a policy indicator P^1 and a macroeconomic variable X^1 [specification (5)]. Following standard practice,

Box 2. **Details on the empirical set-up** *(cont.)*

the interactions are specified as multiplicative terms, which take the form of products of deviations of policies and macroeconomic variables from their sample means:

$$\Delta Y_{it} = \alpha(Y_{it-1} - \delta_i - \lambda_t - \tau_i t - \beta X_{it-1} - \gamma P^1_{it-1} - \mu P^2_{it-1} - \tau(P^1_{it-1} - \overline{\overline{P}}^1)(P^2_{it-1} - \overline{\overline{P}}^2)) + \sum_{j=1}^{3}\Phi_j \Delta Y_{it-j} + \sum_{j=0}^{3} B_j \Delta X_{it-j} + \sum_{j=0}^{3}\Gamma_j \Delta P^1_{it-j} + \sum_{j=0}^{3}\Omega_j \Delta P^2_{it-j} + \sum_{j=0}^{3} T_j \Delta((P^1_{it-j} - \overline{\overline{P}}^1)(P^2_{it-j} - \overline{\overline{P}}^2)) + \varepsilon_{it} \quad (4)$$

$$\Delta Y_{it} = \alpha(Y_{it-1} - \delta_i - \lambda_t - \tau_i t - \beta X_{it-1} - \gamma P^1_{it-1} - \tau(X^1_{it-1} - \overline{\overline{X}}^1)(P^1_{it-1} - \overline{\overline{P}}^1)) + \sum_{j=1}^{3}\Phi_j \Delta Y_{it-j} + \sum_{j=0}^{3} B_j \Delta X_{it-j} + \sum_{j=0}^{3}\Gamma_j \Delta P^1_{it-j} + \sum_{j=0}^{3} T_j \Delta((X^1_{it-j} - \overline{\overline{X}}^1)(P^1_{it-j} - \overline{\overline{P}}^1)) + \varepsilon_{it} \quad (5)$$

Where $\overline{\overline{P}}^1$, $\overline{\overline{P}}^1$ *and* $\overline{\overline{X}}^1$ are the sample means (across countries and over time) of P^1, P^2 and X^1, respectively, and other variables are denoted as before.

The analysis that involves the broader country set of both OECD and non-OECD economies is based on the following equation:

$$\tilde{Y}_{it} = \alpha + \beta \tilde{X}_{it} + \gamma \tilde{P}_{it} + \varepsilon_{it} \quad (6)$$

where a tilde denotes a five-year average and all other notations are as before. A simple static specification is preferred to a dynamic one in the spirit of equation (2) because of the very limited the time-series dimension of the data set. The equation is estimated with linear least squares, using a variance-covariance matrix that is robust to country-specific heteroskedasticity. In a first step, equation (6) is estimated relating the GDP shares of saving, investment and current account balances only to macroeconomic control variables. In a second step, structural policy indicators are introduced one-by-one into these baseline specifications. The broader dataset is also used to test for policy interactions:

$$\tilde{Y}_{it} = \alpha + \beta \tilde{X}_{it} + \gamma \tilde{P}^1_{it} + \varpi \tilde{P}^2_{it} + \kappa(\tilde{P}^1_{it} - \overline{\overline{\tilde{P}}}^1)(\tilde{P}^2_{it} - \overline{\overline{\tilde{P}}}^2) + \varepsilon_{it} \quad (7)$$

where $\overline{\overline{\tilde{P}}}^1$ *and* $\overline{\overline{\tilde{P}}}^2$ are the sample means (across countries and over time) of respectively $\tilde{P}^1$ *and* $\tilde{P}^2$.

The empirical strategy has a number of shortcomings which have to be kept in mind when interpreting the results. *First*, the approach does not explicitly account for the joint determination of current accounts and some of the explanatory variables (*e.g.* interest rates), potentially leading to an endogeneity bias. *Second*, it does not allow distinguishing between different types of shocks (*e.g.* temporary *versus* permanent shocks, expected *versus* unexpected shocks, credible *versus* non-credible shocks). The analysis is thus likely to capture an average effect across heterogeneous reform experiences, which reduces chances of obtaining significant and robust results.[11] *Third*, the approach treats saving and investment decisions separately. As discussed in the previous section this assumption of independence between saving and investment is unlikely to be fulfilled, especially during earlier periods of the sample when the Feldstein-Horioka puzzle was still strong. *Fourth*, structural policies are likely to influence saving and investment decisions through changes in the macroeconomic control variables, reducing the chances of finding significant coefficients on the policy variables themselves.[12]

Box 2. **Details on the empirical set-up** *(cont.)*

1. It might be more natural to think of equation (1) in terms of an autoregressive distributed lag (ARDL) model linking the (stationary) level of *Y* to its lags as well as to current and lagged levels of *X* and *P*. The ECM is strictly equivalent to an ARDL model, but gives direct estimates of the longer-run effects – *i.e.* cumulated over years – of the explanatory variables.
2. Lag delegation is done by successively dropping the least significant variable until all coefficients have an individual p-value below 10%. Note that once some lags are dropped from the dynamic part of the ECM, it is no longer necessarily equivalent to an unrestricted autoregressive distributed lag (ARDL) model.
3. Controlling for autocorrelation is less relevant in the context of an ECM due to the inclusion of lagged dependent variables. Lagrange multiplier tests indeed indicate that the residuals do not suffer from autocorrelation. Alternative variance-covariance matrices that are robust to arbitrary heteroskedasticity and within-country serial correlation or country-specific heteroskedasticity (but not to correlation between residuals for different countries) produce very similar conclusions.
4. Although the fixed effects estimates are biased in the presence of the lagged dependent variable, alternative estimators such as the GMM procedure proposed by Arellano and Bond (1991) are disregarded as the bias is likely to be small for our dataset (Judson and Owen, 1999), in particular for the estimate of β, which is the ultimate interest of this study.
5. The maximum set of countries includes Australia, Austria, Belgium, Brazil, Canada, Chile, China, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, India, Indonesia, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Russia, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States. While in principle calculating the average across all countries for which data are available might cause sudden jumps in the data in years where a large country is added to the list, calculating the average alternatively over the G7 economies and only for years for which data are available for all of them is found to hardly affect the results.
6. Measuring all variables relative to a world average as in the current account equations (not shown in the paper) produces very similar results.
7. While dynamic panel regressions with fixed effects may produce biased results when the time dimension of the panel *T* is small and the number of cross sections *N* is large (*e.g.* Nickell, 1981), the average *T* in the regressions is generally large enough for the bias to be sufficiently small to be ignored.
8. In order not to increase the number of regressors and reduce degrees of freedom too much, linear time trends, period fixed effects and country fixed effects are not considered all together in a single specification.
9. For all policy variables that capture social welfare no short-run dynamics are included in the specification since some years of data had to be interpolated for these variables.
10. No lagged differences are included for these variables in the regressions since they show little dynamics over time.
11. In cases where the direction of impact differs across different types of shocks, the sign of the estimated coefficient may still give some hints on how economic agents perceived the shock, however.
12. A two-stage approach which would properly address the problem by first estimating the impact of structural policies on the macroeconomic variables and then incorporating the results in the saving, investment and current account equations is beyond the scope of this paper.

3.2. The impact of macroeconomic conditions

3.2.1. Saving

The baseline saving equations feature the real interest rate, the growth rates of productivity (measured as real GDP per worker) and the terms of trade, the youth and old-age dependency ratios and the government budget balance (Table 1).[22, 23] The results for the OECD sample are fairly robust to alternative specifications (see Kerdrain *et al.*, 2010).[24] The positive impact of productivity growth on saving in the medium to long run is consistent with a standard life cycle framework: to the extent that higher productivity growth benefits workers more than retirees and saving rates per age remain unchanged, the higher saving rate of workers generates an increase in the aggregate saving rate. The positive relationship between improvements in the terms-of-trade and the aggregate saving rate can be explained by households smoothing consumption in the face of a transitory level shock.[25] The effect appears to be stronger for oil exporting countries (see Kerdrain *et al.*, 2010), which is not surprising given that the terms of trade of these countries are highly influenced by the price of a finite resource. The short-run dynamics do not provide any evidence of overshooting with the transition of saving rates to the new equilibrium following a shock to the growth rates of productivity or the terms of trade being rather smooth. The regressions for the broader data set confirm the positive

Table 1. **Baseline estimation results for OECD sample 1965-2008: Country and period fixed effects**

	SAVT	SAVP	INVT	INVP	CA
Long-run relationship					
User cost of capital			–0.150**	–0.249***	–0.113
			(0.062)	(0.070)	(0.157)
Productivity growth	1.063***	0.542**	1.908***	1.912***	–1.497***
	(0.386)	(0.250)	(0.343)	(0.335)	(0.530)
Change in population aged 15-64			1.938***	0.982**	–4.550***
			(0.526)	(0.481)	(1.654)
Change in terms of trade	0.427***	0.172**			0.489***
	(0.130)	(0.083)			(0.162)
Real long-term interest rate	–0.623***	–0.486**			0.012
	(0.233)	(0.205)			(0.324)
Old-age dependency ratio	–0.547***	–0.330**			–0.680***
	(0.145)	(0.156)			(0.216)
Youth dependency ratio	0.294**	0.432***			0.259*
	(0.146)	(0.142)			(0.141)
Government net lending	0.322***	–0.596***			0.008
	(0.118)	(0.107)			(0.160)
Short-run dynamics					
Error correction parameter	–0.182***	–0.223***	–0.176***	–0.178***	–0.210***
	(0.038)	(0.037)	(0.025)	(0.028)	(0.038)
ΣΔ Dependent variable	–0.114***		0.154***	0.152***	
	(0.040)		(0.057)	(0.058)	
ΣΔ User cost of capital			0.039***	–0.038***	
			(0.013)	(0.011)	
ΣΔ Productivity growth	0.222***	0.042	0.207***	0.253***	–0.234**
	(0.055)	(0.079)	(0.034)	(0.030)	(0.096)
ΣΔ Change in population aged 15-64			0.422***		–1.106***
			(0.106)		(0.362)
ΣΔ Change in terms of trade	0.100***	0.047***			0.135***
	(0.014)	(0.016)			(0.023)
ΣΔ Real long-term interest rate	–0.071**	–0.049*			–0.143***
	(0.028)	(0.027)			(0.055)
ΣΔ Old-age dependency ratio	0.562**	0.248***			
	(0.240)	(0.365)			
ΣΔ Youth dependency ratio	–0.522***	–0.342*			–0.742***
	(0.146)	(0.179)			(0.276)
ΣΔ Government net lending	0.178***	–0.416***			0.114*
	(0.033)	(0.042)			(0.062)

Robust standard errors in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level. SAVT, SAVP, INVT, INVP, and CA denote the GDP shares of respectively total saving, private saving, total investment, private investment, and the current account balance. All models include country and period fixed effects.

relationship between total saving rates and changes in productivity and the terms of trade, with the magnitudes of the estimated effects being very close to the medium to long-run effects found in the dynamic panel regressions for OECD countries (Table 2).

