Monetary policy and the role of intangible capital

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1   Extended Abstract

Over the last decades the importance of intangible capital as a factor of production steadily rises. Advanced economies rapidly transform their production structures towards intangible intensive economic activities. At least since 1995, European economies have seen a significant rise in the intangible intensity of their production activities. Figure 1 illustrates the ratio of intangible to tangible investment during 1995-2017 in European economies. Intangible investment increases from 32% in 1995 to 58% in 2017 as a share of tangible investment. At the same time, we observe a similar reallocation of hours worked towards occupations related to the production of intangible assets. That is the share of hours worked to occupations related with the production of intangibles rises from 9% in 1998 to 20% in 2017.[1]

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[1]Hours worked of intangible capital occupations are taken from EU-LFS. We follow the International Standard Classification of Occupations 2008 (ISCO-08) to regroup occupations in tangible and intangible ones. We assume that the following 2-digit occupational groups belong to the intangible group: 11-Chief executives, senior officials and legislators, 12-Administrative and commercial managers, 21- Science and engineering professionals, 24-Business and administration professionals, 25-Information and communications technology professionals, 26-Legal, social and cultural professionals.

Figure 1: Intangible to tangible ratios of investment and hours worked
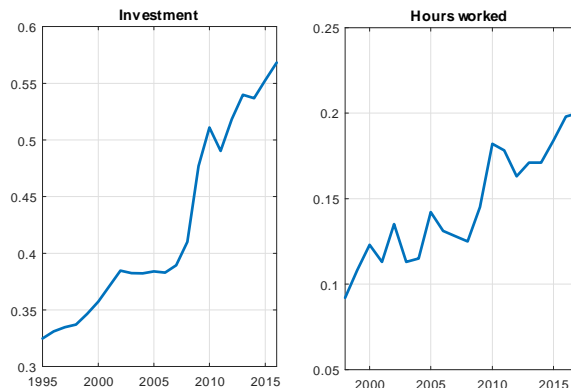
As Haskel and Westlake (2017) point out intangible capital affects modern economies in a fundamentally different way than tangible capital. Their argument stems from the structural economic characteristics of intangible assets. In particular, intangible investment is a non-rivalrous input in the sense that it can be used in multiple production activities at the same time. In addition, intangibles assets are difficult to measure both at micro and macro level. Finally, these assets involve irrecoverable costs which means that they cannot be liquidated or sold. Thus, most of the times intangible capital cannot be used as a collateral.

These economic characteristics of intangible capital pose new challenges for monetary policy. Since intangible capital is a poor collateral, the rise in intangible intensity (or the decline in tangible intensity) of modern economies implies that borrowing constraints are more likely to bind. As a result, this might increase the sensitivity of intangible intensive corporate firms to financial shocks (see e.g. Ignacio Lopez and Olivella (2018)).

The focus of this paper is on how the rise in intangible intensity affects the efficacy of conventional and unconventional monetary policy **in** the presence of financial frictions.

We build a dynamic general equilibrium model in the spirit of McGrattan and Prescott (2005, 2010). The model consists of households, firms and government. We assume a final and an intermediate good sector. The intermediate good sector consists of corporate firms which have access to two production technologies. That is a corporate firm can produce: (i) tangible good services and (ii) intangible assets. Both production technologies utilize tangible and intangible capital and hours worked to produce their outputs. We assume that tangible and intangible capital have different economic characteristics. First, tangible capital is assumed to be a rivalrous input in contrast with intangible capital which is assumed to be a non-rivalrous input. This captures the fact that machinery and equipment can be used in a single production activity; on the other hand knowledge and business process can be used to produce multiple tangible goods/services and new intangible assets at the same time. Second, we assume that only tangible capital can be used as a collateral. Thus, as intangible intensity of the corporate

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sector rises, the borrowing constraints are more likely to bind and as a result firm's economic decisions become more vulnerable to structural shocks.

In this setup, we assume that monetary policy has access two types of policy instruments, a conventional one and an unconventional one. We allow the nominal interest rate to act as the conventional monetary instrument and as such is set according to a standard Taylor type rule. The unconventional instrument takes the form of direct financial assistance of the Central Bank to the corporate firms. When the borrowing constraints of the corporate firms binds during a negative financial shock, the Central Bank can intervene and directly lend them to finance their economic decisions.

Fiscal policy finances an exogenous stream of government expenditures by levying consumption, labour, capital and corporate taxes.

Our preliminary results indicate that the presence of intangible capital in the model differentiate the dynamic responces of the endogenous variables with respect to standard structural shocks. Conventional monetary policy instruments are less effective in mitigating the economic impact of negative shocks; on the other hand unconventional monetary policy instrument could be more effective in supressing the negative shocks.