

The national income identity says that total income must be equal to the sum of the various components of GDP.

The **national income identity** states that all spending in the economy can be split into four categories: consumption, investment, final government spending, and net exports – that is, exports minus imports. Or:

$$Y = C + I + G + (X - M)$$

Because this is an identity, it always holds exactly. So if we know all but one of the terms in the equation, we can calculate the remaining one. For example, in 2014, US GDP was \$17 trillion. Consumption spending totaled \$12 trillion, final government spending totaled \$3 trillion, exports were \$2 trillion, and imports were \$3 trillion. Knowing this, we can calculate investment spending:

$$17 = 12 + I + 3 + (2 - 3)$$

$$I = 17 - 12 - 3 - 2 + 3 = 3$$

Investment must have been \$3 trillion. And in fact it was.

Note that imports are a subtraction from GDP. This makes sense, since they represent domestic spending that does not fall on domestically produced goods.

The identity also applies to changes in GDP. So it can be used to tell us what kinds of macroeconomic developments are possible.

By itself, the identity is not very useful, since you are unlikely to be in a situation where you know some of the components of GDP but not others. It becomes more interesting when we think about changes in GDP rather than its current level.

Any accounting identity also holds for changes in the variables. If investment spending rises by one dollar, and no other expenditure changes, then GDP must also rise by one dollar. So any change in GDP must involve changes in the various components that add up to the overall change.

Usually, we measure changes in the components in *percent of GDP*, rather than dollars. Note that to say that investment rose by one percent of GDP, is different from saying that it rose by one percent. Using the numbers above, a one percent of GDP increase in investment would be an increase of \$170 billion; a one percent increase in investment would be only \$30 billion.

If we think that spending determines output – as almost all economists do for short-run changes – then we can say that the changes in the

various components explain the change in total GDP. For example, we might say that an economy grew by 1 percent because households increased investment spending by two percent of GDP, while businesses reduced investment spending by one percent of GDP.

The BEA produces tables exactly like this, reporting "Contributions to Percent Change in GDP" by various expenditure categories. For example, in the third quarter of 2015, real GDP grew at a 2 percent annual rate. Of this, consumption contributed 2, investment -0.1, exports 0.1, imports -0.4, and final government spending 0.3. (The numbers don't quite add up because of rounding.) Note that the negative contribution of investment means that investment spending was falling, while the negative contribution of imports means that imports were rising.

This is useful: It tells us that growth in output is currently based on households' willingness to increase consumption relative to their incomes.

The same kind of analysis is also useful when we want to ask what is possible in terms of economic growth. For example, during 2007-2009, residential investment fell by a total of 3 points as the housing bubble collapsed. This decline was partly, but not entirely, offset by an increase in final government spending. Some people argue that this increase in government spending was not needed to maintain demand. But in that case, we can ask, what other component of demand could have increased to make up for the fall in residential investment? It does not seem plausible that households would have increased consumption expenditure sharply as the value of homes was falling, and household debt was already at high levels. (In fact, real consumption spending was flat during those three years.) It's hard to see how there could have been an increase in investment spending if businesses were seeing falling sales and many were having trouble getting loans. (In fact, business investment fell by 1.2 points.) So someone who claims that additional government spending was not required to maintain demand during 2007-2009 should have some explanation of how US exports might have grown, and/or imports fallen, by an additional 3 percent of GDP during this period.

Similarly, there is concern now in China that high growth has been driven by very high business investment, much of which may turn out to be wasteful or unprofitable. The national income identity reminds us that for investment growth to slow without pulling down GDP growth, some other component of demand must grow faster. Again, to use the national income identity to analyze these issues, we simply recall that $Y = C + I + G + (X - M)$ whether measured in dollars or percentage points of GDP. Suppose that Chinese investment must fall by, say, 5 percent of GDP to get back to a sustainable level.

As Martin Wolf discusses in a recent column in the *Financial Times*, there are serious challenges to faster growth of consumption by Chinese households, larger Chinese trade surpluses, or big increases in government spending. But we know that for GDP growth to be sustained, some combination of consumption, government spending and net exports must increase by 5 points.

The national income identity can be rearranged to show that the difference between private saving and investment, plus the government budget balance, must be equal to the trade balance.

Another way of using the national income identity is to introduce taxes, government transfers, disposable income and private savings. We will need to introduce some new variables for this. **Disposable income** is the flow of money available to households. So it includes both current income (that is, wages and profits from the business sector) and **transfers**, less tax payments. So if we write Y_D for disposable income, T for tax payments, and TR for transfers, then:

$$Y_D = Y - T + TR$$

In macroeconomics, savings simply means that part of total income that is not used for consumption. In other words,

$$S = Y - C$$

In the same way, **private saving** is that part of disposable income that is not used for consumption. So, writing S_p for private saving,

$$S_p = Y_D - C = Y - T + TR - C$$

Or equivalently, consumption is equal to disposable income minus private saving:

$$C = Y_D - S_p = Y - T + TR - S_p$$

We will ignore private transfers and assume all transfers are from government to households. Then total government spending is equal to G (purchases of goods and services for public purposes) plus TR . So the government budget surplus (positive) or deficit (negative) is equal to $T - (G + TR)$.

Now we combine the previous equation for consumption with the national income identity and rearrange the terms:

$$Y = (Y - T + TR - S_p) + I + G + (X - M)$$

$$0 = (I - S_p) + (G + TR - T) + (X - M)$$

$$(M - X) = (I - S_p) + (G + TR - T)$$

This says that the trade deficit must equal the excess of private investment over private saving, plus the government budget deficit. The excess of private saving over private investment is also called the **private balance**; in effect, it is the amount of income the private sector (households and business together) has left over after paying for all desired investment. If the private balance is negative, that means that there is more investment taking place than there is private savings to pay for it. Since savings always equals investment, the remaining saving must come from somewhere else – either the government (via a budget surplus) or the rest of the world (via a trade deficit.)

We could just as easily reverse all the terms (that is, multiply both sides of the equation by negative one). Then it says that the trade surplus must be equal to the excess of private savings over private investment, plus the government budget surplus:

$$(X - M) = (S_p - I) + (T - G - TR)$$

The previous equation is an **accounting identity**; it is always exactly true. But that raises the question – what if something happens that changes just one of the terms in the equation – how does it balance? Which of the terms in the equation “call the shots,” and which are passive? For example, in the 1980s, many people believed in the idea of “dual deficits” – that the large budget deficits under the Reagan administration were responsible for the large trade deficits that began around the same time. Later, in the 1990s, the federal government moved back toward budget surpluses, but the trade deficits continued. This made the dual deficits idea less attractive. It remains true, however, that if the government budget deficit increases, either the private sector must be saving more or investing less, or else the trade deficit must increase as well.

Another example: Suppose you think that China ought to have a smaller trade surplus. The national income identity shows us that this is possible only if Chinese households reduce their savings, or Chinese businesses increase their investment, or the Chinese government moves toward a budget deficit. Any successful effort to reduce the Chinese trade surplus must somehow bring about at least one of these outcomes.

In general, classical economists believe that savings calls the tune – that an increase in P_s will lead to an increase in I . They therefore favor measures to discourage consumption and to redistribute income to the rich, who tend to save more. Keynesian economists, on

the other hand, believe that investment calls the tune and private savings adjusts in reaction. In this view, an increase in I is more likely to lead to an increase in P_S than the reverse. (This is because not all of the the new income created by increased private investment is consumed.) So Keynesians are more likely to see higher consumption as good for the economy, and to favor redistribution to the poor.