The old-age dependency ratio turns out to be negatively related to the aggregate saving rate in the medium to long run, in line with the standard life-cycle hypothesis that older people tend to have a higher propensity to consume out of income than people of working age (Modigliani and Ando, 1963). The point estimate implies that a 1 percentage point increase in the old-age dependency ratio reduces total saving by about half a percentage point of GDP in the medium to long run, which is in line with the findings of

other recent studies (*e.g.* Cheung *et al.*, 2010) and with the estimate obtained in the regression for OECD and non-OECD countries.[26, 27] While the baseline specifications shown in Table 1 suggest that a rise in the youth dependency ratio temporarily reduces saving rates in OECD countries but leads to an increase in saving rates in the medium to long run, this result appears to be sensitive to the choice of deterministic control variables (*i.e.* country and period fixed effects, only country fixed effects or country fixed effects and country-specific time trends) and to the inclusion of the real interest rate.[28] Improvements in government budget balances have a significantly positive effect on total saving in the medium to long run, but reduce household saving, potentially due to (partial) Ricardian equivalence.[29] The private saving offset is estimated at around two-thirds, which is somewhat larger than the magnitudes found in previous studies (*e.g.* Cheung *et al.*, 2010; Röhn, 2010). Changes in the real interest rate also have a significant influence on saving behaviour, with a 1 percentage point increase in the real interest rate lowering private saving by about half a percentage point of GDP.[30] One interpretation is that, on average across countries, the income effect of an interest rate change outweighs its substitution and wealth effects.

Looking at the in-sample and out-of-sample fit of the estimated baseline saving equations shows that fitted saving rates track actual rates fairly well for most countries in-sample (see Kerdrain *et al.*, 2010), though this is clearly driven by the lagged dependent variables for at least some of them. To explore the out-of-sample forecasting properties of the equations, they are estimated until 2000 and then used to dynamically forecast the GDP shares of saving and investment until 2008. Since the period fixed effects do not exhibit any clear trend, they are set equal to zero over the forecasting horizon. The out-of-sample fit varies considerably across countries, though in general actual saving rates lie within the 90% confidence interval around the forecast.[31] For example, while the equations track the actual saving rate fairly well for Japan, Germany, the United Kingdom, Australia and the Netherlands, they perform rather poorly for the United States, Spain and Norway. This rather poor forecasting performance for some countries could be explained by the omission from the baseline equations of structural policy variables which may explain at least some of the recent changes in saving rates.[32]

3.2.2. Investment

The baseline investment specifications feature the user cost of capital (or the real interest rate when based on the second sample that involves non-OECD countries), productivity growth and the growth rate of the working-age population, and yield results that are qualitatively in line with existing empirical evidence.[33] The regressions for the OECD sample indicate that higher TFP growth, a higher growth rate of the working-age population or lower cost of capital raise investment rates in the medium to long run (Table 1). The user cost effect is consistent with the notion that higher user costs lower the returns on investment projects and confirms the findings of previous OECD work (*e.g.* Vartia, 2008; Schwellnus and Arnold, 2008). The point estimate implies that a 1 percentage point increase in the user cost of capital reduces private investment by a quarter of a percentage point of GDP in the medium to long run, which is somewhat smaller than the magnitude implied by other studies (Cummins *et al.*, 1994). As it turns out, a fall in the interest rate is found to raise saving by slightly more than investment. The short-run dynamics suggest that, following a shock to any of the three explanatory variables, half of the full adjustment of the private investment rate to the new equilibrium is achieved within four years. The results are very robust to alternative choices of

deterministic regressors and to the omission of influential data points (see Kerdrain *et al.*, 2010).[34] Moreover, the conclusions are confirmed by the regressions for the broader data set of OECD and non-OECD countries (Table 2).[35] The out-of-sample forecasting performance of the estimated investment equations varies considerably across countries (see Kerdrain *et al.*, 2010). For example, the equations produce a very good forecast for the United States and, to a lesser extent, for the Netherlands. In the case of Germany, the United Kingdom and Norway, the equations perform well at least during more recent years, though they are not able to predict movements in the investment rate at the beginning of the forecasting period (*i.e.* in 2001/2002).[36]

Table 2. **Baseline estimation results for OECD/non-OECD sample**

	SAVT	INVT	CA
Real interest rate	–0.101***	–0.069**	–0.059
	(0.031)	(0.033)	(0.046)
Productivity growth	0.326*	1.146***	–1.011
	(0.196)	(0.308)	(0.659)
Change in population aged 15-64		0.514*	0.454
		(0.282)	(0.924)
Change in terms of trade	0.263**		0.501***
	(0.120)		(0.131)
Old-age dependency ratio	–0.572***		–0.323*
	(0.139)		(0.175)
Youth dependency ratio	–0.281***		–0.223***
	(0.044)		(0.063)
Number of cross sections	96	117	97
Number of observations	240	314	245

Note: Robust standard errors in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level. SAVT, INVT, and CA denote the GDP shares of respectively total saving, total investment, and the current account balance.

3.2.3. Current account

The current account equations feature all macroeconomic variables that have a significant influence on total saving, total investment or both and yield results that are broadly consistent with the regression results for the two components.[37] The regressions for OECD countries indicate that changes in productivity, changes in the size of the working-age population, and changes in the terms of trade have a lasting impact on current account positions (Table 1). However, the current account equations do not provide any evidence that the real interest rate has a lasting impact on current account positions. The somewhat counter-intuitive relative magnitudes of the medium- to long-run interest rate elasticities found in the saving and investment rate equations do thus not carry over to the current account equation. As for the user cost of capital, the real interest rate and the dependency ratios, the results are sensitive to the precise specification used (see Kerdrain *et al.*, 2010). Overall, the results are consistent with those from comparable studies (*e.g.* Chinn and Ito, 2007; Cheung *et al.*, 2010). In the regression for OECD and non-OECD countries only the two dependency ratios and terms-of-trade changes come out as significant (Table 2).

3.2.4. Implications for the impact of structural policies

Insofar as structural policies affect the macroeconomic variables included in the baseline specifications, significant coefficients on these variables imply that these reforms should ultimately also affect saving and investment rates. In particular, there is growing evidence that removing anti-competitive product market regulation, relaxing overly stringent employment protection legislation and fostering the completeness and depth of financial markets all boost productivity growth.[38] The empirical results in Tables 1 and 2 would therefore imply that such reforms also have a negative impact on the current account position. Similar implications can be derived from the significant influence of government fiscal balances on saving since structural reforms can, and often do have side-effects on public budgets.[39]

3.3. The impact of social welfare reform

The empirical analysis shows that a higher GDP share of public spending on health is associated with lower saving rates (Tables 3 and 4), in line with the notion that improvements in the coverage and/or quality of social welfare schemes reduce the need for precautionary saving.[40] The effect appears to be especially strong under low initial levels of social spending (Table 5 and Figure 3, panel A), consistent with existing evidence (*e.g.* Furceri and Mourougane, 2010; Baldacci *et al.*, 2010). The point estimates for the OECD sample imply that, on average, a 1 percentage point increase in the GDP share of public health spending reduces total and private saving rates by over 1½ percentage points in the medium to long run. The standard deviation around this point estimate is high, however. For other areas of social welfare, the analysis yields less robust results. The results depend in particular on the choice of deterministic control variables, with higher total public social spending,[41] higher public social spending on old age[42] and higher and more long-lasting unemployment benefits only found to reduce saving rates in specifications that feature country-specific time trends (see Kerdrain *et al.*, 2010).[43, 44] The current account regression results are in line with those obtained for saving, with more developed public health care systems being associated with weaker current account positions.

These findings are broadly consistent with micro studies on the saving impact of social welfare schemes. Higher unemployment benefit replacement rates have been found to reduce household saving on US state-level data (Engen and Gruber, 2001).[45] Likewise, several studies show that a broader coverage and better quality of public health insurance schemes discourage private saving (*e.g.* de Nardi *et al.*, 2006; Jappelli *et al.*, 2006; Maynard and Qiu, 2009; Chou *et al.*, 2003), though the size of the effect differs across different types of households. Regarding China more specifically, there is recent evidence that government health spending (or lack thereof) affects individual household saving rates (OECD, 2010c; Barnett and Brooks, 2010; Chamon and Prasad, 2010). Other relevant design features of social welfare systems include the asset tests associated with means-tested social programmes, which may discourage saving in order to qualify for benefits (see Hubbard *et al.*, 1995, Gruber and Yellowitz, 1999; Nam, 2008; and McKernan *et al.*, 2007 for some evidence for the United States).[46]

Regarding pension reforms, the present analysis suggests that increasing the statutory retirement age by one year reduces total and private saving by around half a percentage point of GDP in the medium to long run (Table 3), a finding that is robust to variations in the sample (Kerdrain *et al.*, 2010).[47, 48] This negative relationship is consistent with the notion that a higher retirement age prolongs the period during which to accumulate wealth and

Table 3. **The impact of structural policies on saving, investment and current accounts in OECD countries**

Baseline equations augmented with structural policy indicators

	SAVT		SAVP		INVT		INVP		CA	
	LR	SR	LR	SR	LR	SR	LR	SR	LR	SR
Social security programmes										
Unemployment benefit replacement rate	0.008		–0.029						–0.090	
	(0.067)		(0.052)						(0.088)	
Public social spending, total	–0.165		–0.260						–0.185	
	(0.191)		(0.206)						(0.304)	
Public social spending, old age	0.099		–0.005						–0.008	
	(0.564)		(0.499)						(0.518)	
Public social spending, health	–1.889***		–1.549***						–2.269***	
	(0.612)		(0.523)						(0.626)	
Standard retirement age	–0.516*		–0.664**						–0.351	
	(0.291)		(0.283)						(0.396)	
Labour market policy										
Employment protection legislation (EPL)	–0.456		0.068		1.043**		0.626*		–1.711**	
	(0.576)		(0.431)		(0.439)		(0.346)		(0.948)	
EPL on regular contracts	0.170		0.595		0.262		0.181		–0.980	
	(0.943)		(0.821)		(0.695)		(0.444)		(1.188)	
EPL on temporary contracts	–0.270		–0.052		0.819***		0.589***		–1.033*	
	(0.375)		(0.314)		(0.290)		(0.218)		(0.583)	
Financial market regulation										
Credit to the private sector (% of GDP)	–3.954***	0.593*	–2.987**	–1.133**	1.842	1.126**	1.896*	0.970**	–2.930	
	(1.262)	(0.315)	(1.362)	(0.470)	(1.180)	(0.451)	(1.019)	(0.452)	(1.848)	
Stock Market Capitalisation (% of GDP)	–1.744	–0.342	–0.821	–0.389	0.181		1.979	1.036**	–2.636	
	(2.391)	(0.544)	(1.421)	(0.720)	(1.435)		(2.220)	(0.498)	(1.918)	
Stock market trade (% of GDP)	–1.085	–0.594***	–1.065	–0.442**	–0.332		0.250	0.312*	–1.057	–0.692*
	(1.184)	(0.206)	(0.662)	(0.214)	(0.697)		(0.692)	(0.179)	(0.902)	(0.326)
Financial reform index	0.016		–0.076		0.146		0.153		–0.096	
	(0.087)		(0.104)		(0.131)		(0.117)		(0.168)	
Product market regulation										
Regulation in seven non-manufacturing sectors					0.150	–0.543**	0.270	–1.002**	–0.866	
					(0.375)	(0.221)	(0.355)	(0.390)	(0.598)	

Note: Robust standard errors in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level. SAVT, SAVP, INVT, INVP, and CA denote the GDP shares of, respectively, total saving, private saving, total investment, private investment, and the current account balance. LR = long run, SR = short run. For social welfare programmes no short-run dynamics are included in the specifications due to linear interpolation of the data. All specifications include country and period fixed effects.

shortens the period during which to live off that wealth, and it is also supported by other recent studies (*e.g.* Kirsanova and Sefton, 2007). As regards pension benefits, the existing empirical evidence indicates that a cut in benefits is associated with higher private saving rates in the aftermath of the reform. Exploiting the Italian pension reform of 1992, Attanasio and Brugiavini (2003) demonstrate that this effect is particularly high for workers between 35 and 45. Feng *et al.* (2009) show that the pension reform for enterprise employees implemented in China in the late 1990s boosted the household saving rate.[49] The scarce evidence that exists on the relative impact of unfunded *versus* funded schemes is more mixed, with tentative evidence that countries with a pay-as-you-go system tend to have lower saving rates (Samwick, 2000).

Table 4. **The impact of structural policies on saving, investment and current accounts: OECD/non-OECD sample**

Baseline equations augmented with structural policy indicators

	INVT	SAVT	CA
Employment law index	–2.130	–3.201	–4.204
	(2.870)	(5.230)	(5.719)
Unemployment benefits		–2.832	–1.834
		(3.947)	(3.275)
Public health expenditure (% of GDP)		–0.725	–0.992**
		(0.491)	(0.465)
Ease of doing business index	–0.014		–0.003
	(0.012)		(0.026)
Cost of starting a business (% of GNI)	–0.009**		–0.005
	(0.004)		(0.004)
Days required to start a business	0.008		0.015
	(0.010)		(0.017)
Number of procedures to register a business	–0.229**		0.245
	(0.110)		(0.202)
Financial reform index	–0.082	–0.311*	0.042
	(0.093)	(0.172)	(0.148)

Note: Robust standard errors in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level. SAVT, INVT, and CA denote the GDP shares of, respectively, total saving, total investment, and the current account balance.

3.4. The impact of labour market reform

There is ample evidence at the micro level that higher income uncertainty is associated with larger wealth holdings by households (or higher saving/lower consumption), though the size of the effect appears to differ widely across studies, potentially related to the focus on different countries.[50] The empirical analysis conducted in this paper does not provide strong evidence that the stringency of employment protection legislation (EPL) impacts the private or total saving rate in OECD countries.[51, 52] The insignificance of this variable may reflect two offsetting effects, as more stringent protection reduces the probability of job loss, but also lengthens the expected unemployment spell after dismissal. This explanation is consistent with existing evidence that perceived job security is actually weaker in high-EPL countries (Clark and Postel-Vinay, 2009). For the broader country dataset, however, there is some evidence that lower employment protection is associated with higher saving rates, but only in countries with low or no unemployment benefits (Table 5 and Figure 3, panel B).[53] Other labour market indicators (*e.g.* the level of the minimum wage and the bargaining power of unions) are not found to have a significant influence on saving rates (results not shown).

As regards investment, employment protection is the only one of the labour market indicators considered that is found to have a robust impact, and only for the sample of OECD countries. Stricter EPL appears to be associated with higher GDP shares of both private and total investment, a finding that applies to both the overall index of employment protection and the sub-index for temporary workers (Table 3).[54, 55] One potential explanation for this result is that while the implicit and explicit costs associated with stronger protection might discourage FDI to countries with higher EPL,[56] domestic firms may instead react by substituting capital for labour,[57] and the latter effect may dominate on average across OECD countries. The point estimates imply that a one-standard-deviation rise in the EPL indicator boosts private investment by around half a

Table 5. **Results for interaction effects**

OECD/non-OECD sample

	SAVT	SAVT	SAVT
Real interest rate	–0.076	–0.603***	–0.118***
	(0.063)	(0.182)	(0.045)
Productivity growth	0.532	0.506	0.277
	(0.324)	(0.582)	(0.282)
Change in terms of trade	0.333**	0.289	0.115
	(0.132)	(0.260)	(0.149)
Old-age dependency ratio	–0.461**	–0.336	–0.493***
	(0.223)	(0.266)	(0.149)
Youth dependency ratio	–0.286***	–0.205***	–0.223***
	(0.053)	(0.059)	(0.043)
Public health expenditure (% of GDP)	–1.128**		
	(0.558)		
Public health expenditure (% of GDP) squared	0.375***		
	(0.137)		
Employment law index		–4.230	
		(5.332)	
Unemployment benefits		–1.373	
		(3.993)	
Employment law index * Unemployment benefits		23.270*	
		(13.376)	
Financial reform index			–0.444**
			(0.222)
GDP per capita relative to the United States			6.759*
			(3.993)
Financial reform index * GDP per capita relative to the United States			0.176
			(0.627)
F-test for joint significance of policy variables and interaction term (*p*-value)	0.017	0.248	0.077
Number of cross sections	90	54	58
Number of observations	170	54	161

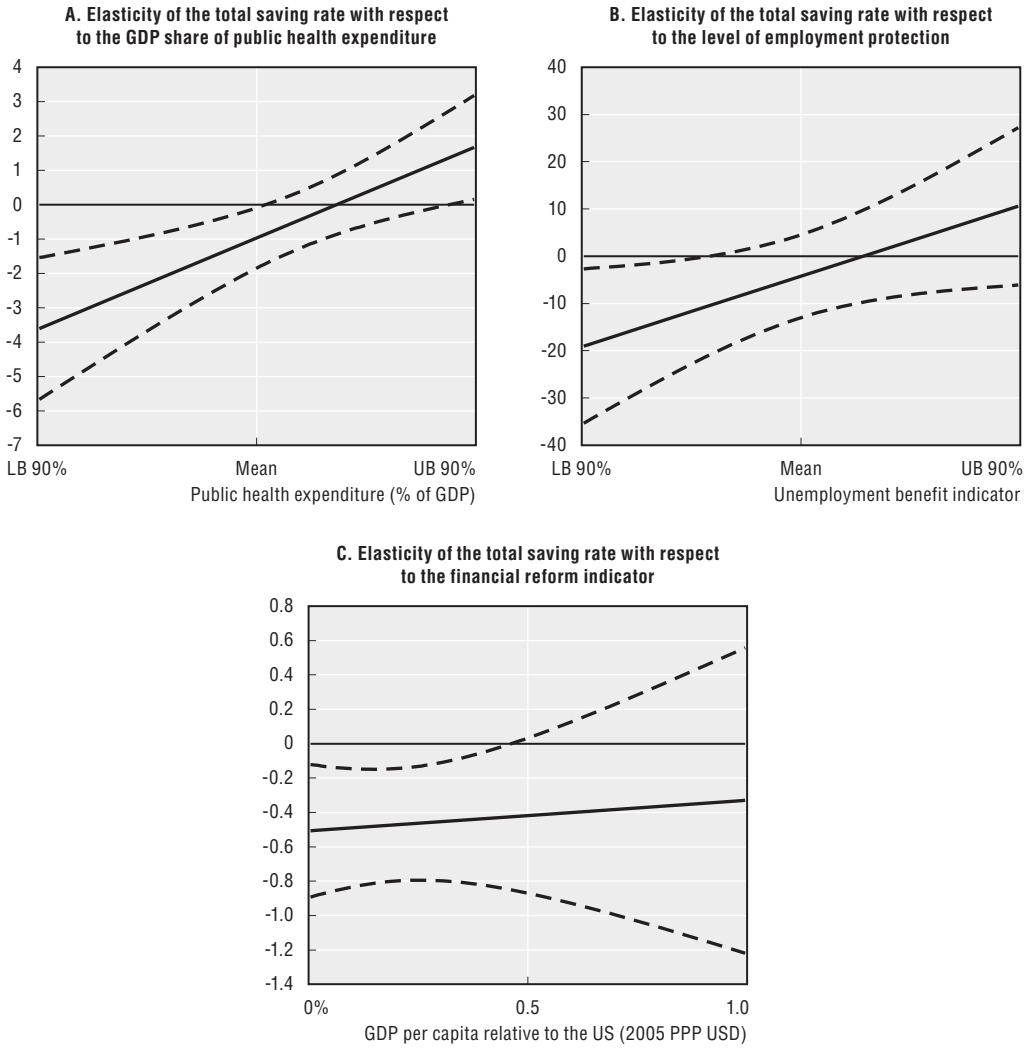
Note: Robust standard errors in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level. SAVT denotes the GDP share of total saving.

percentage point of GDP and total investment by around 1 percentage point of GDP in the medium to long run.[58] This rise in investment is likely to be partially offset in the short run through a temporary fall in productivity growth (see Barnes *et al.*, 2011 for an estimate of the GDP per capita effects of EPL reform). The current account regressions point to a negative link between a country's level of employment protection and its current account position, in line with the favourable investment effects of strict EPL.[59, 60]

3.5. The impact of product market reform

Product market reform can influence investment in several conflicting ways (Alesina *et al.*, 2005): *i)* reductions in entry barriers may increase output and capital accumulation by reducing the mark-up of prices over marginal costs; *ii)* reductions in red tape and other forms of regulatory burdens can lower the costs of expanding the capital stock for incumbent firms and thus enhance their capacity to respond to changes in fundamentals;[61] *iii)* in the presence of information asymmetries, internal and external sources of financing may not be perfectly substitutable, and reductions in mark-ups may depress investment; *iv)* to the extent that product market reforms are accompanied by the privatisation of public enterprises that had been heavy investors, investment may fall despite the decline

Figure 3. **Results for interaction effects: OECD/non-OECD sample**



Note: Mean, LB 90% and UB 90% denote, respectively, the sample mean and the lower and upper bounds of a 90% confidence interval around the mean of the variable considered. A higher score on the unemployment benefit indicator (panel B) means better income protection in case of job loss.

Source: Calculations based on coefficient estimates presented in Table 5.

in the shadow cost of entry; *v*) product market reforms may affect the GDP share of investment by altering the sectoral specialisation of the economy towards sectors that are less/more capital intensive or rely less/more on investment goods with a high rate of depreciation.[62]

The empirical analysis suggests that product market deregulation boosts private investment and total investment, but that this effect vanishes after a few years (Table 3).[63] Taken at face value, the magnitude of the coefficient implies that an improvement in the regulation index similar in size to that achieved in the average OECD country over 1998-2008 is associated with an increase in total investment by about 0.4 percentage points of GDP in the year following the reform (Kerdrain *et al.*, 2010, Figure A1.7).[64] While this direct effect is rather small, it is likely to be amplified substantially through the indirect effect that works through higher productivity growth (Boulhol *et al.* 2008 and Barnes *et al.*, 2011). This is

relatively small and likely to be offset by a fall in investment The level of product market regulation does, however, not appear to affect the speed at which the investment-to-GDP ratio adjusts to its new equilibrium level following an exogenous shock.[65] Previous studies on the issue also generally conclude that a reduction in regulation is associated with higher investment. Alesina *et al*. (2005) find for a panel of OECD countries that this effect is particularly large for a removal of entry barriers. Regarding public ownership, the authors find that privatisation is associated with higher investment rates, suggesting that privatisation is, on average, associated with lower shadow costs of entry and that this outweighs the effect of less overinvestment. Vartia (2008) and Griffith and Harrison (2004) also provide evidence that less regulation is associated with a higher investment rate. As for the current account, the empirical analysis does not provide any robust evidence for an impact of product market regulation.[66]

3.6. The impact of financial market reform

The impact of financial market reform on the saving behaviour of firms and households is theoretically ambiguous. On the one hand, reforms that increase the depth and/or sophistication of domestic financial markets might reduce saving by relaxing borrowing constraints and by lowering the need for precautionary saving through better portfolio diversification, at least provided adequate prudential regulation is in place. On the other hand, financial market development might increase saving by widening saving opportunities, which should allow the supply of financial services to better match individual preferences, risk aversion and income profiles. In addition, financial market development might influence saving by altering rates of return and lending margins (*e.g.* by lowering transaction costs), with the direction of the impact depending on the relative strength of the substitution and income effects.

Financial market regulation indicators are inherently difficult to construct with many studies not using policy indicators but intermediate outcome indicators which suffer from potential endogeneity. For the OECD sample, the study relies on both outcome and policy indicators to measure financial market reform and the results appear to be highly sensitive to the choice of the indicator. While the outcome indicators tend to point to a negative relationship between financial market development and saving rates, this is generally not confirmed by the financial reform index of Abiad *et al*. (2010), which combines a wide range of policy indicators on financial sophistication and liberalisation: The financial reform index comes out significantly negative only when dropping the real interest rate from the set of control variables.[67] These mixed results are consistent with the existing empirical literature.[68] One possible explanation for the mixed results is the existence of threshold effects whereby the negative effect from the removal of borrowing constraints may dominate in early stages of financial development, whereas the positive impact from broader supply and expected returns may become predominant at later stages (Ferrucci and Miralles, 2007). The analysis for the broader sample that includes both OECD and developing countries lends some support to this explanation, with the financial reform index by Abiad *at al*. (2010) found to be significantly negatively related to the total saving rate (Table 4). The effect appears to hold only for countries with GDP per capita levels below half of the US level (Table 5 and Figure 3, panel C). There is no robust evidence that the depth and sophistication of financial markets influence the saving effects of other structural policies, or that it affects the speeds at which households and firms adapt their saving behaviour in response to changes in fundamentals.

Financial market deregulation should stimulate investment, not least by lowering the cost of acquiring and evaluating information on prospective projects and by reducing the risk of resource mismanagement through easier monitoring of investments (OECD, 2003a). However, to the extent that financial repression is associated with households supplying cheap capital to enterprises, liberalisation may raise the cost of capital and thus lower investment. As stressed by Caballero (2006) and Caballero *et al*. (2008), financial market imperfections in emerging and developing countries might be one reason why these countries have invested in advanced countries such as the United States rather than domestically. While a positive link between financial development and investment is supported by several recent studies (*e.g.* OECD, 2003a; Cheung *et al.*, 2010; Dorrucci *et al.*, 2009),[69] the empirical analysis conducted in this paper yields somewhat ambiguous results, with the coefficient either positive or insignificant depending on the choice of the proxy for financial market regulation and the specification.[70] Similarly, this study does not find strong evidence that financial market development weakens the current account position, unlike several other studies (Chinn and Ito, 2007; Kennedy and Sløk, 2005; Dorrucci *et al*., 2009).[71]

3.7. The impact of tax reform

Tax reforms may affect household saving through a variety of different channels, not least *via* the after-tax rate of return on saving or *via* asymmetric tax treatment of different types of capital income (*e.g.* tax deductibility of interest expenses on loans in the absence of taxation of imputed rent). While the limited availability of time series data on capital gain tax rates and the interest rate deductibility of mortgages does not allow an investigation of these effects here, a number of individual-country studies have concluded that a reduction in the after-tax rate of return (*e.g.* by cutting down tax deduction of interest expenses) boosts the saving rate (*e.g.* Summers, 1984, for the United States; Koskela and Virén, 1994, for Denmark, Sweden and Finland). To the extent that higher-income households have a higher propensity to save, a more progressive income tax system may be associated with a lower aggregate saving rate, *ceteris paribus*. The empirical analysis does not yield robust evidence in favour of such a link, with the coefficient on income tax progressivity being significantly negative or insignificant, depending on the precise specification and sample (results not shown). As for tax-deferred retirement saving vehicles, several studies find that they boost private saving (Poterba *et al*., 1996; Rossi, 2009), whilst others point to sizeable crowding-out, at least for some types of households (Attanasio *et al*., 2004; Corneo *et al*., 2009). Looking at various pension-unrelated savings accounts, OECD (2007) concludes that tax-preferred accounts create new savings only when moderate-income households participate in them.

Lower corporate tax rates (or larger capital depreciation allowances) should raise investment by reducing the user cost of capital.[72] Although the significant negative coefficient on the (not tax-adjusted) user cost of capital variable in the baseline specification is consistent with this link, the empirical analysis in this paper does not find support for a direct negative effect of corporate taxes when introducing them as separate explanatory variables in the investment equations.[73] Studies that make use of sector or firm-level data generally find that lower corporate tax rates or higher depreciation allowances are associated with higher investment (*e.g.* Vartia, 2008; Schwellnus and Arnold, 2008; Hassett and Hubbard, 2002).[74]

4. Quantifying the impact of policy reforms on current account imbalances

The empirical results presented in the previous section (see Table 6 for an overview) are used to obtain illustrative estimates of the side effects of possible growth-enhancing policy reform packages on saving-investment gaps. While the reform packages are chosen to yield a double dividend by both boosting growth *and* reducing saving-investment gaps, some other desirable reforms ignored in the simulations may well be associated with a widening of external positions. Given the likelihood of and need for major fiscal tightening across the OECD over the coming years, the packages also incorporate fiscal tightening scenarios. The (dynamic) simulations rely on the coefficient estimates obtained for the saving and investment rate equations in Table 1, which prove to be more robust than the current account equations.[75] For the purpose of the simulations, the equations are transformed into deviations from the cross-country average to account for the fact that relative (rather than absolute) movements in macroeconomic and structural policy settings drive saving-investment gaps in equilibrium. A total of four scenarios are created, two global scenarios that look at 27 OECD countries[76] plus China, and two euro area scenarios.[77] In both cases, one scenario exclusively considers changes in fiscal positions, while the other also assumes the implementation of structural reforms. The results of this rather simplistic simulation exercise need to be interpreted with care. Most importantly, the simulations treat saving and investment separately and abstract from possibly heterogeneous interest rate responses (in particular to fiscal tightening). Specific caution is warranted when interpreting the results for China since the simulations mostly rely on the coefficient estimates obtained with the OECD panel dataset.[78] Moreover, some of the coefficients used in the simulations are rather imprecisely estimated, meaning that the precise magnitudes of the saving-investment gap effects of policy reforms are surrounded by a high degree of uncertainty.

Table 6. **Overview of the estimated effects of structural policies on saving, investment and current accounts**

	Total saving	Total investment	Current account
Macroeconomic conditions			
Increase in productivity growth	+	+	–
Increase in the user cost of capital		–	(+)
Increase in the growth rate of working-age population		+	–
Increase in the rate of change of the terms of trade	+		+
Increase in the real rate of interest	–		(-)
Increase in the old-age dependency ratio	–		–
Increase in the youth dependency ratio	+		+
Increase in government net lending	+		(+)
Structural policies			
Improvement in coverage/quality of social welfare system	–		–
Increase in retirement age	–		(-)
Lowering of employment protection	0	–	+
Product market deregulation		+	(-)
Financial market deregulation	0/–	0/+	(0/-)

Note: +, –, 0 denote, respectively, a significant rise, a significance fall, and no significant change in the dependent variable. The reported results refer to the medium- to long-run effect in all cases but product market regulation reform, where the short-run effect is shown. Results for the current account regressions are reported in parentheses if the findings from the preferred saving and investment equations imply an impact which cannot be detected in the current account estimates. The lower half of the table reports the impact of structural policies over and above any impact that works through changes in macroeconomic conditions (*e.g.* product market deregulation may raise investment not only directly but also indirectly through higher productivity growth).

Figure 4 shows the simulated response of saving rates in selected countries under both the global and the euro area fiscal scenario (relative to a no-change baseline), and Figure 5 illustrates the implied impact on the size of global and intra-euro-area imbalances (measured as the GDP-weighted sum of the absolute saving-investment-gap-to-GDP ratios of all countries in the region).[79] All countries with the exception of China (which is assumed to leave its budget balance unchanged) are assumed to adjust their underlying primary balance so as to stabilise the debt-to-GDP ratio over the long term, as embodied in the long-term baseline scenario presented in the *OECD Economic Outlook* 87.[80] Fiscal tightening is implemented in equal steps over a period of 15 years (see Table 7 for an overview of the magnitude and timing of fiscal measures).

Figure 4. **Simulated current account impact of illustrative structural reforms and fiscal consolidation scenarios**

Percentage point deviation from no-change scenario

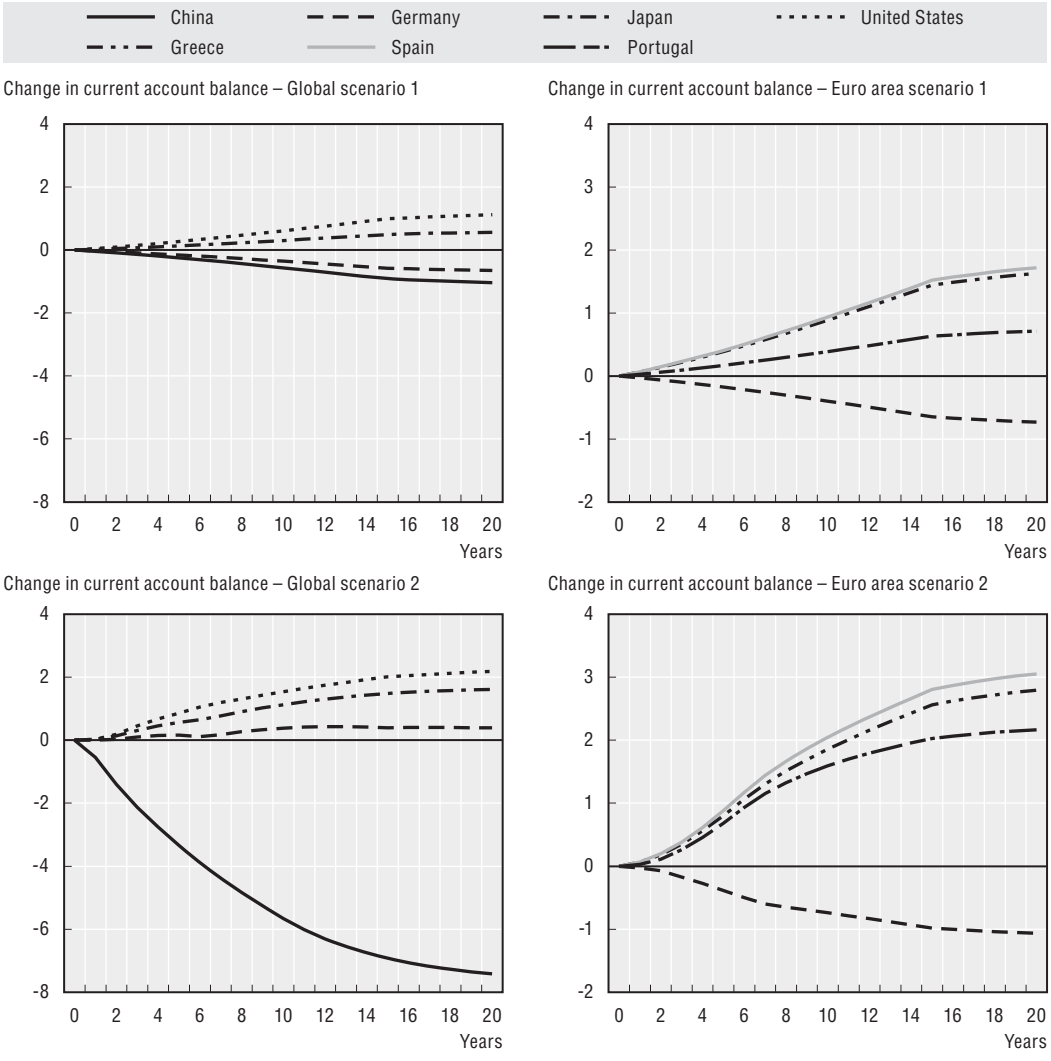


Table 7. **Assumptions underlying the scenario analysis**

	Change in government net lending	Product market reform (change in economy-wide PMR indicator)	Change in public social spending on health	Financial market reform (change in FRI)	Labour market reform (change in EPL indicator)
Global scenarios					
United States	7.3% of GDP, split evenly over first 15 years				
Japan	5.4% of GDP, split evenly over first 15 years	–0.25, split evenly over first 5 years			
Germany	1.3% of GDP, split evenly over first 15 years	–0.46, split evenly over first 5 years			
China		–0.80, split over first 10 years with larger reforms in first 5 years	2% of GDP, split evenly over 1st and 2nd year	6.50, split evenly over first 10 years	
Unweighted average of other countries in the region[1]	4.5% of GDP, split evenly over first 15 years				
Euro area scenarios					
Germany	1.3% of GDP, split evenly over first 15 years	–0.46, split evenly over first 5 years			
Spain	9.6% of GDP, split evenly over first 15 years				–2.41, split evenly over first 5 years
Portugal	6.2% of GDP, split evenly over first 15 years				–2.58, split evenly over first 5 years
Greece	9.3% of GDP, split evenly over first 15 years				–2.16, split evenly over first 5 years
Unweighted average of other countries in the region[2]	4.7% of GDP, split evenly over first 15 years				
Specifications	Table 1 (SAVT)	Table 3 (INVT)	Table 5 (SAVT)	Table 5 (SAVT)	Table 3 (INVT)

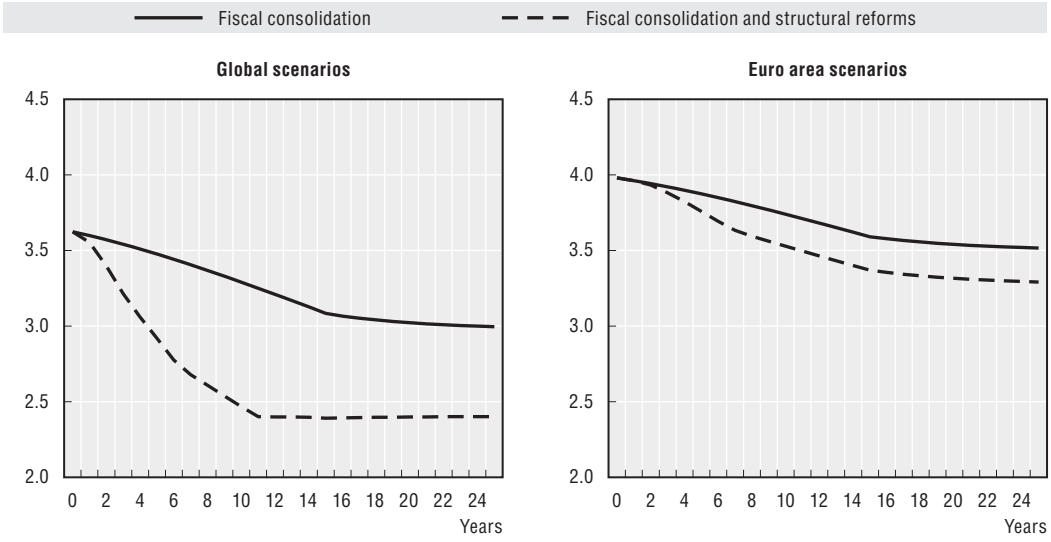
1. Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Greece, Hungary, Iceland, Ireland, Italy, Korea, Netherlands, New Zealand, Norway, Poland, Portugal Slovak Republic, Spain, Sweden Switzerland, United Kingdom.
2. Austria, Belgium, Finland, France, Ireland, Italy, Netherlands, Slovak Republic.

Overall, as fiscal tightening would be stronger in deficit countries than in surplus countries, global and intra-euro-area imbalances would narrow as a result of fiscal consolidation, although only to a limited extent (Figure 5). Fiscal consolidation in the United States would raise the aggregate saving rate, thereby reducing the country's saving-investment gap. However, due to private saving offsets and due to the simultaneous fiscal tightening in other countries, the gap would decline by less than the improvement in the government's budget balance, *i.e.* by just 0.6 percentage points of GDP over the next decade and by about 1¼ percentage points of GDP over the full 25 year simulation horizon considered here. In Japan, fiscal tightening would raise the currently positive saving-investment gap by slightly over half a percentage point of GDP over the next two decades. In Germany, the positive saving-investment gap would fall, reflecting the smaller effort needed to stabilise the debt-to-GDP ratio compared with other countries. As for other euro area countries, fiscal tightening would, for example, reduce the saving-investment gap in Spain, Portugal and Greece.

The second set of scenarios investigates how saving-investment gaps would be affected if countries were to implement structural reforms in addition to the fiscal measures. The reform packages that underlie the scenarios are designed with the view to reducing current account imbalances in countries with sizeable deficits or surpluses. However, other desirable, growth-enhancing structural reforms ignored here may or may not be associated with a reduction in saving-investment gaps.[81] In the global scenario,

Figure 5. **Simulated impact of structural reforms and fiscal consolidation on a summary measure of global and intra-euro-area imbalances**

% of region-wide GDP



Note: The size of imbalances is measured as the sum of the absolute saving-investment-gap-to-GDP ratios of all countries in the region, weighted by 2009 GDP (in current USD). The starting values are based on the current-account-to-GDP ratios in 2009. Global scenario 1 and Euro area scenario 1 only feature fiscal adjustment, whereas Global scenario 2 and Euro area scenario 2 feature fiscal adjustment and structural reforms.

Source: Simulations based on assumptions presented in Table 7.

Japan, Germany and China are assumed to deregulate their product markets so as to align their level of regulation with OECD best practice (defined as the average of the top three performing countries). In addition, China is assumed to implement over the next decade financial market reforms that are similar in magnitude to those undertaken between 1995 and 2005, and to increase social spending on health by 2 percentage points of GDP, split equally over the first and second years. The increase in public health spending is assumed to be fiscally neutral, so that the government budget balance remains unchanged. For the euro area scenario it is assumed that Germany deregulates its product markets and that Spain, Portugal and Greece deregulate their labour markets, aligning the level of their EPL indicator to OECD best practice (see Table 7 for an overview of the magnitudes and timing of simulated structural reforms). This second set of scenarios accounts both for the direct effect of product market reforms, based on the preferred specifications from Section 3, and for their indirect impact *via* higher productivity growth, using estimates by Boulhol *et al.* (2008).[82]

The removal of competition-unfriendly product market regulation in Japan, Germany, and China would temporarily reduce the saving-investment gaps of all three countries. In the year after the reform is fully phased in, the investment rate of Germany would be 0.4 percentage points above its pre-reform level, whereas those of Japan and China would be 0.15 and 0.2 percentage points higher, respectively. The increase in public health expenditure in China would reduce the country's saving-investment surplus by a further 4 percentage points of GDP, with more than half of the adjustment complete after about five years.[83] The decline in the surplus attributable to structural reforms could reach over 5 percentage points of GDP if China also were to implement financial market reforms. Overall, a combination of fiscal tightening/loosening and structural reforms would reduce

global imbalances by about one-third over the forecast horizon, compared with one-sixth in the pure fiscal scenario (Figure 5). Similarly, the structural reforms that underpin the euro area scenario would contribute to a narrowing of intra-euro-area imbalances. While, overall, the size of this effect would be rather modest, saving-investment gaps would be reduced significantly in the smaller euro area countries (Figure 4).[84] The simulated contribution of structural reforms to the reduction in global and intra-euro area imbalances represents a lower-bound estimate since their indirect impact through changes in macroeconomic conditions is not fully taken into account.[85] Moreover, it should be kept in mind that the summary measure of imbalances used here implicitly takes zero current accounts as the benchmark. It seems plausible that observed current account imbalances are at least partially an equilibrium phenomenon, so that there would be no need to bring them fully back to zero. To the extent that this is the case, the share of any undesirable imbalance that could be reduced through structural reforms would be bigger than computed here.[86]

Notes

1. Within the scope of this paper, structural policy reforms are defined as all reforms that may enhance long-run living standards, as analysed for instance by the OECD in its *Going for Growth* process.
2. This mechanism was strengthened insofar as the corresponding income loss in oil-importing countries was considered as temporary.
3. Some authors have also pointed towards too lax monetary policy (in particular in the United States) as a source of too low interest rates (*e.g.* Obstfeld, 2010; Obstfeld and Rogoff, 2009), though this view is heavily disputed (for example, Bernanke, 2010, concludes that there is little empirical support for this proposition).
4. Equilibrium may also be restored through changes in other macroeconomic variables and in particular in interest rates.
5. For example, a reform that boosts consumption would put upward pressure on the relative price of non-tradables and thereby weaken the trade balance to a point where the current account balance equals the (new) saving-investment balance.
6. In countries where private pensions are dominant, retirees might also gain from increased profits.
7. If a distinction is made between tradable and non-tradable goods, the saving impact of an income shock will also depend on whether consumers are more concerned about keeping overall consumption stable over time, or keeping the composition of the consumption basket stable and on the sector in which the shock occurs, since disturbances that affect the relative price structure over time also affect the optimal path of consumption and external borrowing (Dornbusch, 1983 and Fournier and Koske, 2010).
8. Aglietta *et al.* (2007) provide simulations of the impact of different pension reforms on aggregate saving in an overlapping-generations model.
9. This holds insofar as the effective retirement age also rises, as has typically been the case in the aftermath of past increases in the statutory retirement age across OECD countries (see, *e.g.* Duval, 2003). However, if the effective retirement age increases by less than the statutory age and individuals self-finance retirement ahead of the statutory age in order to stick with their original retirement plans, the saving rate might temporarily increase following the reform.
10. Although individuals may leave some of their wealth to their heirs, the size of the bequest should not rise indefinitely over generations.
11. Ultimately, the investment decision of a firm should not depend on the absolute price of an investment good but on its relative price *vis-à-vis* alternative factors for production. In this sense, reforms that affect the price of labour or other inputs should also influence the investment rate, with the size and the direction of the impact depending on the rate of substitution between production factors. For example, Alesina *et al.* (2002) show that higher government spending on

wages has a sizable negative impact on private investment and attribute this result to wage spillovers between the public and private sectors.

12. The productivity-induced rise in profits may at least partially be offset by higher real interest rates or by declining world market prices – as has happened in the 1990s and 2000s in some countries that enjoyed large productivity gains in the production of ICT goods.

13. Higher uncertainty can be thought of as raising the magnitude by which the return on investment must exceed its cost (Dixit and Pindyck, 1994) or by directly raising costs (Abel and Eberly, 1994).

14. This may have been one reason why the surge in corporate profits in China over the past decade translated in an increase in retained earnings rather than in higher dividend payouts (*e.g.* Jha *et al.*, 2009). It may also explain why companies in advanced economies increased net savings during the recent crisis.

15. This may partially explain for instance the persistent and sizeable imbalances within the euro area.

16. See Kerdrain *et al.* (2010) for further details on the policy indicators used as well as on data sources and construction.

17. The impact of indicators of overall institutional quality is not addressed in the analysis since a recent OECD study could not find any significant effect of this factor on saving and investment rates (Cheung *et al.*, 2010).

18. All OECD member countries apart from Chile, Israel and Slovenia. The time dimension of the sample varies by country and by specification with the maximum time period covered being 1965 to 2008.

19. The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

20. For this broader country set no data on private saving and investment rates are available.

21. For all macroeconomic control variables, a five-year average is calculated whenever data are available for at least three years; otherwise, the data point is reported as missing. For policy variables, an average is calculated whenever data are available for at least one year. For some of the policy variables data are only available for a single five-year time window (or even just a single year), in which case the analysis is reduced to a pure cross-section regression.

22. The budget balance is excluded from the static regressions that involve non-OECD countries as data for this variable are available only for a very small number of non-OECD countries.

23. Other variables that were initially included in the baseline regressions for the OECD sample but later dropped due to insignificance or lack of robustness include the GDP shares of the capital stock and the net foreign asset position, inflation, inflation volatility, GDP growth volatility, and the unemployment rate.

24. The main exceptions are the youth dependency ratio and the real interest rate which are neither significant for total nor for private saving in a pure – but arguably inappropriate – country fixed-effect regression that neither controls for common shocks nor for country-specific time trends. Moreover, the coefficient on the youth dependency ratio changes its sign when including country-specific time trends instead of period fixed effects.

25. An improvement in a country's terms of trade increases real income, measured as the purchasing power of its exports, therefore affecting private saving in the same way as income growth (*e.g.* Ostry and Reinhart, 1991). The finding of a significantly positive relationship with the terms of trade is in line with other macroeconomic studies on the determinants of saving (*e.g.* Ferrucci and Miralles, 2007; de Mello *et al.*, 2004; de Serres and Pelgrin, 2003; Loayza *et al.*, 2000).

26. While the expected longer longevity which is typically associated with a rise in the old-age dependency ratio and which may encourage younger people to increase their saving rate may counteract the effect of a higher share of dis-savers, the latter effect apparently dominates.

27. The medium to long-run elasticities obtained from the regressions for OECD countries and the elasticity obtained from the regression for OECD and non-OECD countries are very close to those reported, for example, by Cheung *et al.* (2010) and Furceri and Mourougane (2010).

28. While the negative short-run effect is consistent with the typical humped-shaped saving rate profile across age cohorts, the positive medium- to long-run effect could be explained by medium-

aged households increasing their saving rate in response to a rise in the youth dependency ratio to prepare for future education expenses.

29. The results should be interpreted with care, however, since the specifications do not control for possible reverse causality between government budget balances and saving rates.

30. This elasticity is close to that obtained in previous OECD work (de Serres and Pelgrin, 2003; de Mello *et al.*, 2004) and somewhat larger than that obtained here for the broader OECD/non-OECD sample.

31. The baseline specifications with country-specific time trends tend to produce somewhat better out-of-sample forecasts (results not shown).

32. Equations that feature policy variables yield indeed better out-of-sample forecasts for a number of countries, including in particular Spain and the United States.

33. A number of other variables were initially included in the dynamic panel baseline specifications but were later dropped because of insignificance. These are the GDP shares of the capital stock and the net foreign asset position and GDP growth volatility.

34. The results are also robust to a change in the precise calculation of the user cost variable. For example, when assuming a uniform depreciation rate of 11.8% (which corresponds to the sample mean) across countries and time, a 1 percentage point decline in the user cost of capital is estimated to raise total and private investment by respectively 0.26 and 0.20 percentage points of GDP.

35. The real interest rate effect appears to be about five times larger for OECD than for non-OECD economies, whereas for the other explanatory variables, there is no evidence that elasticities differ between OECD and non-OECD countries.

36. Equations that feature policy variables yield better out-of-sample forecasts for several countries, including Japan, Germany and the United Kingdom, among others.

37. The set of explanatory variables does not feature the real exchange rate since it is jointly determined with the current account.

38. For product market regulation see, for example, Scarpetta and Tressel (2002), Nicoletti and Scarpetta (2003), Conway *et al.* (2006) and the literature review by Schiantarelli (2008); for employment protection legislation see, for example, Scarpetta and Tressel (2002; 2004) and Bassanini and Venn (2007); for financial market reform see, for example, de Serres *et al.* (2006) and the literature surveys by Levine (2005) and Papaioannou (2007); and for innovation policy, see Box (2009).

39. Though quantitatively of minor importance (especially in the short to medium run), it should be noted that structural policies may affect saving and investment also through the demographic variables. Examples include improvements in the availability of early childcare places (which might raise fertility) or improvements in health care provision (which might increase longevity).

40. The finding is robust to variations in the sample and in the precise specification (see Kerdrain *et al.*, 2010).

41. Total public social spending includes, among others, public spending on old age, survivors, incapacity-related benefits, health, family, active labour market programmes, unemployment, and housing.

42. Public social spending on old age includes, among others, spending on pensions and residential care/home-help services.

43. Insofar as the social welfare reforms affect the level of employment (*e.g.* in the case of pension or unemployment benefit reform) they should also alter investment. However, this effect is likely to be of secondary importance, as also suggested by the current account regressions.

44. When dropping the real interest rate from the set of control variable, total public social spending comes out as significantly negative also in the model with period and country fixed effects.

45. According to Engen and Gruber (2001), cutting the unemployment benefit replacement rate by half would increase gross financial asset holdings by 14% for the average worker.

46. Specifically, the authors examine the means tests of the AFDC/TANF programs (Aid to Families with Dependent Children and Temporary Assistance for Needy Families) and of Medicaid. However, Hurst and Ziliak (2006) and Sullivan (2006), also looking at the AFDC/TANF programs, cannot find any evidence that means tests discourage asset holding.

47. While the variable is insignificant in the specification with country-specific time trends (see Kerdrain *et al.*, 2010), this result may be due to the specific way in which such reforms are implemented – namely step-wise increases in the retirement age phased in over a period of several years – which make the variable essentially collinear to a linear combination of a country-specific dummy and a country-specific trend.

48. While a rise in the retirement age may temporarily boost the saving rate through higher productivity growth, this indirect effect is likely to be too small to offset the direct effect in a noticeable way (see Barnes *et al.*, 2011 for an estimate of the GDP per capita effect of a rise in the retirement age).

49. Attanasio and Brugiavini (2003) look at a simultaneous rise in the retirement age and a cut in the level of benefits. The positive relationship could thus be interpreted in the sense that the effect of the benefit cut dominates or that the analysis captures the immediate impact of an increase in the retirement age with individuals increasing their saving in order to self-finance a retirement ahead of the new retirement age so as to stick to their pre-reform retirement plans.

50. Income risk is typically measured by either the variance of income over time (*e.g.* Guariglia and Rossi, 2002; Zhou, 2003; Hurst *et al.*, 2005; Bartzsch, 2006) or by self-reported information on the future employment and/or earnings outlook (*e.g.* Lusardi, 1997; Harris *et al.*, 2002; Carroll *et al.*, 2003; Benito, 2006). Regarding the magnitude of the effect, Lusardi (1997) finds, for example, that precautionary wealth accumulation ranges from one-fifth to one-quarter of the total wealth accumulation of Italian households, whereas Hurst *et al.* (2005) conclude that precautionary wealth accounts for less than 10% of total household wealth in the United States.

51. Although the variable comes out as significant in the specification that features country-specific time trends (see Kerdrain *et al.*, 2010), this result does not appear to be robust across different country samples.

52. Bassanini *et al.* (2010) point out that the indicator of employment protection on temporary contracts must be handled with care due to strong enforcement issues in several OECD countries. However, restricting the sample to countries with good law enforcement – defined as those with an average score on two enforcement indicators (integrity of the judicial system and the enforcement of contracts) that is above the median of the sample (see Bassanini *et al.*, 2010) – does not change the results.

53. No evidence of such an interaction effect is found for the OECD sample (results not shown), possibly reflecting the higher level of benefits in these countries (which, during the sample period, was generally above the significance threshold found for the broader country set).

54. However, stronger employment protection may be detrimental to investment in specific sectors. For example, OECD (2003b) provides some indicative evidence that ICT investment is lower in countries with strong EPL, which may reflect higher workforce adjustment costs that limit firms' profitability from investments.

55. The finding is robust to most (though not all) variations in the specification (see Kerdrain *et al.*, 2010, Tables A1.8 and A1.11) and also to variations in the sample, including the omission of countries with poor law enforcement (see Kerdrain *et al.*, 2010, Table A1.9 and Figures A1.15 and A1.16).

56. Detrimental effects of strict EPL on FDI inflows are confirmed by several recent studies (*e.g.* Haaland *et al.*, 2003; Nicoletti *et al.*, 2003; Görg, 2005; Javoric and Spatareanu, 2005).

57. There is even some evidence that strict employment protection in a firm's home country makes this firm reluctant to relocate abroad, at least temporarily (Dewit *et al.*, 2009).

58. By construction, the values of the EPL indicator range from 0 to 6. In 2008, the average value across all OECD countries was 1.94 and the standard deviation was equal to 0.85. For the average OECD country, a decline in the EPL indicator by one standard deviation would be equivalent to bringing it down to the stance observed, on average, in the five most liberal OECD countries (Australia, Canada, Ireland, the United Kingdom, and the United States).

59. The EPL indicators are, however, not statistically significant in the specification that features country-specific time trends (Kerdrain *et al.*, 2010, Table A1.8).

60. There is no evidence that labour market reforms affect the speed at which investment adjusts to its new equilibrium level following a macroeconomic shock to the economy (results not shown).

61. The more responsive investment is to the marginal profitability, the higher the steady state capital stock.

62. In the latter case only the *gross* investment rate is affected, whereas in all other cases it is also the *net* investment rate that changes.

63. Although the specification with country-specific time trends indicates that product market deregulation is detrimental to investment in the medium to long run, this result appears to be driven by a small number of countries. Previous studies on the link between product market regulation and investment also use specifications without time trends (*e.g.* Vartia, 2008).

64. Figure 4 shows the investment effect of a *one-standard-deviation* increase in the indicator of regulation in seven non-manufacturing industries. By construction, the values of the indicator on regulation in seven non-manufacturing industries range from 0 to 6. In 2007, the average value across all OECD countries was 2.13 and the standard deviation was equal to 0.63. For the average OECD country, a decline in the regulation indicator by one standard deviation would be equivalent to bringing it close to the stance observed in some of the most liberal OECD countries (Australia, Denmark and Spain, where regulation is estimated to be somewhat more stringent than in the most liberal countries, Germany and the United Kingdom).

65. The regressions for the broader country dataset which make use of the World Bank's *Doing Business* indicators also point to a possible negative link between some regulations and investment (Table 4).

66. By reducing precautionary saving through higher job turnover, product market deregulation may also affect the saving rate.

67. The outcome indicators are the GDP shares of stock market capitalisation and stock market trade (which have the disadvantage of being driven by changes in the valuation of listed companies, thus capturing wealth effects) and credit to the private sector (which is likely to be endogenous to saving decisions).

68. For example, Loayza *et al.* (2000), Bandiera *et al.* (2000) and Sarantis and Stewart (2001) find a negative impact of financial market development on saving rates, whereas Cheung *et al.* (2010) and Hüfner and Koske (2010) are unable to establish a significant link.

69. Moreover, Henry (1999) provides some evidence that stock market liberalisation leads to private investment booms in less developed countries.

70. The specifications with time trends even point to a detrimental effect of financial market reforms in the medium to long run, though the significance of this effect hinges crucially on the set of countries that are included in the regression.

71. This negative effect of financial development on current accounts has been found to be greater in the presence of a strong legal system that increases the returns on investment through increased transparency and predictability of economic activity (Chinn and Ito, 2007).

72. If capital markets are not perfect there might be an additional effect beyond the user cost as taxes affect the after-tax earnings from existing projects and hence the internal funds available to finance future investment (see the discussion in Section 2).

73. As pointed out by Hassett and Hubbard (2002), investment and tax policy tend to move together over the business cycle, which makes it difficult to establish the user cost effect based on aggregate data. For example, policymakers introduce investment tax credits when investment is perceived to be low and remove them when investment is perceived to be high (Cummins *et al.*, 1994; OECD, 2009).

74. Tax policies affect individual firms differently as the composition of the capital stock varies across firms, making it possible to identify the effect of tax policies based on *differences* in investment response across different types of firms.

75. These coefficient estimates from the baseline specifications in Table 1 are combined with coefficient estimates from other specifications in order to simulate the impact of structural reforms. An overview on the precise specifications used is provided in Table 7.

76. All OECD countries with the exception of Chile, Israel, Luxembourg, Mexico, Slovenia and Turkey, which are excluded due to data availability problems.

77. The results of the scenario analysis are consistent with any kind of exchange rate regime. It is implicitly assumed that the exchange rate adjusts so as to make the current account balance equal to the saving-investment gap.

78. Although the regressions for the OECD/non-OECD sample do not provide evidence that the effects of policies differ significantly between OECD and non-OECD countries, it cannot be ruled out that the elasticities would be different for a specific country such as China. Indeed, the size of the sample does not allow to properly test for coefficient heterogeneity for one particular country.

79. This measure of imbalances does not account for possible non-linearities (especially threshold effects), thus ignoring for instance that larger imbalances may be associated with disproportionally larger global systemic risk. However, giving more weight to larger surpluses and deficits by using the square instead of the absolute value of individual countries' current account balances yields qualitatively similar results.

80. However, the relatively modest pace of the assumed consolidation is such that in most cases the debt-to-GDP ratio first increases further before stabilising.

81. For example, if all OECD countries were to undertake product and labour market reforms so as to align their level of regulation with OECD best practice, the decline in global imbalances would be somewhat larger than found here.

82. See Table 3, column 1 in Boulhol *et al.* (2008).

83. Relaxing the assumption that the increase in health spending is fiscally neutral would lead to an even larger effect.

84. For instance, when using an unweighted measure of imbalances, the overall decline in intra-euro area imbalances due to fiscal measures and structural policies amounts to almost one-quarter.

85. Also, the simulations do not account for possible structural reforms in the United States that might boost saving and thus lower the size of global imbalances (*e.g.* a reduction of tax deductibility of interest payments on mortgages), the reason being the lack of empirical estimates of the size of the associated saving effects.

86. If by contrast (at least some) countries' observed and equilibrium current account positions were of opposite signs, the contribution of structural reforms to reducing "undesirable" imbalances would be less than computed here against the zero benchmark.

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ANNEX

Dealing with (almost) time-invariant explanatory variables

While it is possible to estimate a fixed effects model with almost time-invariant variables, this is likely to produce inaccurate point estimates for the coefficients of these variables since the between variance (the variation across countries which is disregarded in a fixed effects regression) accounts for a large share of the total variance of these variables, whereas the within variance (the variation across time which is exploited for inference) only accounts for a small share (for time-invariant explanatory variables the model cannot be estimated at all). Several solutions are available to deal with this issue. *First*, the country-specific effects could be dropped from the specification, implicitly assuming that what is not already explained by the regressors in the equation – including omitted fixed effects – is randomly distributed and uncorrelated with the regressors. *Second*, this distribution could be explicitly taken into account by estimating a random effects model. Both solutions add information to the model in order to (better) identify the impact of almost time-invariant variables. However, both will be biased if some regressors are correlated with the country fixed effects, which is likely to be the rule rather than the exception in many applications, including the present one.

Plümper and Troeger (2007) propose a new three-step estimator to make inference about the impact of time-invariant and almost time-invariant regressors. However, as pointed out by Greene (2010) and Breusch *et al.* (2011), the procedure produces downward biased standard errors. Nonetheless, several important insights emerge from the Plümper and Troeger (2007) approach. *First*, almost-time invariant variables should be treated in the same way as time-invariant ones since they carry similar types of information. *Second*, even though the fixed-effects model produces unbiased estimates, departing from the fixed-effects model can be reasonable in order to gain efficiency and obtain coefficient estimates with a smaller variance. *Third*, it is possible to pursue this approach while still controlling at least partially for the presence of country-specific effects.

To formalise, let the model be of the following general form:

$$Y_{it} = X_{it}\beta + Z_{it}\gamma + u_i + \varepsilon_{it} \tag{A1}$$

where Y_{it}, u_i and ε_{it} are scalars, X_{it} and Z_{it} are row-vectors, and $1 \leq i \leq N$ and $1 \leq t \leq T$. The vector Z_{it} contains both time-invariant and almost-time invariant variables, while X_{it} contains the remaining regressors which have sufficient time-variation. The error terms ε_{it}

are assumed to be centred and uncorrelated with each other and also uncorrelated with both X_{it} and Z_{it}. The country random effects u_i capture cross-country differences in Y_i that are not already captured by X_i and Z_i (where Y_i, X_i and Z_i denote the averages of Y_{it}, X_{it} and Z_{it} over time). It is assumed that the u_i follow some centred random distribution and are uncorrelated with all ε_{it}.

To estimate the model, one needs to instrument Z_{it}, meaning that a set of variables must be identified that are uncorrelated with the residual $u_i + \varepsilon_{it}$ but correlated with Z_{it} (for simplicity, variables that are not part of the model are excluded as potential instruments).* If no additional assumption is made about the correlation between (X_{it}, Z_{it}) and u_i, the list of potential instruments reduces to ($X_{it} - X_i$, $Z_{it} - Z_i$), from which (non-identifiable) purely time-invariant Z's are dropped. Therefore, the fixed effects estimator becomes the proper instrumental variables estimator. If it is instead assumed that there is no correlation between (X_{it}, Z_{it}) and u_i, the between information embedded in X_{it} and Z_{it} can be fully exploited. The list of exogenous variables is (X_{it}, Z_{it}) and the optimal linear estimator is the classical random-effects estimator. The random-effects estimator is more efficient than the fixed-effects estimator, but only if this additional assumption is satisfied; otherwise the random-effects estimator is inconsistent and the fixed effects estimator should be preferred.

One way to achieve a reasonable consistency-efficiency trade-off between these two extreme alternatives is to use only *some* of the cross-sectional information embedded in X_{it} and Z_{it}. Assuming that sufficiently good inference on β can be made with the fixed effects estimator, additional information on X_{it} is not necessary, especially if it is also believed that X_{it} is more likely to be correlated with the u_i than Z_{it} is. Since γ is the problematic parameter and since one wishes to exploit the cross-country variations of Z_{it}, using Z_{it} as an instrument, but not necessarily directly X_{it}, looks natural.

Following these ideas, this paper uses an alternative estimator to obtain an estimate of the coefficient vector γ. The work builds upon the results of Breusch *et al.* (2011), who show that in the case of strictly time-invariant variables the estimator proposed by Plümper and Troeger (2007) is in fact an instrumental variable estimator. Defining $\widetilde{X}_{it}$ as the projection of X_{it} onto the orthogonal of Z_{it} and the country-dummies – *i.e.* the residual of a regression of X_{it} on Z_{it} and county dummies (if the entire Z_{it} is time invariant, then $\widetilde{X}_{it}$ simply reduces to $\widetilde{X}_{it} = X_{it} - X_i$) – then the set of instrumental variables could be either ($X_{it} - X_i$, Z_{it}) or ($\widetilde{X}_{it}$, Z_{it}). Both sets of instruments use the between information for Z_{it}, but not for X_{it}. To be consistent, it must be assumed that the Z_{it} are uncorrelated with the unobserved u_i, but no assumption is needed with respect to the joint distribution of u_i and X_{it}. While both sets of instruments could be used to estimate the model with generalised two-stage least squares, the second set is preferred in the application since it produces slightly more robust results than the first one (though the conclusions are comparable). Indeed, the generalised two-stage least squares approach with instruments ($\widetilde{X}_{it}$, Z_{it}) has the additional desirable property that the estimate of β is exactly equal to that obtained from the fixed-effects regression. Hence, if cov(Z_{it}, u_i) is in fact non-zero, then only the estimate of γ is biased, whereas the estimate of β is sheltered from this risk.

* Baltagi (2008) discusses the instruments and the GLS correction that can be used to estimate the model in the case of time-invariant Z'.

While this estimator resembles that of Plümper and Troeger (2007) in its spirit, it is different in two important respects. *First*, the standard errors are trustworthy and, *second*, the feasible GLS method ensures higher efficiency. Even in the case when $\text{cov}(Z_{it}, u_i)$ is non-zero, but remains small, the additional information used by the proposed estimator can still improve the estimate of γ relative to the fixed-effects estimator. Indeed, as demonstrated by Plümper and Troeger (2007) with some simulations, a small bias can be a fair cost for a much lower variance in terms of the root mean square error criterion.

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